

**Tennessee Valley Authority
Regulatory Submittal for Kingston Fossil Plant**

Documents submitted

Kingston Fly Ash Recovery Project Non-Time-Critical Removal Action Embayment/
River System Action Memorandum - Final
Document no. EPA-AO-054

Date submitted

11/01/2012

Submitted to whom

Craig Zeller, EPA

Concurrence

Received Not Applicable

TVA

Kathryn Nash
Dennis Yankee - approved via e-mail
Mark Hastings *MH*
Neil Carriker *NC*
Michelle Cagley *mc*

Received Not Applicable

Jacobs

Jack Howard *JH*
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Approvals

TVA

Kathryn Nash

Date

11/1/12

EPA

Cy Zeller

Date

11/07/12

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 4

ATLANTA FEDERAL CENTER
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ATLANTA, GEORGIA 30303-8960

NOV - 7 2012

MEMORANDUM

SUBJECT: Request for Approval of Phase 3 Action Memorandum for the River System Non-Time-Critical Removal Action TVA Kingston Ash Recovery Project; Roane County, Tennessee.

FROM: Craig Zeller, P.E.
Remedial Project Manager

TO: Franklin E. Hill, Director
Superfund Division

The purpose of this memorandum is to formally request your approval of the Phase 3 Action Memorandum for the River System Non-Time-Critical Removal Action at the TVA Kingston Ash Recovery Project in Roane County, Tennessee.

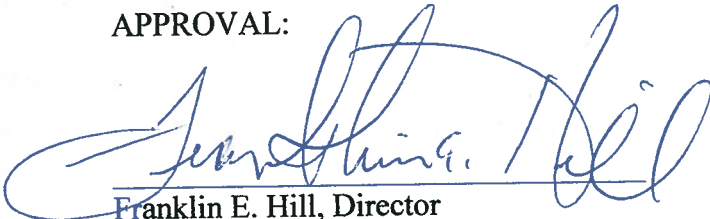
In accordance with the May 11, 2009 Administrative Order and Agreement on Consent (AOC) with EPA, TVA prepared a Sampling and Analysis Plan (SAP) in May 2010 to fully characterize the nature/extent and human health/ecological risks posed by the residual ash in the River System that was not removed during the Phase 1 dredging work. EPA approved the River System SAP in June 2010, and TVA conducted all the required sampling and analysis tasks over a two-year period. TVA prepared a Phase 3 Engineering Evaluation/Cost Analysis (EE/CA) Report, a Baseline Human Health Risk Assessment, and a Baseline Ecological Risk Assessment (BERA). The Phase 3 EE/CA Report developed three removal action alternatives to address the potential ecological risks posed and the identified Removal Action Objectives (RAOs). The Phase 3 EE/CA Report and Baseline Human Health/Ecological Risk Assessments were released to the public for a 60-day public comment period from August 11, 2012 to October 10, 2012. Comments were received from the Roane County Community Advisory Group (CAG), the Roane County Environmental Review Board, (ERB) and area residents Lynne Roberson, Joni Morgan (CAG chair) and Don Simon (CAG member). The Roane County CAG and ERB comments expressed support for Alternative 1 – Monitored Natural Recovery (MNR).

TVA has prepared the Phase 3 Action Memorandum for the River System which also contains the Responsiveness Summary (Attachment B) and the ARARs table (Attachment C). TVA has selected Alternative 1 – MNR in the Phase 3 Action Memorandum which relies on natural processes such as mixing, scouring/redeposition and sedimentation (burial) to reduce the relatively low risks posed to benthic macro invertebrates (bugs) and to birds that prey on bugs. Alternative 1 – (MNR) also includes up to 30 years of annual monitoring to confirm that risks associated with the residual ash remains low, and that ash related metals concentrations decline with time. Alternative 1 – (MNR) was selected because it meets RAOs, provides the best balance with respect to effectiveness and implementability, it is the most cost-effective, and it is also generally supported by the community.

TDEC officials have reviewed the Phase 3 Action Memorandum prepared by TVA and based on my consultations; have provided their concurrence on Alternative 1 – MNR. EPA Region 4 project staff in the Superfund Division and Office of Environmental Accountability have reviewed and provided comments to TVA on the Draft Phase 3 Action Memorandum, Responsiveness Summary and ARARs table. TVA has revised the Draft Phase 3 Action Memorandum and Attachments to fully address those review comments.

Based on the above, I formally request your approval for Alternative 1 – MNR for the Phase 3 River System Non-Time-Critical Removal Action for the TVA Kingston Ash Recovery Project in Roane County, Tennessee.

APPROVAL:



Franklin E. Hill, Director
Superfund Division

Nov. 7, 2012
DATE

DISAPPROVAL:

Franklin E. Hill, Director
Superfund Division

DATE



Tennessee Valley Authority, 1134 Swan Pond Road Trailer Park, Harriman, Tennessee 37748

November 1, 2012

Mr. Craig Zeller
U.S. Environmental Protection Agency
Region 4
61 Forsyth Street, SW
Atlanta, Georgia 30303

Dear Mr. Zeller:

Please find enclosed the revised Non-Time-Critical Removal Action River System Action Memorandum at the Kingston Fossil Plant in Roane County, Tennessee. We have addressed comments received. The enclosed Action Memorandum fulfills the requirements of Section IX, paragraph 30 of the Administrative Order and Agreement on Consent. Please contact me if you have any questions.

Sincerely,

A handwritten signature in black ink that reads 'Kathryn Nash'.

Kathryn Nash
General Manager
Kingston Ash Recovery

Enclosures

cc (Enclosures):
Incident Documentation



**Kingston Ash Recovery Project
Non-Time-Critical Removal Action
River System
Action Memorandum**

**Prepared by:
Tennessee Valley Authority**

Revision	Description	Date
00	Draft AM for TVA Review	11 October 2012
01	Draft Action Memo for EPA/TDEC Review	18 October 2012
02	Final Action Memo for Public Release	01 November 2012

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ACTION MEMORANDUM

I. PURPOSE

The purpose of this Action Memorandum is to request and document approval of the proposed Tennessee Valley Authority (TVA) non-time-critical removal action for the river system impacted by the released ash at the TVA Kingston Fossil Fuel Plant (KIF) Release Site in Roane County, Tennessee. On May 11, 2009, TVA and the U.S. Environmental Protection Agency (EPA) entered into an Administrative Order and Agreement on Consent (AOC) under Sections 104(a), 106(a), and 107 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, pursuant to which TVA will perform the removal action described herein (EPA 2009). Ash in the Emory River and the easternmost portion of the Swan Pond Embayment was removed under a time-critical removal action (TVA 2009). Ash in the western portion of the Swan Pond Embayment is being removed and the former Dredge Cell is being closed as an Ash Landfill under a separate non-time critical removal action (TVA 2010b).

This non-time-critical removal action for the river system involves the restoration of areas having residual ash material that was released into the Emory River and Watts Bar Reservoir. Under CERCLA, the ash spill constitutes a release, as well as a potential for continued releases of hazardous substances into the environment. Pursuant to Section 104(a) of CERCLA, the release of hazardous substances at the Site poses a threat to public health and the environment, if not properly managed. Conditions at the Site meet the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), Section 300.415(b)(2) criteria for removal actions.

II. SITE CONDITIONS AND BACKGROUND

ID Number: TN8640006682

Site Specific ID Number: A4XP

Removal Category: Non-Time-Critical Removal Action

A. SITE DESCRIPTION

This section of the Action Memorandum provides a description of the Site conditions and relevant background information.

1. Removal Site Evaluation

KIF is located at Emory River Mile (ERM) 2.6 and is at the headwaters of Watts Bar Reservoir near the confluence of the Clinch and Emory Rivers. Construction of the plant began in 1951 and was completed in 1955. KIF generates 10 billion kilowatt-hours of electricity a year, enough to supply the needs of more than 700,000 homes in the Tennessee Valley.

On Monday, December 22, 2008, a containment dike surrounding a portion of the Class II landfill for ash from the operation of the power plant failed, releasing about 5.4 million cubic yards (cy) of ash. Ash was released from about 60 acres of the 127-acre Dredge Cell complex. The released material covered about 300 acres of adjacent parts of Watts Bar Reservoir, including most of Swan Pond Embayment and reservoir shorelands. Most of the ash which spilled onto land was on property managed by TVA.

Coal, in its natural state, contains various naturally-occurring metals and radionuclides that can be concentrated and retained in the ash after burning the coal for power production. The ash is composed of fine silica particles similar to sand. Trace amounts of metals and radionuclides occur naturally in the coal and remain in the ash after coal combustion, among which arsenic and selenium are of particular interest.

2. Physical Location

The Site is located just off of Swan Pond Road in Roane County, Tennessee. Roane County had a total population of 54,181 in 2010. The county is primarily rural with about 60% of the population outside of incorporated cities and towns. Most of the 300 acres directly affected by the release was TVA property below Elev. 750 ft msl in Watts Bar Reservoir, although 40 non-TVA owned properties, constituting a total of 8 acres, were affected. TVA has since purchased 156 of the properties affected by the release or that may be affected by previous response actions.

The Emory River drains a watershed area of approximately 865 square miles with average flow rates between 700 and 1,300 cubic feet per second. The affected reach of Watts Bar Reservoir extends upstream to above Harriman. Normal summer pool within Watts Bar Reservoir is maintained between 740 and 741 ft above mean sea level (msl); normal winter pool is maintained between 735 and 737 ft msl. During low flow conditions in the Emory River, and when the Kingston Fossil Plant is running at or near capacity, backflow of water from the Clinch River up the Emory River can occur. The Emory, Clinch, and Tennessee Rivers are waters of the state classified for the following uses: domestic water supply, industrial water supply, fish and aquatic life, recreation, irrigation, livestock watering and wildlife, and navigation.

The released ash extended through several miles of riverways. Initially, the ash may have traveled upriver as far as ERM 5.75 and as far downriver as Tennessee River Mile 564. During the time-critical removal action, further downriver migration of ash may have occurred into the Clinch and Tennessee Rivers in response to large rainfall and high river flow events.

For purposes of sampling and analysis, the river system was divided into 10 different reaches: three upstream (reference) reaches, three downstream reaches in the Emory River, and two downstream reaches in each of the Clinch and Tennessee Rivers. The area most affected by the ash release extends from ERM 1.5 to 3.5 in Emory River Reach B.

3. Site Characteristics

Failure of the former Dredge Cell filled most of the Swan Pond Embayment and portions of the Emory River near the release site. The ash deposits were typically 20 to 40 ft thick. Dredging of the Emory River during the time-critical removal action removed approximately 3,511,000 cy of released ash and sediment, but not all ash was retrieved.

Residual ash in the Emory, Clinch, and Tennessee River system following the time-critical dredging activities was addressed under an EPA-approved Sampling and Analysis Plan (SAP) (TVA 2010c). Residual ash deposits greater than 0.5 ft in thickness were identified in downstream reaches of the Emory and Clinch Rivers. The maximum thickness of ash deposits as measured in vibracore samples was 4.2 ft in Emory River Reach B (ERM 1.5 to 3.5); greater thicknesses of ash deposits may be present in areas not sampled, as described in the EPA On-Scene Coordinator (OSC) Report (TVA 2011). Ash deposits are more extensive in Emory River Reach A (ERM 0.0 to ERM 1.5) than in other reaches, in part because time-critical dredging was not conducted below ERM 1.8 due to the presence of legacy constituents (cesium-137) in the sediment. The total volume of measurable ash deposits estimated to remain in the

river system is 510,000 cy dispersed over approximately 200 acres of the river system, based on the SAP sampling (TVA 2012).

4. Release or Threatened Release into the Environment of a Hazardous Substance, Pollutant or Contaminant

The ash material at the Site contains naturally-occurring metals such as arsenic, chromium, copper, lead, mercury, nickel, selenium, thallium, vanadium, and zinc, which are hazardous substances as defined by CERCLA Section 101(14). The ash material also contains naturally-occurring radionuclides, which are also hazardous substances as defined by CERCLA Section 101(14).

Samples of cell ash, sediment, surface water, groundwater, and biota have been collected and analyzed for metals, organic chemicals, radionuclides, and other parameters. Metals, primarily arsenic and selenium, have been the focus of this monitoring, since they contribute most to potential ecological risk. Arsenic is present in the cell ash at an average concentration of 74.5 milligrams per kilogram (mg/kg); selenium is present in the cell ash at an average concentration of 7.89 mg/kg.

Nearly 70 samples of seasonally-exposed sediment were collected near the shoreline in the Emory and Clinch River reaches. Average arsenic concentrations in seasonally-exposed sediment varied between 14.3 and 19.2 mg/kg in Emory and Clinch River reaches. Average concentrations of selenium, when detected, were near the detection limit, ranging from 1.77 to 2.45 mg/kg in the downstream reaches.

More than 80 samples of submerged sediment were collected from the river bottom from the 10 river reaches. Average arsenic concentrations in submerged sediment were highest in the lower Emory River, at 25.0 mg/kg, and declined to an average of 12.1 mg/kg in the Tennessee River. Average concentrations of selenium, when detected, were highest in the Emory River at 5.16 mg/kg, then declined to non-detect in the Tennessee River sediment.

Surface water samples were collected during an 8-week period in September and October 2010, from both mid-depth and epibenthic (near the bottom of the river) zones. More than 80 mid-depth surface water samples were analyzed from 11 stations located in the Emory, Clinch, and Tennessee Rivers. Average arsenic concentrations in mid-depth surface water were highest in the Emory River at 0.0020 milligrams per liter (mg/L), then declined to near reference values in the Tennessee River. Arsenic in epibenthic surface water in the Emory River was higher than mid-depth surface water, varying between 0.0030 and 0.0037 mg/L. Selenium was detected infrequently and at low concentrations near reference values in surface water samples. No constituent in either mid-depth or epibenthic surface water in downstream reaches exceeded Tennessee Water Quality Criteria (TWQC). Arsenic, lead, and mercury concentrations exceeded TWQC infrequently during storm event sampling.

Groundwater samples were collected between September and October 2010 from a series of 8 permanent monitoring wells, 6 temporary well points, and 11 Geoprobe[®] locations in and around the Ash Landfill. Arsenic concentrations in permanent monitoring wells were less than the TWQC maximum contaminant level of 0.010 mg/L with a maximum of 0.002 mg/L in one well. Arsenic concentrations were much higher in temporary well points in the alluvium beneath the Ash Landfill, with a maximum of 0.594 mg/L; in the cell ash porewater, arsenic concentrations were as high as 0.915 mg/L. Selenium was not detected in any of the permanent monitoring wells or temporary well points; in the cell ash porewater, selenium concentrations ranged from 0.00035 to 0.0196 mg/L. Results of groundwater modeling simulations predict that after 100 years, concentrations of arsenic and selenium will change little over time, primarily a result of sorption, reduction in recharge due to capping, and reduction in lateral groundwater movement due to the construction of a perimeter wall around the Ash Landfill.

Samples of plants and animals were analyzed for evaluation of bioaccumulation and food web modeling in the ecological risk assessment. In addition, results of toxicity testing of sediment and surface water and surveys of fish and benthic invertebrate communities were used as additional lines of evidence (LOE) in evaluating ecological risks.

5. NPL Status

The Site is not on the National Priority List, although, pursuant to the AOC, a preliminary assessment has been conducted at the Site under the SAP (TVA 2010c).

6. Maps, Pictures, and Other Graphic Representations

All removal file information, including maps and aerial photos of the Site, will be maintained by TVA and the EPA Remedial Project Manager and released to the EPA record center and the Administrative Record for inclusion in the Site files. A figure showing the key features of the Site is attached (Figure 1 in Attachment A).

B. OTHER ACTIONS TO DATE

1. Previous Actions

Immediately following the ash spill, an Incident Command Center was established and emergency measures were implemented to ensure safety of people in the area, contain and evaluate the damage, and plan for recovery of the ash. Several environmental monitoring programs were put in place to monitor river water, drinking water, and air quality. Road, railroads, and utilities were repaired and replaced. Dikes and weirs, both on land and in the water, were constructed to control the ash movement; Dike 2 was constructed to contain ash within the Swan Pond Embayment to the west. Dust control activities were implemented and are ongoing. Storm water management systems, such as clean water diversion ditches and ash water collection and settling basins, were constructed.

On August 4, 2009, an Action Memorandum was approved for removing ash from the river east of Dike 2 under a time-critical removal action (TVA 2009). The decision was made to remove ash from the river using hydraulic or mechanical dredging and from dry land areas east of Dike 2 using land-based equipment and then process, transport, and dispose of the ash recovered. The purpose of removing the ash from the river and from dry land areas east of Dike 2 was to limit the potential for future ash migration and to prevent upstream flooding in the event of a large rainfall. Time-critical dredging was completed in June 2010 and offsite disposal was completed in December 2010. Completion of the time-critical removal action was documented in the OSC Report (TVA 2011).

A Work Plan for performing non-time-critical removal actions at the Site was prepared (TVA 2010d). That Work Plan recommended that two Engineering Evaluation\Cost Analysis (EE/CAs) be prepared, one for the embayment/Dredge Cell area and the other for residual ash in the river. The EE/CA for the embayment/Dredge Cell area was approved by EPA in January 2010 (TVA 2010a) and the Action Memorandum was approved in May 2010 (TVA 2010b).

2. Current Actions

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. These non-time-critical removal actions are anticipated to be complete by February 2015. Other related

actions include restoration of the aquatic and riparian habitats within the embayment, anticipated to be complete by spring 2015.

C. STATE AND LOCAL AUTHORITIES' ROLE

1. State and Local Actions to Date

The Tennessee Department of Environment and Conservation (TDEC) has been actively engaged in the actions associated with remedying the release since it occurred. On January 12, 2009, TDEC issued a Commissioner's Order which remains in effect, although TDEC has agreed that work performed under the EPA AOC, in consultation with TDEC, would satisfy portions of the TDEC Order (TDEC 2009). As part of the ICS Unified Command, which included EPA and TVA, TDEC personnel have been onsite as part of a coordinated effort to contain the immediate threat to human health and the environment. Since the release, EPA, the State, and TVA have conducted extensive sampling of air, water, and ash material. Their efforts included sampling and analysis for public drinking water systems to assess whether the raw water entering and the finished water produced by the Kingston Water Treatment Plant meets public health standards. Work also included ongoing water quality monitoring and assessment within the major waterways impacted by the ash release including the Emory, Clinch, and Tennessee Rivers. TDEC and the Tennessee Department of Health provided public health guidance and recommended precautions for citizens that came in contact with the ash; they had major involvement in completing a public health assessment. TDEC has provided review of all regulatory documents (work plans, removal design packages, and concurrence documentation) produced by TVA. EPA consulted with TDEC prior to EPA approving any work. Actions taken by TDEC during the time-critical removal action and ongoing non-time-critical removal action are presented in detail on their website, available at <http://tennessee.gov/environment/kingston/index.shtml>.

2. Potential for Continued State and Local Response

TDEC will continue to play a large role in the response activities at the Site. They will continue to oversee activities under the Commissioner's Order. In addition, the State will continue to be involved in sampling surrounding water bodies and air, and will be responsible for approving the long-term ash management decisions at KIF, including closure of the former Dredge Cell as an Ash Landfill. EPA will coordinate with the State to ensure they are apprised of all progress made under the AOC.

III. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES

The conditions resulting from the ash release at KIF present a threat to the public health or welfare and the environment if not properly managed and meet the criteria for a non-time-critical removal action as provided for in the NCP Section 300.415(b)(2). The primary criteria include:

- **Section 300.415(b)(2)(i) Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants:**

A Baseline Human Health Risk Assessment (BHHR) was conducted to develop quantitative and qualitative estimates of potential cancer risks and noncancer hazards for human populations (receptors) exposed to environmental media impacted by ash remaining in the river system. The risk assessment was conducted in accordance with EPA *Risk Assessment Guidance for Superfund* protocols. Results of the BHHR (Jacobs 2012) are included as an attachment to the river system EE/CA (TVA 2012).

Human receptors evaluated in the BHHRA included a resident exposed to surface water, a recreator (swimmer/beachcomber) exposed to seasonally-exposed sediment or surface water, and a recreator from fish consumption. The risk analysis was based on analytical data collected from seasonally-exposed sediment, surface water, and fish filet sampling. Although there is potential unacceptable noncancer hazard due to ingestion of fish, these hazards are associated with legacy contaminants in the river system and not ash-related. Prior to the ash release, the State of Tennessee issued a fish consumption advisory for the Emory and Clinch Rivers that remains in effect. Results of the BHHRA concluded that there is no unacceptable cancer risk or noncancer hazard to current human receptors due to ash-related constituents.

A Baseline Ecological Risk Assessment (BERA) was conducted to evaluate potential risks to ecological receptors exposed to environmental media impacted by ash remaining in the river system. The risk analysis followed an 8-step process in accordance with EPA's *Ecological Risk Assessment Guidance for Superfund* protocols. Results of the BERA (Arcadis 2012) are included as an attachment to the river system EE/CA (TVA 2012).

Receptor groups evaluated included the benthic invertebrate and fish communities, aquatic- or riparian-feeding bird and mammal populations, aerial-feeding bird and mammal populations, amphibians, reptiles, and aquatic plant communities. Each receptor group was evaluated using multiple endpoints and multiple LOE. Potential risks were then characterized using a weight-of-evidence approach. More than one LOE was used to evaluate the potential for ash-related constituents to cause adverse effects. Primary evidence included comparison of effects values to measured constituent concentrations in environmental media, prey, or the organism's tissue; results of toxicity tests; and site-specific biological community surveys. Secondary evidence included health metrics (such as liver enzyme levels in fish and mammals, organ dysfunction, or increased frequency of lesions in fish).

Benthic invertebrates (e.g., mayflies or snails) were considered to be at moderate risk in the Emory River and low risk in the Clinch River due to biouptake of arsenic and selenium in ash-contaminated sediment. Riparian-feeding birds (e.g., killdeer) that feed on benthic invertebrates in ash-impacted areas of the river system were considered at low risk due to biouptake of arsenic and selenium in their diet (larval mayflies and snails). Aerial-feeding birds (e.g., tree swallows) were also considered to be at low risk due to biouptake of selenium in their diet (adult mayflies). Risk management actions were recommended for protection of these receptor groups; the proposed action is presented in this Action Memorandum.

Other ecological receptor groups were considered to be at low to negligible risk. These include fish, fish-eating birds, mammals, amphibians, reptiles, and aquatic plant communities. No further actions were recommended for protection of these receptor groups.

- **Section 300.415(b)(2)(ii) Actual or potential contamination of drinking water supplies or sensitive ecosystems:**

There is no identified groundwater contamination or groundwater plume associated with the former Dredge Cell or Ash Pond and therefore no potential contamination of drinking water supplies. Sensitive aquatic ecosystems that existed in the Swan Pond Embayment prior to the ash release (approximately 2.58 acres of wetlands) were virtually eliminated by the release. Wetland areas were typically associated with the shoreline margins, floodplain, small islands, and coves at the head of the embayment. These wetlands included a mix of forested shrub/scrub and emergent wetlands. A separate non-time-critical removal action is currently underway to address these sensitive ecosystems in the embayment. The BERA identified moderate risk to benthic invertebrates due to exposure to ash-contaminated sediment and low risk to riparian-feeding birds (e.g., killdeer) and aerial-feeding birds (e.g., tree swallows) due to ash-related constituents in their diet.

- **Section 300.415(b)(2)(v) Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released and,**
- **Section 300.415(b)(2)(viii) Other situations or factors that may pose threats to public health or welfare of the United States or the environment:**

Scour and sedimentation processes will result in mixing of residual ash deposits and natural sediments in the river system. Baseline fate and transport modeling of the Emory and Clinch Rivers sediment was conducted by the Engineering Research and Development Center, Waterways Experimentation Station (ERDCWES). The model was established to represent how the river system would respond to periodic floods and low flow periods. Results of that modeling (ERDCWES 2012) indicated that over the long term natural sediment dynamic processes will yield decreasing proportions of ash and decreasing concentrations of arsenic and selenium in sediment in the Emory and Clinch Rivers. Natural sedimentation and scour processes will likely produce a layer of mixed ash and sediment approximately 6 inches thick over a period of 10 to 15 years in depositional side channel areas.

The modeling also showed that periodic severe storm flow events (greater than a 10-year recurrence interval) would be expected to result in scouring portions of this natural cover, particularly in the main channel as well as some of the side channel deposits. The bulk of the residual ash would be transported downstream and out of the lower Emory and Clinch Rivers. Following such severe storm flow events, deeper sediments with potentially higher levels of ash and ash-related constituents could become exposed. However, the model predicted that ash and natural sediment mixtures would deposit in side channel areas of the Emory and Clinch Rivers, and that the natural cover of mixed ash/sediment would redevelop. Deposition rates in the Emory and Clinch Rivers averaged about 0.5 inch per year over the 30-year simulation; sediment accumulations as high as 5 ft were estimated in some side channel areas over the 30-year simulation.

IV. PROPOSED ACTION

A. PROPOSED ACTIONS

The proposed actions listed below have been developed in coordination with the TDEC and EPA. These actions are designed to address the remaining ash in the river system. These actions will minimize the potential for exposure by benthic invertebrates to the ash, and minimize potential biouptake by riparian- or aerial-feeding birds in their diet. An EE/CA has been prepared that evaluated alternative response actions with respect to their effectiveness, implementability, and cost (TVA 2012). The proposed action is to implement Alternative 1, Monitored Natural Recovery (MNR), as evaluated in the EE/CA. A removal action work plan, with associated sampling and analysis plan, will be developed to implement the MNR actions described below.

1. Proposed Action Description

The actions under this alternative are designed to evaluate the natural processes of sedimentation and scouring/redeposition to achieve Removal Action Objectives (RAOs) over time. Given the relatively low levels of risk, objectives for monitoring the natural recovery of the river system are to confirm that risks associated with the ash release remain low and that ash-related metals concentrations in sediment and benthic invertebrate tissue decline with time.

An adaptive monitoring and management framework will be followed. Adaptive methodologies incorporate decision points where causal effects of changed conditions are explored as an integral component of the process. Adaptive methodologies will provide opportunities for effective response to unexpected monitoring results, and will provide objective decision points regarding continuation or

termination of specific monitoring program components. A key component of the adaptive management process will be the sediment dynamic modeling, as has been performed by ERDCWES. Results of sediment and biota monitoring will be used in conjunction with results of sediment transport modeling to evaluate the rate of decline in concentrations, locations of ash or sediment deposition, effectiveness of mixing, or to evaluate whether contingent response actions or additional data gathering is warranted.

Figure 2 presents a sketch showing the monitoring transects to be sampled during the proposed MNR action. Six representative monitoring transects will be sampled in the Emory and Clinch Rivers (at approximately ERM 1.0, ERM 2.0, ERM 3.0, ERM 4.0, Clinch River Mile [CRM] 3.0, and CRM 4.0), and one monitoring transect will be sampled at a reference location. Actual locations of the monitoring transects and types and frequencies of sampling will be further refined through a data quality objectives (DQO) process with participation by TVA, EPA, and TDEC. Because the alternative involves no construction, it will be implemented immediately.

Monitoring of Sediment. Several discrete sediment samples will be collected from each of the monitoring transects at locations determined through the DQO process. Samples will be taken using vibracore sampling techniques to determine depth of any ash deposit that may be present. Samples of sediment will be selected from the top 6 inches of the vibracore sample, the zone in which burrowing benthic invertebrates might be exposed. Samples will be analyzed for analysis of percent ash content and of arsenic and selenium concentrations. Sampling will be conducted once per year for up to 30 years.

Remediation goals (RGs) are target levels in sediment samples for meeting primary ecological endpoints through monitoring. For sediment, the range of RGs for monitoring of arsenic concentrations is 29 to 41 mg/kg, and the range of RGs for monitoring of selenium concentrations is 3.0 to 3.2 mg/kg.

Monitoring of Biota. Monitoring will involve collection of benthic invertebrate adult emergent and larval insect (mayfly) body burden data for use in dietary risk calculations. Several composite samples of both adult mayflies and larval mayflies will be collected along each monitoring transect at locations determined through the DQO process. Samples of mayfly whole body will be analyzed for arsenic and selenium. Sampling will be conducted once per year for up to 30 years. Other monitoring will include supplemental investigation of fish bioaccumulation of arsenic and selenium for up to 5 years to confirm declining trends in whole body fish tissue.

Tissue Monitoring Endpoints (TMEs) are target levels in biota tissue samples for meeting primary ecological endpoints through monitoring. For larval insects (mayflies), the range of TMEs for monitoring of arsenic concentrations is 34 to 81 mg/kg, and the TME for monitoring of selenium is 7 mg/kg. For adult insects (mayflies), the TME for monitoring of selenium is also 7 mg/kg.

Monitoring of Effects. Monitoring will involve collection of benthic invertebrate community structure data for evaluation of abundance and diversity. Up to ten discrete samples will be collected from each of the seven monitoring transects. Sampling will be conducted once per year for up to 30 years. Other monitoring will include supplemental fish community surveys and sediment toxicity testing for up to 5 years to confirm trends.

Each year, a monitoring report will be prepared, documenting any changes in the sediment and biota analytical results or the invertebrate and fish community structures. Risk evaluations will be conducted to compare invertebrate-feeding bird risk parameters (invertebrate community abundance and diversity, mayfly body burdens) relative to those derived for reference locations and to those documented in the baseline.

Modeling of Sediment Transport. Monitoring results will be compared against predicted rates of natural recovery, in particular, the predicted rate of reduction in ash content and the predicted rate of reduction in arsenic and selenium concentrations. The sediment fate and transport modeling will be updated, as appropriate, every 5 years for 30 years to evaluate ash/sediment mixing and recovery rates, using updated information on bathymetry, ash deposit locations, and observed hydrology for that 5-year period. Modeling will be used to evaluate sediment transport impacts following significant storm flow events, as appropriate.

Groundwater Monitoring. A post-closure groundwater monitoring plan will be developed and implemented when the Ash Landfill closure is complete, in accordance with TDEC regulations found in 1200-1-7-.04.

Five-Year Remedy Reviews. Monitoring will be conducted annually for 30 years, with remedy reviews conducted every 5 years. At each 5-year review, the monitoring data will be evaluated. Based on the results of that evaluation, the sampling scope, locations, and/or frequency may be adjusted appropriately. New sampling technologies or methodologies will be identified that could improve monitoring efforts, increase confidence in results, be more applicable, or reduce costs. Any changes recommended for the monitoring program as a result of this evaluation will be submitted to EPA and TDEC for review and approval prior to replacing previous protocols. TVA and EPA will continue to conduct public meetings and invite community participation in accordance with the Community Involvement Plan, which will provide opportunities for the public to assess the progress of the restoration.

2. Rationale for Selection of the Proposed Action

TVA has selected the proposed action based on careful consideration of multiple factors, as evaluated in the EE/CA. The proposed action, which consists of monitoring the natural recovery of the river system, offers the best tradeoff of effectiveness, implementability, and cost remedy evaluation criteria. The following summarizes the key considerations in selecting this action.

- a. **Scour and sedimentation processes are effective in naturally covering the ash deposits and reducing concentrations of arsenic and selenium in the river sediment.** The ERDCWES has performed baseline fate and transport modeling of the Emory and Clinch Rivers sediment to evaluate long-term effectiveness of MNR. Results of that modeling (ERDCWES 2012) indicated that over the long term natural sediment dynamic processes yield decreasing proportions of ash and decreasing concentrations of arsenic and selenium in sediment in the Emory and Clinch Rivers. Natural sedimentation and scour processes will likely produce a layer of mixed ash and sediment approximately 6 inches thick over a period of 10 to 15 years in depositional side channel areas. This mixed ash/sediment layer has been observed in vibracore sampling performed in 2009 and 2010, confirming the model predictions. Scour and sedimentation processes will therefore be effective in producing a natural cover over any residual ash deposits, with declining concentrations in arsenic and selenium.

The modeling also showed that periodic severe storm flow events (greater than a 10-year recurrence interval) would be expected to result in scouring portions of this natural cover, particularly in the main channel as well as some of the side channel deposits. The bulk of the residual ash would be transported downstream and out of the lower Emory and Clinch Rivers. Following such severe storm flow events, deeper sediments with potentially higher levels of ash and ash-related constituents could become exposed. However, the model predicted that ash and natural sediment mixtures would deposit in side channel areas of the Emory and Clinch Rivers, and that the natural cover of mixed ash/sediment would redevelop. Deposition rates in the Emory and Clinch Rivers averaged about 0.5 inch per year over the 30-year simulation.

Deposition in side channel areas is projected to be substantially higher. In Emory River Reach C, the model identified areas with predicted sediment accumulation depths of over 5 ft after 30 years; in Emory River Reach B, the model predicted sediment accumulation depths of nearly 2 ft after 30 years; and in Emory River Reach A, the model predicted accumulation depths of approximately 1 ft. Similarly, in Clinch River Reach B, sediment accumulation depths of more than 1 ft were predicted for some areas after 30 years. Therefore, the model predicted substantial depths of deposition in side channel areas in the Emory and Clinch Rivers over a 30-year period.

The model predicted the percentage of ash in the ash/sediment side channel deposits will gradually decrease over time with mixing and redeposition throughout the river system. Based on the model predictions, surficial ash/sediment mixtures will contain less than 50% ash in approximately 10 years, and will continue to decline thereafter. This mixture of ash and sediment has been observed in vibracore sampling performed in 2009 and 2010, confirming the model predictions.

- b. **The proposed action is effective in meeting each of the RAOs.** RAOs have been identified in the EE/CA to mitigate the threat or potential threat to the public or the environment as a result of the residual ash in the Emory and Clinch Rivers. These threats or potential threats, as listed in Section III of this Action Memorandum, were evaluated in the BHHRA and BERA as part of the EE/CA, which indicated potential risk to ecological receptors due to exposure to arsenic and selenium in the ash-contaminated sediment. The RAOs also reflect the mid-term strategic objectives of the site as defined in the AOC. The following describe how the proposed action meets each of the RAOs.

- i. ***Protect benthic invertebrate populations in Watts Bar Reservoir from adverse effects due to arsenic and selenium in ash-contaminated sediment.*** The BERA concluded there is a moderate risk to benthic invertebrates due to exposure to arsenic and selenium in sediment. Results of toxicity testing suggested statistically significant reductions in growth and biomass could occur when percent ash in the sediment yields concentrations greater than the selected RGs for arsenic and selenium. Risks to benthic invertebrate populations will gradually diminish over time as ash-related constituent concentrations in sediment decline to below the selected RGs. Based on the results of the ERDCWES fate and transport modeling, sediment mixing and redeposition will likely result in average arsenic concentrations declining to less than the uppermost part of the RG range of 41 mg/kg in all areas of the river system in less than 12 years. Similarly, average selenium concentrations will decline to less than the uppermost part of the RG range of 3.2 mg/kg in less than 26 years.

Following periodic severe storm flow events, exposures may increase briefly in some scour areas; however, as the natural cover redevelops, exposure concentrations and associated risks will decline. Given that baseline levels of unacceptable ecological risk are confined to few receptors and are already low, these short-term scour events will have little likelihood of increasing risks over the long term. MNR will therefore effectively meet RAOs for protection of benthic invertebrate populations.

- ii. ***Protect riparian-feeding bird (e.g., killdeer) and aerial-feeding bird (e.g., tree swallow) populations from adverse effects due to uptake of arsenic and selenium in ash-contaminated sediment through their diet (benthic invertebrates).*** The BERA concluded there is a low risk to birds that feed on benthic organisms. These low risks will further diminish over time, as ash-related constituent concentrations in benthic invertebrate

tissue decline to below the selected TMEs. MNR will therefore effectively meet RAOs for protection of invertebrate-feeding bird populations.

- iii. ***Restore the ecological function and recreational use of the river system to pre-release conditions.*** Results of the BHHRA concluded that there is no unacceptable risk to current human receptors from the remaining ash, so that recreational use of the river system has been restored to pre-release conditions. By allowing natural processes of scour and sedimentation to occur, a natural cover will develop in depositional areas of the river system. This natural cover will be effective in eliminating exposure and biouptake by benthic organisms, restoring the ecological function of the reservoir throughout the food web.
 - iv. ***Dispose of waste streams from the removal action in accordance with Applicable or Relevant and Appropriate Requirements (ARARs).*** There will be no waste streams from the MNR removal action requiring disposal. Because only monitoring activities will be conducted within the rivers, no location- or action-specific ARARs will be invoked.
- c. **The proposed action has been demonstrated to be effective at other sites.** MNR has been proven effective at other sites in remediation of contaminated sediments. The Department of Energy (DOE) selected MNR as the remedy for management of contaminated sediments in the Clinch River (DOE 1997) and in Watts Bar Reservoir, downstream in the Tennessee River (DOE 1995). Those selected remedies established that the sediment should not be removed because there would be more risk from removing it than leaving it in place due to high rates of sediment resuspension and impacts to the benthic invertebrate population. Natural sedimentation was found to cover existing contamination and reduce its availability to the environment; as a result, mercury contamination in fish has shown a decreasing trend since the 1990s (DOE 2012). The U.S. Department of Defense, Environmental Security Technology Certification Program (ESTCP) evaluated more than a dozen case studies of sites throughout the U.S. for which MNR was selected as a remedy component (ESTCP 2009). The primary reasons for selecting MNR in those cases included ability of MNR to achieve RAOs within an acceptable time period and at a reasonable cost, preservation of valuable habitat that would otherwise be destroyed by capping or dredging, and infeasibility of capping or dredging, or their inability to achieve better results than MNR. Natural sedimentation and dispersion (scour/mixing with natural sediments) were found to result in reduction in contaminant concentrations and associated sediment toxicity. In almost every case where long-term monitoring was sufficient to evaluate remedy success, the results indicated appropriate progress toward achieving RGs.
- d. **Ecological populations will be adequately protected over the short term.** Benthic invertebrate community surveys conducted in the Emory and Clinch Rivers over the past few years have not shown substantial impacts attributable to the ash release; on the contrary, macroinvertebrate density and taxa richness in the immediate area of the ash release were similar to or even greater than other locations in the river system. The data did not indicate a trend of decreasing macroinvertebrate abundance or decreasing richness. Combined, these results showed no obvious patterns of persistent adverse impacts from the ash release; observed differences are likely the result of variation in habitat and substrate type. Therefore, the short-term risk to benthic invertebrates is relatively low and MNR would be effective in demonstrating these low short-term risks do not increase.

The BERA identified low risks to invertebrate-feeding birds based on conservative dietary exposure models. Risks for the tree swallow are based on site-specific reproductive measures that show little, if any, reduction in female fledglings produced per nesting female; the probability

of selenium dietary hazard quotients exceeding 1 is low (10 to 30%). Therefore, the short-term risks to invertebrate-feeding birds are low and MNR would be effective in demonstrating these low short-term risks do not increase.

- e. **Short-term adverse impacts are not likely under the proposed action.** There will be no action taken in the river system or on land that would impair the ecological habitat or increase short-term risks to human health or the environment. MNR will not disturb the sediments on the river bottom, avoiding short-term turbidity and suspended solids impacts on water quality and avoiding any exposure of cesium-137 contaminated sediments or other legacy constituents (such as mercury or polychlorinated biphenyls) to the aquatic environment. There is a DOE Record of Decision (DOE 1997) in place for the Clinch River, which establishes that the sediment not be removed because there is more risk from removing it than leaving it in place due to high rates of sediment resuspension and impacts to the benthic invertebrate population. MNR will therefore be consistent with this existing DOE Record of Decision.
- f. **The proposed action is the most cost-effective.** The proposed action is estimated to cost the least of the alternatives considered, primarily because there would be no capital cost associated with MNR. Long-term monitoring costs are expected to be the same for all alternatives.

This lower estimated cost, combined with the effectiveness in meeting RAOs and the lower risk of any adverse impacts, provides the best tradeoff of effectiveness, implementability, time, and cost among the alternatives considered. Several public comments on the EE/CA (see the Responsiveness Summary in Attachment B) expressed a preference for implementing Alternative 1 (MNR) due to additional risks and impacts associated with Alternative 2 (Capping) and Alternative 3 (Dredging).

3. Contribution to Remedial Performance

The proposed removal action will address the threats discussed in Section III, in accordance with the removal criteria of NCP Section 300.415(b)(2). The removal action contemplated in this Action Memorandum is consistent with any future remedial actions that could be anticipated at the Site.

4. Description of Alternative Technologies

The use of alternative technologies is not anticipated at this time. The EE/CA presented an evaluation of two alternative technologies for restoration of the river system.

One alternative would have placed a thin granular cap (nominally 6 inches thick) over the ash-contaminated sediment to contain it and to reduce biouptake of metal contaminants through the food web. MNR would have been implemented to demonstrate that recovery is occurring as expected. Approximately 200 acres of ash deposits at least 6 inches thick would have been capped. A subalternative was developed that would have placed the thin granular cap only over areas of ash deposits that are subject to scour, approximately 160 acres. The actions under this alternative would have been designed to avoid direct contact between the ash and benthic invertebrates and to prevent scour and subsequent transport of ash-contaminated sediment. This alternative was not selected because of (1) uncertain reliability and limited effectiveness if a severe storm flow event were to occur that could scour away the cap, and (2) short-term impacts of capping such as smothering existing benthic invertebrate communities and sediment resuspension, which could increase potential exposure of benthic organisms to sediments containing legacy constituents (cesium-137, PCBs, and mercury). This alternative would not have provided any greater environmental protectiveness, yet would have resulted in present worth costs that are four times higher than the selected action.

A second alternative would have dredged the ash deposits, dewatered the dredged spoils, and disposed of the material offsite. MNR would have been implemented to demonstrate that recovery is occurring as expected. Approximately 440,000 cy of ash deposits at least 12 inches thick would have been dredged. A subalternative was developed that would have dredged only shallow-water areas that are of greater ecological significance, removing approximately 160,000 cy. The actions under this alternative would have been designed to minimize long-term exposure of benthic invertebrates to ash-related constituents by removing much of the ash. This alternative was not selected because of complications due to the presence of legacy constituents, particularly cesium-137, in the river sediment. These complications would have included (1) sediment resuspension during dredging that could increase potential exposure of benthic organisms to the legacy constituents (cesium-137, PCBs, and mercury), and (2) availability of suitable capacity of disposal facilities due to potential cesium-137 contamination in the ash. This alternative would not have provided any greater environmental protectiveness, yet would have resulted in present worth costs that are 8 to 18 times higher than the selected action.

Several public comments on the EE/CA (see the Responsiveness Summary in Attachment B) expressed a preference for removal of highly localized sediments adjoining private properties, docks, and beaches. This removal would meet a goal for recreational use by these landowners as good, or better, than before the ash release. However, results of the BHHRA and BERA, as presented in the EE/CA, do not show unacceptable risks to either human health (recreational use) or the environment (restoration of the shoreline) in highly localized areas. The restoration of the river system under CERCLA has considered tradeoffs in effectiveness, implementability, and cost of alternatives so as to meet stated RAOs. Isolated deposits in highly localized areas do not represent significant exposure to either ecological systems or to people. For these reasons, the proposed removal action does not include removal of highly localized sediments adjoining private properties.

5. Engineering Evaluation/Cost Analysis (EE/CA)

The EE/CA for the embayment/Dredge Cell (TVA 2012) is available in the Administrative Record, available at the TVA Outreach Center, the Kingston Public Library, the Harriman Public Library, and online at www.tva.com/kingston and www.epakingstontva.com. The EE/CA was issued for public comment on August 10, 2012. Following a 60-day public comment period, written responses to significant comments on the EE/CA were prepared. The Responsiveness Summary is attached to this Action Memorandum (Attachment B).

6. Applicable or Relevant and Appropriate Requirements (ARARs)

Pursuant to the NCP, removal actions conducted under CERCLA are required to attain ARARs to the extent practicable, considering the exigencies of the situation. Waivers described in 40 CFR 300.430 may also be used for removal actions. This action is being conducted as a non-time-critical removal action. Pursuant to the AOC, restoration of area waters impacted by the coal ash release will be considered a remedial activity for purposes of complying with ARARs. Therefore, ARARs pertaining to such restoration shall be attained unless a waiver has been approved by EPA. A list of ARARs is attached to this Action Memorandum (Attachment C).

The proposed removal action will comply with all ARARs. Natural recovery of the rivers would gradually restore waters of the state for fish and aquatic wildlife and recreation in compliance with Tennessee rule 1200-4-3 and associated ARARs. Because only monitoring activities would be conducted within the rivers, no location- or action-specific ARARs would be invoked.

B. PROJECT SCHEDULE

Because the proposed removal action will not involve any construction, it will be implemented immediately. A removal action work plan will be developed to provide more details on the anticipated sampling and analysis. Actual locations of monitoring transects and types and frequencies of sampling will be further refined through a DQO process with participation by TVA, EPA, and TDEC. Monitoring will be conducted annually for 30 years, or as modified following the 5-year reviews. Each year, a monitoring report will be prepared, documenting trends in the sediment and biota analytical results and the invertebrate and fish community structures. Remedy reviews will be conducted every 5 years. At each 5-year review, the monitoring data and any changes in ecological risks will be evaluated. Based on the results of that evaluation, the sampling scope, locations, methodologies, or frequencies may be adjusted appropriately.

C. ESTIMATED COSTS

There are no capital costs associated with implementing the proposed removal action. Ongoing operations and maintenance (O&M) costs are estimated at \$543,000/year (2012 dollars) for up to 30 years. Costs of other monitoring are estimated at \$339,000/year for up to 5 years. Total present worth of capital, O&M, and other costs is \$10.0 million for a 30-year monitoring period.

V. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

If the proposed action were to be delayed or not taken, then conditions at the Site could change as a result of ongoing restoration activities and natural restoration processes. The ongoing non-time-critical action in the Swan Pond Embayment and Dredge Cell closure is scheduled to be completed in spring 2015. Discharges from the Site via storm water runoff or groundwater discharge are minimal, but conditions will change once the non-time-critical action is complete. Severe storm events are unpredictable and could change conditions in the river system. Ongoing processes of scour and sedimentation and bioaccumulation in the food web will continue to change conditions in the river. A delay in the decision would not adversely affect the effectiveness of these natural processes, although a delay in monitoring would mean that changes would not be determined until monitoring could begin.

VI. OUTSTANDING POLICY ISSUES

There are no outstanding policy issues.

VII. ENFORCEMENT

This action is being undertaken pursuant to an AOC between TVA and EPA, and also satisfies portions of the TDEC Commissioner's Order. TVA is the lead Federal agency for this action.

VIII. RECOMMENDATION

This Action Memorandum is the decision document that represents the selected removal action for restoration of the river system associated with the TVA KIF Release Site in Roane County, Tennessee. This Action Memorandum has been developed in accordance with CERCLA as amended, and is not inconsistent with the NCP. This decision is based on the Administrative Record for the site, available

online at www.tva.com/kingston and www.epakingstontva.com. The Administrative Record is also available at the following locations:

TVA Outreach Center
509 N. Kentucky Street
Kingston, Tennessee
(865) 632-1700

Kingston Public Library
1004 Bradford Way
Kingston, Tennessee
(865) 376-9905

Harriman Public Library (computer disks)
601 Walden Street
Harriman, Tennessee
(865) 882-3195

IX. REFERENCES

- Arcadis 2012. *Kingston Ash Recovery Project Non-Time Critical Removal Action River System Baseline Ecological Risk Assessment*. Document No. EPA-EO-050. August 3, 2012.
- DOE 1995. *Record of Decision for the Lower Watts Bar Reservoir*, Document No. DOE/OR/02-1373&D3, September 1995.
- DOE 1997. *Record of Decision for the Clinch River/Poplar Creek Operable Unit*. Document No. DOE/OR/02-1547&D3. August 1997.
- DOE 2012. *2012 Remediation Effectiveness Report for the DOE Oak Ridge Reservation*. Document No. DOE/OR/01-2544&D1. March 2012.
- EPA 2009 (May 11). *Administrative Order and Agreement on Consent, Docket No. CERCLA-04-2009-3766, Region 4*.
- ERDCWES 2012 (June). *Long Term Simulation of Residual Fly Ash Transport and Fate in the Watts Bar Reservoir System*. Stephen H. Scott. Coastal and Hydraulics Laboratory; U.S. Army Engineering Research and Development Center. Waterways Experimentation Station, Vicksburg, MS.
- ESTCP 2009. *Monitored Natural Recovery at Contaminated Sediment Sites*, ESTCP Project ER-0622, May 2009.
- Jacobs 2012. *Kingston Ash Recovery Project Non-Time-Critical Removal Action River System Baseline Human Health Risk Assessment*. Document No. EPA-EO-052. July 11, 2012.
- TDEC 2009 (January 12). *Commissioner's Order, Case No. OGC09-0001*, Division of Water Pollution Control.
- TVA 2009 (August 4). *Action Memorandum: Request for Removal Action at the TVA Kingston Fossil Fuel Plant Release Site, Roane County, Tennessee*. Document No. EPA-AO-005.

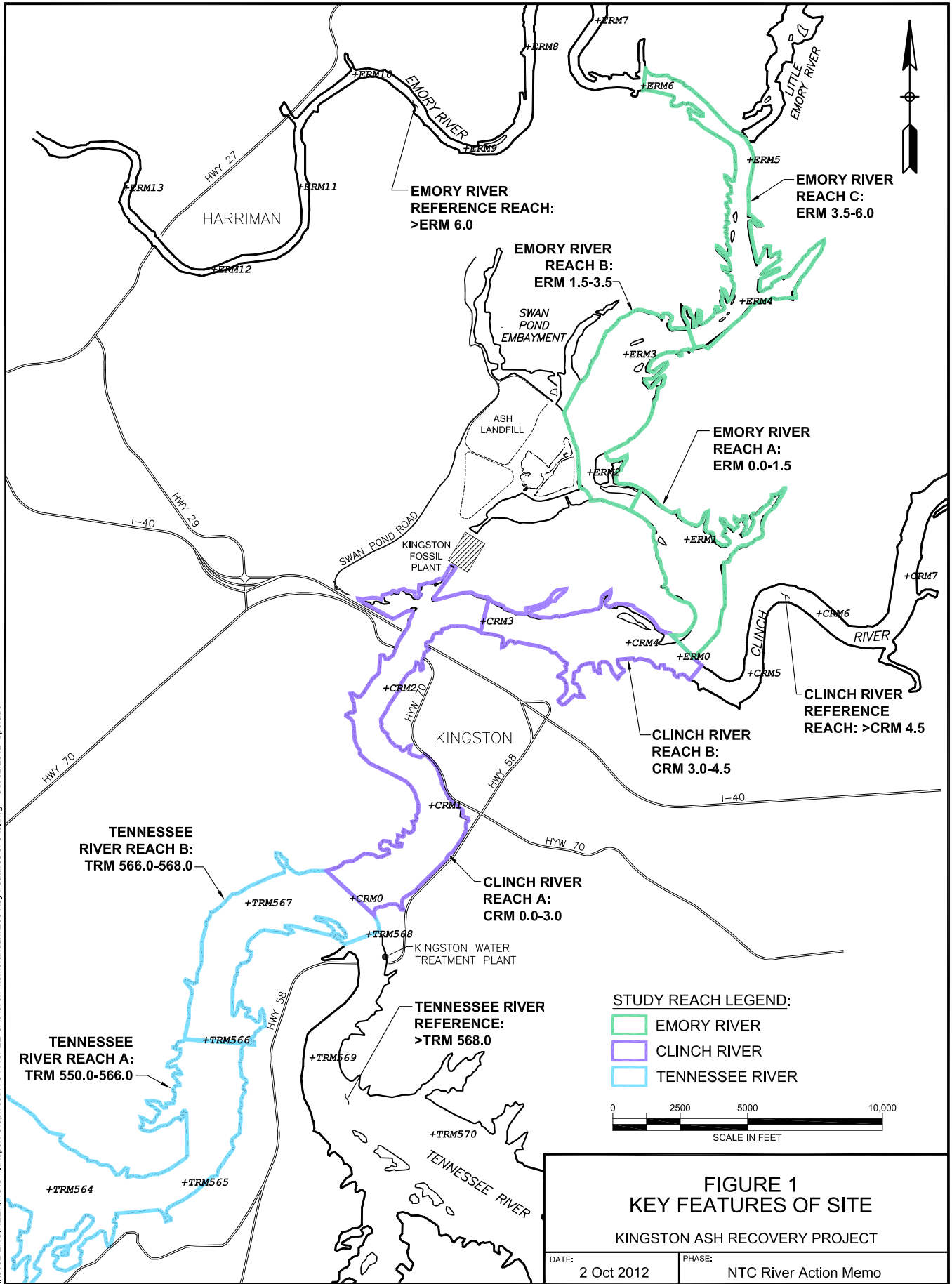
- TVA 2010a. (January 15). *Kingston Ash Recovery Project, Non-Time-Critical Removal Action, Embayment/Dredge Cell, Engineering Evaluation/Cost Analysis (EE/CA)*. Document No. EPA-AO-008.
- TVA 2010b. (May 18). *Kingston Ash Recovery Project, Non-Time-Critical Removal Action, Embayment/Dredge Cell, Action Memorandum*. Document No. EPA-AO-024.
- TVA 2010c (June 1). *Non-Time-Critical Removal Action for the River System, Sampling and Analysis Plan (SAP). Revision 3*. Document No. EPA-AO-021.
- TVA 2010d (August 18). *Kingston Ash Recovery Project, Non-Time-Critical Removal Action Work Plan for the Embayment / Dredge Cell*. Document No. RAWP-057.
- TVA 2011 (March 31). *TVA Kingston Fossil Plant Release Site, On-Scene Coordinator Report for the Time-Critical Removal Action, May 11, 2009 through December 2010, Harriman, Roane County, Tennessee*. Document No. EPA-AO-030.
- TVA 2012 (August 6). *Kingston Ash Recovery Project, Non-Time-Critical Removal Action, River System, Engineering Evaluation/Cost Analysis (EE/CA)*. Document No. EPA-AO-051.

X. ATTACHMENTS

- Attachment A Figures
- Attachment B Responsiveness Summary
- Attachment C Applicable or Relevant and Appropriate Requirements (ARARs)

ATTACHMENT A
Figures

P:\0002 ENGINEERING\Civil\Report Graphics\NTC River EE-CA\Action Memorandum\266 Key Features of Site.dwg - Oct 02, 2012 - bperatro



HARRIMAN

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 REACH A: TRM 550.0-566.0

TENNESSEE RIVER REFERENCE: >TRM 568.0

STUDY REACH LEGEND:

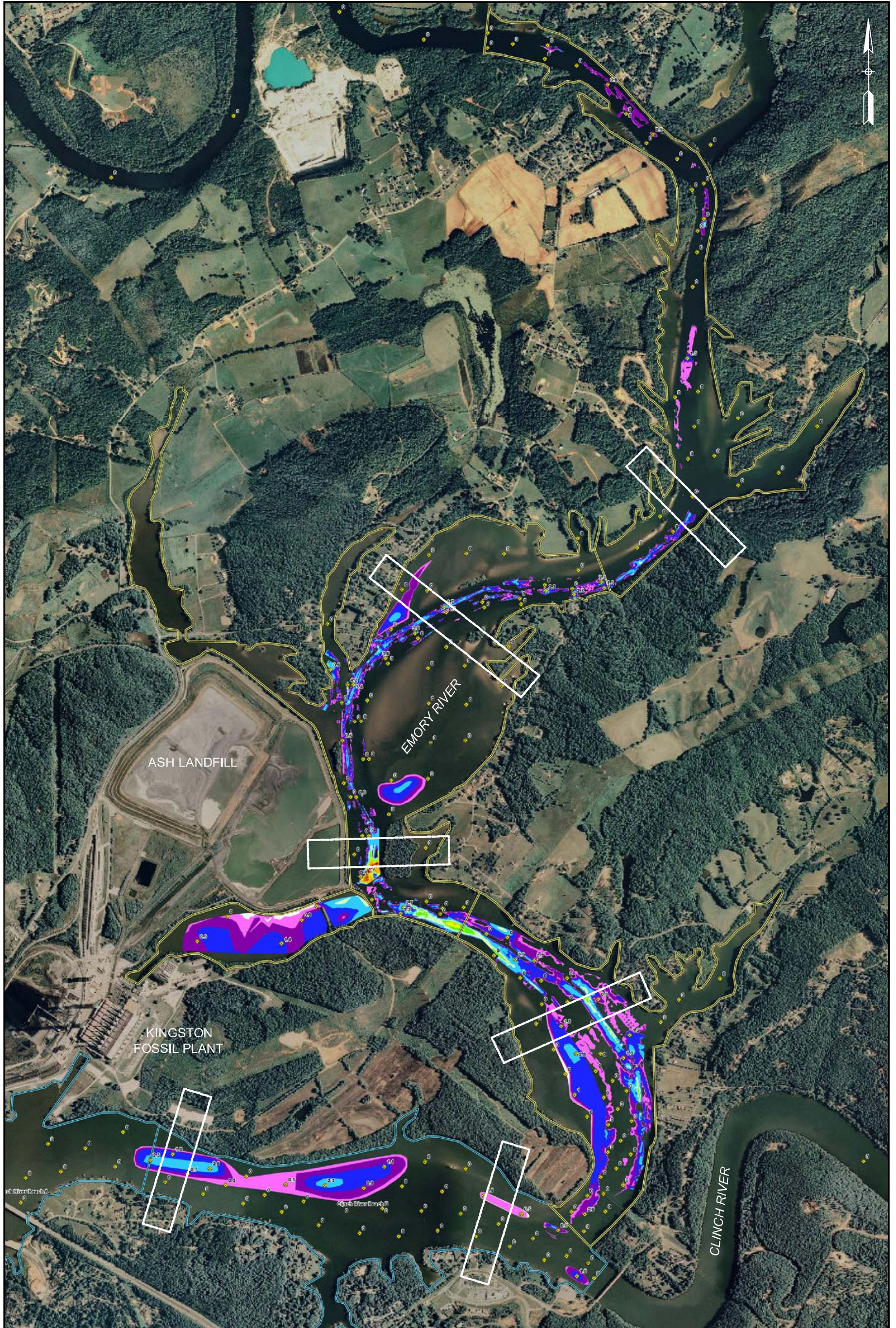
- EMORY RIVER
- CLINCH RIVER
- TENNESSEE RIVER

SCALE IN FEET

FIGURE 1
KEY FEATURES OF SITE

KINGSTON ASH RECOVERY PROJECT

DATE: 2 Oct 2012	PHASE: NTC River Action Memo
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Legend

- Vibracore Location Labeled with Ash Thickness (ft) (if < 50% Ash, Ash Thickness = 0)
- Emory River Reaches A, B, & C
- Clinch River Reaches A & B
- Locations of Monitoring Transects

Thickness of Ash in Vibracores >50% Ash

	No Ash		6 ft - 8 ft
	Less Than 0.5 ft		8 ft - 10 ft
	0.5 ft - 1.0 ft		10 ft - 15 ft
	1 ft - 2 ft		15 ft - 20 ft
	2 ft - 4 ft		20 ft - 25 ft
	4 ft - 6 ft		

Note:
Actual locations to be refined during the Data Quality Objectives process.

FIGURE 2
MONITORING TRANSECTS
KINGSTON ASH RECOVERY PROJECT

DATE: 2 Oct 2012	PHASE: NTC River Action Memo
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ATTACHMENT B
Responsiveness Summary

**Summation of Comments Received and Response to Comments
Tennessee Valley Authority (TVA), Kingston Ash Recovery Project
Non-Time-Critical Removal Action
River System Engineering Evaluation / Cost Analysis (EE/CA)
Document No. EPA-AO-051
Public Comment Period August 11, 2010 – October 10, 2010**

An Engineering Evaluation / Cost Analysis (EE/CA) was issued by TVA and the U.S. Environmental Protection Agency (EPA) on August 11, 2010. The EE/CA describes and evaluates alternatives for conducting a non-time-critical removal action to address residual ash in the river system. Three alternatives developed in the EE/CA are:

Alternative 1 - Monitored Natural Attenuation (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 under this alternative would include sampling of sediment, mayflies and mayfly larvae for arsenic and selenium, surveying benthic populations for abundance and diversity, and evaluating mixing and recovery rates for up to 30 years. The present worth cost of this alternative is estimated at \$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. Actions under this alternative would include monitoring of capping operations, restriction of river traffic and dredging in capped areas, and long-term cap maintenance. Two sub alternatives (2a and 2b) were developed to evaluate full capping and optimized (targeted) capping options. The present worth cost of this alternative is estimated to range between \$38.7 and \$44.8 million.

Alternative 2 - 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 would also be used to demonstrate that recovery is occurring as expected, both in dredged and undredged areas. Actions under this alternative would include monitoring of dredging operations, restriction of river traffic around active dredging operations, construction of a land-based dredge spoils processing area, dewatering the spoils, and loading and hauling the dried ash/sediment to permitted solid waste landfills. The present worth cost of this alternative is estimated to range between \$83.4 and \$179.1 million.

A 30-day public comment period on the River System EE/CA was initiated on August 11, 2010. The public comment period was extended by EPA to October 10, 2010. This Responsiveness Summary lists the comments received from the public by email or mail, and TVA's responses to the comments. These comments fell into 2 broad categories, those related to the EE/CA and those beyond the scope of the EE/CA. Similar comments received from multiple parties have

been grouped together and addressed. These comments are separated into these categories as they are addressed.

Comments were received from the Roane County CAG, the Roane County Environmental Review Board; and area citizens Lynne Roberson, Joni Morgan and Don Simon. Each of the comments received are attached in entirety at the end of this Responsiveness Summary. Responses below address primary comments submitted:

COMMENTS RELATED TO THE EE/CA

1. EPA should require a formal public comment period of at least 30 days to allow interested parties to review and comment on the selected alternative resulting from this EE/CA.

TVA Response: A 30-day public comment period was established for the previous Embayment/Dredge Cell Action Memorandum. TVA and EPA intend to establish a similar public comment period for the River System Action Memorandum.

2. The Roane County CAG, Roane County Environmental Review Board and Joni Morgan recommended the implementation of Alternative 1, Monitored Natural Recovery.

TVA Response: TVA appreciates your comment recommending that TVA implement Alternative 1 (MNR).

3. The RCERB recommends that TVA/EPA conduct public meetings and provide publications annually to present the results of sampling and monitoring activities associated with Alternative 1 (MNR) for the first five years. After the first five years, public meetings and publications presenting MNR activities and results could be performed at five-year intervals.

TVA Response: TVA/EPA will provide the results of sampling and monitoring activities via their web pages annually with copies being added to the locations where the Administrative Record is located.

4. The timeframe for Alternative 1 is currently 30 years, the EE/CA needs to stipulate monitoring could end sooner if sampling and monitoring results show levels below action levels for macroinvertebrates and riparian birds. After that time, continued expenditures are not warranted.

TVA Response: TVA agrees that the monitoring could end sooner if sampling and monitoring results show levels below action levels for macroinvertebrates and birds. The EE/CA indicated a monitoring time frame “up to 30 years”, and 5-year reviews in which the sampling plan would be evaluated for changes to the sampling scope including the determination that sampling can end.

5. A limited amount of dredging may be desirable for some residential landowners directly affected by ash in and around personal river/lakefront properties. These landowners should be asked if they desire the ash to be removed (or not) in order to meet the Remedial Action Objective of recreational use as good or better than before the ash spill.

As the recreational use by these landowners is highly localized (adjoining private properties), removal of the ash would restore the shoreline and shallow water to almost pre-spill conditions.

TVA Response: Results of the Baseline Human Health Risk Assessment (BHHRA) and Baseline Ecological Risk Assessment (BERA), as presented in the EE/CA do not show unacceptable risks to either human health (recreational use) or the environment (restoration of the shoreline) in highly localized areas. The restoration of the river system under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) considers tradeoffs in effectiveness, implementability, and cost of alternatives so as to meet stated Remedial Action Objectives (RAOs). Isolated deposits in highly localized areas do not represent significant exposure to either ecological systems or to people.

6. Alternative 2 (Capping) is not a desired alternative in any form. Capping would result in a significant increase of risks to human health over the entire proposed 30-year period.

TVA Response: TVA appreciates receiving your comment recommending that TVA not implement Alternative 2 (Capping) in any form.

7. Alternative 3 (Dredging) as written presently is not a desired alternative. Dredging would result in the same risks to human health as Alternative 2 (capping).

TVA Response: TVA appreciates receiving your comment recommending that TVA not implement Alternative 3 (Dredging) as written presently. TVA acknowledges your prior comment regarding dredging of highly localized areas adjacent to public properties.

8. What did TVA base the costs on to determine the breakdown of monitoring costs, what unit rates (e.g., direct salaries, overhead burdens)? For example, the Project Manager for the monitoring and sampling was listed at \$250K, however it is not well understood how that salary was derived.

TVA Response: Monitoring costs were estimated based on evaluation of typical costs incurred to date for similar activities under the Kingston Ash Recovery Project. For the Project Manager example, costs were estimated using contractor hourly billing rates and multiplying by 176 hours (one month of work per year) for an estimated annual cost of \$22,800 per year. Note that a salary of \$250K was not listed in the EE/CA cost estimates.

9. The planning level estimates for the monitoring listed an accuracy range of -30% (minus) to +50% (plus), which does not provide much accuracy, although the EE/CA categorized this as the "range of cost accuracy."

TVA Response: The planning level estimates are based on EPA's *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA*, EPA/540/G-89/004, OSWER Directive 9355.3-01, October 1988. Cost estimate accuracy is described in that EPA guidance as follows: "Under CERCLA typically, these 'study estimate' costs made during the FS are expected to provide an accuracy of +50 percent to -30 percent and are prepared using data available from the RI. It should be indicated when it is not realistic to achieve this level of accuracy."

10. (What are the mercury and cesium levels in the shallow areas of the Emory and Clinch Rivers? During low Emory flow, the Kingston Steam Plant intake suction causes the Clinch River to back into the Emory. The EE/CA shows the cesium; however, it cannot be determined how close sampling was done right along the shorelines.

TVA Response: Mercury was detected in 13 of 45 seasonally-exposed sediment samples collected along the shoreline of the Emory River. Detected mercury concentrations ranged from 0.053 to 0.13 mg/kg. Cesium-137 was detected in 5 of 9 seasonally-exposed sediment samples collected along the shoreline of the Emory River. Detected Cesium-137 concentrations ranged from 0.0462 to 0.406 pCi/g. Mercury was detected in 21 of 25 seasonally exposed sediment samples collected along the shoreline of the Clinch River. Detected mercury concentrations ranged from 0.065 to 1 mg/kg. Cs-137 was detected in 5 of 6 seasonally exposed sediment samples collected along the shoreline of the Clinch River. Detected Cs-137 concentrations ranged from 0.367 to 2.84 pCi/g. These are the results of the sampling done near shorelines at varying distances based on the width of exposed area. More information can be found in *Kingston Ash Recovery Project Non-Time-Critical Removal Action River System Sampling and Analysis Plan Task Completion Technical Memorandum Ash Deposits, Submerged Sediment, and Seasonally-Exposed Sediment* which is located at the following link: http://www.tva.gov/kingston/admin_record/pdf/NTC/NTC71.pdf

11. ATSDR does not recommend dredging in the Lower Watts Bar Reservoir (LWBR). This admonition applies to all legacy contaminants (PCBs, mercury and radionuclides) from the Oak Ridge Reservation.

TVA Response: TVA appreciates receiving your comment reiterating that ATSDR does not recommend dredging in the LWBR due to legacy constituents in the river system.

12. All COPECs that bioaccumulate in the food web need to be followed over time to ascertain whether these need to be included in long-term monitoring of surface water, sediment, biota and/or other environmental media. Simple monitoring of arsenic and selenium is not enough. There is a need to provide a full characterization of all COPECs at the spill site and all river reaches upstream/downstream in our waterways and to identify known sources of pollution.

TVA Response: TVA, EPA, TDEC, and independent researchers have completed comprehensive investigations of all COPECs in multiple media, including surface water, sediment, biota, and groundwater. These prior investigations have completed a full characterization of all COPECs from both the ash release and legacy sources of pollution. The BHHRA and BERA evaluated those data and media for multiple receptors and have concluded that the only ash-related constituents of ecological concern are arsenic and selenium. Further monitoring for constituents that do not contribute to ecological risk is unwarranted. The CERCLA remediation is not to remediate other COPECs due to legacy constituents in the river system, such as cesium-137, PCBs, PAHs, or mercury, that are not ash related. Nevertheless, TVA intends to continue fish bioaccumulation studies over the next few years that will analyze for multiple COPECs in fish tissue.

13. The EE/CA report does not clear up questions about the bioaccumulation of methyl mercury in fish and turtles... Also, dioxin was found upstream ... [and] more testing for dioxin is needed in the LWBR. Do we know enough to estimate how long it will take to see a decline in ash-related and legacy COPECs so that it may be possible to lift fishing advisories and the ban on commercial fishing here?

TVA Response: Methyl mercury and dioxin are not constituents related to the ash release. Investigation of these constituents in LWBR is outside the scope of the Kingston Ash Recovery Project and is therefore not addressed by this EE/CA. As noted in the BHHRA, TDEC has issued fish advisories for mercury (Emory River) and PCBs (Watts Bar Reservoir). Mercury and dioxins are legacy constituents unrelated to the ash release; therefore, an evaluation of the rate of decline in legacy COPECs is outside the scope of this EE/CA. Nevertheless, TVA intends to continue fish bioaccumulation studies over the next few years that will analyze for multiple COPECs in fish tissue.

COMMENTS BEYOND THE SCOPE OF THE EE/CA

- a. EPA and TVA have stated that the remediation of the fly ash spill and the construction of the disposal cell represent major steps towards Mr. Kilgore's commitment to "make the area better than it was". The impacted community takes great exception to this position.

TVA Response: Thank you for your comment.

- b. EPA's established cleanup criteria of 50% fly ash to 50% soil, which was unilaterally established without involving the interested public, has left the Emory and Clinch Rivers blemished and contaminated with fly ash.... The alternatives that are proposed in the EE/CA will not restore the surface waters and beaches to their respective conditions prior to the spill. They will only restore them to adequately support human health and ecosystem health. This restoration will be far from TVA's commitment to restore the impacted area to a condition that is equal to or better than it was before the spill.

TVA Response: The EE/CA establishes Removal Action Objectives (RAOs) and remedial goals (RGs) for arsenic and selenium in sediment as well as tissue monitoring endpoints (TMEs) for arsenic and selenium in benthic invertebrate tissue to be protective of human health and ecological receptors. These are the cleanup criteria. Please note that the 50% ash is used as a practical consideration to define whether a sample is primarily ash or sediment, and is not a cleanup criterion. It should be noted that the goal of this removal action is not to clean up natural sediment that may have higher concentrations of arsenic and selenium. The EE/CA was issued for public comment on the RAOs, RGs, and TMEs and does not establish any decision.

- c. TVA recovered several permitted docks along Emory River Road and Lakeshore Drive from homes that were purchased and destroyed by TVA. TVA should re-distribute those dock permits to existing homes on the Emory River that currently do not have those privileges.

TVA Response: Issuance of dock permits is outside the scope of this EE/CA and is regulated by Section 26a of the TVA Act. Individuals wishing to acquire a dock permit should contact their respective TVA Regional Watershed Office.

- d. TVA should deed property below the 750 ft elevation along the Swan Pond and Emory Road areas to owners of the adjacent properties.

TVA Response: TVA stewardship of Watts Bar Reservoir shorelines is outside the scope of this EE/CA.

- e. TVA should take immediate steps to mitigate the real estate damage to the Swan Pond area by conducting a thorough cleanup of its construction activities along Swan Pond and Swan Pond Circle Roads. Construction support services, offices and equipment should be moved to portions of the site that are not visible from those roads. Ultimately, the only evidence of KFP should be the towers and stacks visible behind a landscaped parkway.

TVA Response: TVA continues to be actively engaged in non-time-critical removal actions that require the construction support services, offices, and equipment referenced in your comment. These will be removed upon completion of the ongoing construction.

- f. TVA should also move all construction vehicles off of the public roads onto the site, to reduce traffic and other hazards associated with the cleanup efforts.

TVA Response: TVA will continue to reduce construction vehicles on public roads to the extent possible during non-time-critical removal action construction.

- g. TVA should continue to meet with residents of the impacted areas to continually assess the reparations of the impacts to determine an appropriate investment in restoration and recovery.

TVA Response: Public involvement is outside the scope of the EE/CA. TVA/EPA will continue to meet with the Community Advisory Group and community leaders, and conduct public meetings and invite community participation.

- h. TVA should completely pay for all planned parks and recreation areas proposed by their Master Plan.

TVA Response: Parks and recreation areas are outside the scope of the EE/CA. TVA will provide land use to the county through a license agreement, assist the county with designs, and bring the area to grade. Roane County will be responsible for constructing ball fields and infrastructure.

- i. In addition to reclamation, TVA should promote the restored impact area in a manner similar to British Petroleum's (BP) promotion of the gulf areas subsequent to their oil spill.

TVA Response: Promotion and publicity of the area is outside the scope of this EE/CA. TVA contributed \$43 million to the Roane County Economic Development Fund. Project funds have been distributed based on recommendations from local elected

leaders on the foundation board. The majority of funds have been invested in local schools, and \$1 million has been set aside for public relations assistance.

- j. The focus of the EE/CA report is on ... remediation in local waterways. There are concerns that go beyond this limited focus to include the health and well-being of people living in the area including those who were relocated as a result of the coal fly ash release; the strength of the response of local health care providers, local government, and the community; and the state of the art in risk assessment and education of the public.... There is a need to provide additional information on the impact of the coal fly ash spill on the physical and mental health and social-well being of those affected by the release.... Not all of the results of the ORAU/Vanderbilt health screening program were fully explained (e.g., iron-deficiency anemia, selenium in blood).... It would be wise to register people for follow-up health studies...under the auspices of ATSDR and TDH.

TVA Response: TVA contracted with ORAU to conduct medical screening health assessments in 2009 and 2010. The ORAU reported no findings that indicated local or systemic toxicity related to constituents identified in the ash. Repeat measurements of selenium in blood were taken for individuals who reduced their selenium intake in their dietary and supplement sources; those measurements found selenium in the normal range. ORAU recommended repeat evaluations of these individuals. TVA would refer all such individuals to ORAU or their personal physician for such repeat evaluations. Such medical screening is outside the scope of the EE/CA.

- k. Other recommended local/State actions include: educate the general public on ... fishing advisories and other institutional controls designed to reduce contaminant exposure; include consumers in the development and testing of educational programs, materials, and web sites (e.g., TDEC fishing advisories); identify agencies represented in the Watts Bar Interagency Working Group (WBIWG) and specify the enabling authority; and consider adding an independent member of the public (e.g., a CAG member) and representatives of local government (e.g., Roane County Boards of Health and Environmental Review, and OES) in an ex officio capacity to make people aware of current issues and pending actions in dredging local waterways.

TVA Response: These actions are outside the scope of the EE/CA and are referred to local and State authorities for their consideration.

- l. I also feel that TVA should fund mixed river front development at Kingston Gravel Pit .It should be promoted with docking for boats, shopping & signage as a complete recreation area to visit by boat or auto to visit Roane County. Funds should not be given to General Fund or Mayors must be directed to a committee to secure a developer to bring mixed business that would enhance area. This would generate much needed revenue, plus promote the beauty & strongest strength the area has to offer.

TVA Response: This comment is beyond the scope of the EE/CA. Economic Development and uses of TVA land are managed under existing programs. Please contact local elected officials and economic development officials (Roane Alliance) to discuss the ideas you are bringing up.

COMMENTS FROM THE ROANE COUNTY COMMUNITY ADVISORY GROUP (CAG)

ROANE COUNTY COMMUNITY ADVISORY BOARD COMMENTS
ON THE EE/CA OF OCT 2010

BACKGROUND

As decided by the U.S. District Court, Eastern Division of Tennessee, TVA's negligent conduct resulted in more than five million cubic yards of coal ash catastrophically escaping the Kingston plant's containment structure shortly after midnight on Monday, December 22, 2008. This action contaminated and violated the Emory River, the Clinch River, and the Tennessee River, and most especially the Swan Pond community. Houses were destroyed and people's lives were adversely changed by the release and by the subsequent construction activities required to attempt the restoration of the rivers and communities impacted by the spill.

MAJOR CONCERNS

1. Almost immediately, EPA and TDEC established a presence at the site of the disaster. Also, almost immediately, decisions concerning conduct of the cleanup were made. TVA, EPA and TDEC made some of the most important decisions without involvement or consideration of the community members those decisions would impact. Without providing the opportunity for input from the impacted residents, EPA decided to employ EPA's Removal Process rather than its Remedial Process. EPA and the State unilaterally decided to forego the requirement to develop a no-action alternative as part of the Removal Action. TVA, EPA and the State established a clean-up level of 50% fly ash to 50% native soil/sediment without notification of or consultation with the residents, who will have to live with that level of contamination indefinitely. And most recently, the impacted community has discovered that the selected alternative of this EE/CA will not be presented to the public for a formal comment period but will be unilaterally selected and implemented by TVA and the regulators.

A review of EPA's regulations, guidance and policies informs the reviewer of EPA's commitment to meaningfully involve the local community in its decision making processes early in its activities at CERCLA sites. However, at this CERCLA site, it has been the practice of EPA, TVA and TDEC to unilaterally make decisions that have significant impact on cleanup procedures without involving the community until after decisions were made. To mitigate the past practices of excluding the public from appropriate and meaningful involvement in the decision making process, EPA should require a formal public comment period of at least 30 days to allow interested parties to review and comment on the selected alternative resulting from this EE/CA.

2. TVA responded to the environmental insult of December 2008 by initiating a campaign to assure those members of the impacted community that TVA would take whatever actions were required to restore the affected area to pre-spill conditions and to make the area better than it was. These assurances were made publically by TVA President Tom Kilgore at TVA sponsored public meetings and were documented by the news media and local residents. TVA established several small groups of employees and former employees to meet with impacted community members and answer questions and reassure them that TVA would make the area better than it was.

HOWEVER: As part of the program to "make the area better", TVA designated \$43 Million to Roane County elected officials - again without public participation in what was

needed and how it would be used. None of the \$43 million resulted in any restoration or improvement to the Swan Pond or Emory River Road communities, the two communities that were and continue to be directly impacted by the spill and cleanup.

HOWEVER: TVA has taken over 180 private properties in these two communities off of the county property tax roles. This was done without any apparent process or procedure to determine whether or not a property was impacted by the spill. And there is no indication of when, or even if, TVA will return any of those properties to public ownership.

HOWEVER: TVA has, since early 2009, adversely impacted the Swan Pond community by turning it into a construction site. Residents have to navigate through heavy construction traffic, dust, dirt and sightseers on a daily basis. Simply keeping one's car clean has become impossible. In addition, noise contamination continues to impact the once peaceful environment of this area. Anyone interested in purchasing property in the area is discouraged from further investigation.

This is NOT "making the area better."

EPA and TVA have stated that the remediation of the fly ash spill and the construction of the disposal cell represent major steps towards Mr. Kilgore's commitment to "make the area better than it was". The impacted community takes great exception to this position and believes that the cleanup activities and the disposal cell construction represent only the minimum actions needed to establish a condition that should have been in place for day-to-day operations of not only Kingston but all other coal-fired plants. Had TVA constructed the original disposal facility in an appropriate manner and maintained and monitored that facility as expected by the State of Tennessee and in accordance with TVA's commitment contained in their operating permits, the spill would not have occurred and TVA would not have felt the need to make new commitments to "make the area better than it was."

3. EPA's established cleanup criteria of 50% fly ash to 50% soil, which was unilaterally established without involving the interested public, has left the Emory and Clinch Rivers blemished and contaminated with fly ash. The once white sand beaches are now gray from the fly ash left after the cleanup, and they will continue to be for 30 or more years. The alternatives that are proposed in the EE/CA will not restore the surface waters and beaches to their respective conditions prior to the spill. They will only restore them to adequately support human health and ecosystem health. This restoration will be far from TVA's commitment to restore the impacted area to a condition that is equal to or better than it was before the spill.

CAG COMMENTS ON REMOVAL ACTION ALTERNATIVES

This EE/CA presents four removal action objectives to address a "relatively low potential risk to ecological receptors." The impacted community recognizes that these objectives are significantly less rigorous from the objective of restoring the river system and the impacted area to its pre-spill condition and even further from leaving the impacted area "better than it was" prior to the spill. TVA should work with residents of the impacted area to develop a plan that will establish objectives and alternatives that are consistent with Mr. Kilgore's commitment to "make the area better than it was" before the spill.

The three alternatives presented for “restoration” of the river system appear to meet the removal action objectives. Alternative 1, monitored natural recovery, represents the least invasive of all alternatives. According to the information presented in the EE/CA, this alternative can be considered to have started in 2010, after completion of the previous dredging actions. It appears that by 2015, the potential risk to ecological receptors may have been reduced to levels below concern. This alternative represents a low risk to human health from fly ash contaminated sediments, additional construction activities and transportation activities.

Alternative 2, in-situ capping, represents a significant increase during construction in ecosystem risk from capping activities. It also represents increased risk to human health from sediment in the river, increased construction activities, increased transportation activities, and increased river traffic issues. It is assumed that those objectives could be compromised by a flood/high-water event that could scour the applied cap. In addition, the application of additional material in the river system would result in impacts to the floodway and the 100+ year flood elevations.

Alternative 3, dredging, represents a significant increase in ecosystem risk from dredge operations during construction. This alternative also represents increased risk to human health from increased sediment in the river, increased construction activities, increased transportation activities and increased river traffic issues. It is assumed that construction of this alternative would begin sometime in 2014 and terminate in 2016. Therefore, the removal objectives would not be met until sometime after 2016 and transportation of the dredged material could continue for years.

All three alternatives contain a requirement for monitoring of ecosystem impacts for 30 years.

FORMAL RECOMMENDATIONS BY THE ROANE COUNTY CAG

The Roane County Community Advisory Group recommends the implementation of alternative 1, monitored natural recovery, to meet the removal objectives. However, to meet the commitment made by TVA President Tom Kilgore, we also strongly recommend the following:

- a. TVA should work with residents of the impacted areas to develop a plan that will establish objectives and alternatives that are consistent with Mr. Kilgore’s commitment to “make the area better than it was before the spill.” Area residents’ docks and beaches should be dredged of the influx of sediments resulting from the massive wave created by the spill.
- b. TVA recovered several permitted docks along Emory River Road and Lakeshore Drive from homes that were purchased and destroyed by TVA. TVA should re-distribute those dock permits to existing homes on the Emory River that currently do not have those privileges.
- c. TVA should deed property below the 750 ft elevation along the Swan Pond and Emory Road areas to owners of the adjacent properties.
- d. TVA should take immediate steps to mitigate the real estate damage to the Swan Pond area by conducting a thorough cleanup of its construction activities along Swan Pond and Swan Pond Circle Roads. Construction support services, offices and equipment should be moved to portions of the

- site that are not visible from those roads. Ultimately, the only evidence of KFP should be the towers and stacks visible behind a landscaped parkway.
- e. TVA should also move all construction vehicles off of the public roads onto the site, to reduce traffic and other hazards associated with the cleanup efforts.
 - f. TVA should continue to meet with residents of the impacted areas to continually assess the reparations of the impacts to determine an appropriate investment in restoration and recovery.
 - g. TVA should completely pay for all planned parks and recreation areas proposed by their Master Plan
 - h. In addition to reclamation, TVA should promote the restored impact area in a manner similar to British Petroleum's (BP) promotion of the gulf areas subsequent to their oil spill.

Additionally, EPA should require a formal public comment period of at least 30 days to allow interested parties to review and comment on the selected alternative resulting from this EE/CA.

We also request that TVA conduct annual public meetings to present the sampling and monitoring activities and their results for the first 5 years after selection of the alternative, then every 5 years for the duration of the sampling.

**COMMENTS FROM THE ROANE COUNTY ENVIRONMENTAL REVIEW BOARD
(RCERB)**

**Roane County Environmental Review Board (RCERB)
River System Phase 3 Engineering Evaluation/Cost Analysis (EE/CA)
Recommendation and Comments
October 4, 2012**

Base Recommendations:

- 1) The RCERB supports Alternative 1 (Monitored Natural Recovery) in basis. The timeframe for this alternative is currently 30 years. The EE/CA needs to stipulate monitoring could end sooner if sampling and monitoring results show levels below action levels for macroinvertebrates and riparian birds. After that time, continued expenditures are not warranted.

However, the RCERB recommends the following be an addition to Alternative 1. A limited amount of dredging may be desirable for some residential landowners directly affected by ash in and around personal river/lakefront properties. These landowners should be asked if they desire the ash to be removed (or not) in order to meet the Remedial Action Objective of recreational use as good or better than before the ash spill. As the recreational use by these landowners is highly localized (adjoining private properties), removal of the ash would restore the shoreline and shallow water to almost pre-spill conditions. The following elements should be considered:

- a. No dredging in deeper areas (e.g., 5 feet at winter pool), not to disturb the newer sediments covering PCBs, mercury, and Cesium-137.
 - b. It is not expected to encounter PCBs, mercury, and Cesium-137 in the shallows, but monitoring would be required.
 - c. Wet-vacuum dredging would be much preferable than mechanical dredging. Wet-vacuum methods would create much less disturbance (less dredge material is suspended in the water column to be transported out of the dredge area).
 - d. Recovery in these limited areas would be quicker as more ash would be extracted from the river system. Most of the ecological systems reside in these shallow areas.
 - e. Ash (as a heavier component) can be expected to stay in the shallow areas longer than deeper areas as they are less likely to scour (lack of major flow in shallow areas). Major storm events may be the only way of moving ash out of these shallow areas.
 - f. Removing this ash would significantly reduce exposure to both ecological systems (macroinvertebrates, riparian birds, etc.) and to people. This would also help alleviate the concerns of some Roane County citizens living in these areas, even though the ash is not considered "toxic."
 - g. Properties may be perceived as more "sellable" as the ash has been removed, helping property owners with home and property values.
- 2) Alternative 2 (Capping) is not a desired alternative in any form. Capping would result in a significant increase of risks to human health over the entire proposed 30-year period. Risks come in the forms of: 1) safety concerns associated with construction activities, such as the use of heavy equipment both on land and waterways; and 2) safety concerns associated with the additional transportation activities, such as trucks and barges hauling capping materials. Additional damage to roads due to increased truck traffic would result in more costs due to repaving and road repairs. Recreational use of the waterways is negatively impacted due to the increased waterway traffic, both during initial capping installations and periodically for the next 30 years to replace capping in scoured areas. Capping construction also will continue to negatively affect the quality of life for the surrounding residents in the Swan Pond area. Capping would result in substantial short-term impact to the environment, since the activity would greatly disturb the aquatic ecosystem. Existing benthic invertebrate communities beneath the cap

**Roane County Environmental Review Board (RCERB)
River System Phase 3 Engineering Evaluation/Cost Analysis (EE/CA)
Recommendation and Comments
October 4, 2012**

would be smothered by the cap materials. The cap materials would consist of gravel-sized particles to resist scour; yet those materials would inhibit burrowing of benthic organisms, which could result in reduced abundance and biodiversity. Replacement of sediment would occur in the capped areas, but would likely scour out during significant storm events. This alternative requires capping be re-installed when the affected area scours.

- 3) Alternative 3 (Dredging) as written presently is not a desired alternative. Dredging would result in the same risks to human health as Alternative 2 (capping). Dredging causes dredged material (ash and sediments) to be suspended in the water column, impacting the water quality (e.g., turbidity and clarity) and allowing more ash/sediment materials to be transported downstream. Dredging also will continue to negatively affect the quality of life for the surrounding residents in the Swan Pond area and to those on the Emory and Clinch River waterfronts. Recreational use of the waterways is negatively impacted due to the increased waterway traffic.
- 4) The RCERB recommends that TVA/EPA conduct public meetings and provide publications annually to present the results of sampling and monitoring activities associated with Alternative 1 (MNR) for the first five years. After the first five years, public meetings and publications presenting MNR activities and results could be performed at five-year intervals.
- 5) The RCERB recommends that TVA/EPA establish a public comment period of a minimum of 30 days to allow interested parties to review and comment on the selected EE/CA alternative, along with the written resolution of comments received.

Other Questions and Comments:

- 1) What did TVA base the costs on to determine the breakdown of monitoring costs, what unit rates (e.g., direct salaries, overhead burdens)? For example, the Project Manager for the monitoring and sampling was listed at \$250K, however it is not well understood how that salary was derived.
- 2) The planning level estimates for the monitoring listed an accuracy range of -30% (minus) to +50% (plus), which does not provide much accuracy, although the EE/CA categorized this as the "range of cost accuracy."
- 3) What are the mercury and cesium levels in the shallow areas of the Emory and Clinch Rivers? During low Emory flow, the Kingston Steam Plant intake suction causes the Clinch River to back into the Emory. The EE/CA shows the cesium; however, it cannot be determined how close sampling was done right along the shorelines.

Respectfully submitted,

Mary Anne Koltowich, Vice Chair
2012 RCERB
1733 James Ferry Road
Kingston, TN 37763

COMMENTS FROM: LYNNE ROBERSON, ROANE COUNTY, TN (CITIZEN)

PUBLIC COMMENTS

TO: Tennessee Valley Authority
P.O Box 40
Kingston, TN 37763-0400
kingstoncomm@tva.com

FROM: Lynne Roberson, Roane County, TN (Citizen)

RE: Kingston Ash Recovery Project, Non-Time Critical Removal Action
River System Engineering Evaluation/Cost Analysis (EE/CA)
Harriman, Roane County, Tennessee
Document No. EPA-AO-051

DATE: October 8, 2012

Having attending both symposia and the recent series of six workshops, I have followed progress in the research domain with considerable interest. This is the most comprehensive research endeavor I have ever observed. My compliments to the research teams and their leadership for their dedication and persistence in the advancement of science as a basis for decision-making in this situation. It is remarkable how much was accomplished in such a short period of time under very difficult circumstances, especially during the time-critical phase of cleanup that included dredging and a number of high-flow storm events. I also appreciate the effort to build in quality control so that these data sets can be used by other researchers in the future.

Having said that, given my limited insight into engineering matters, I do not intend to comment on the proposed remediation alternatives other than to reiterate that ATSDR does not recommend dredging in the Lower Watts Bar Reservoir (LWBR.) ATSDR said:

"To prevent unnecessary exposures to workers and the public, ATSDR cautions that the LWBR sediments not be disturbed, removed, or disposed of without careful review by the interagency working group." (p. 183, Evaluation of Y-12 Mercury Releases, U.S. Department of Energy, Oak Ridge Reservation, Oak Ridge, Anderson County, Tennessee, EPA FACILITY ID: TN1890090003, March 30, 2012).

This admonition applies to all legacy contaminants (PCBs, mercury and radionuclides) from the Oak Ridge Reservation. I would add that consideration should also be given to *constituents of potential ecological concern (COPECs)* emanating from the proposed superfund site (an old paper and pulp mill) upstream on the Emory River as well as any other significant natural, industrial, agricultural, accidental and incidental contaminant sources upstream and downstream from the spill site.

I do have some concerns that need to be addressed during Phase 3 of the cleanup. The focus of the EE/CA report is on discussion of rationale supporting decision-making on alternatives for remediation in local waterways. There are concerns that go beyond this limited focus to include the health and well-being of people living in the area including those who were relocated as a result of the coal fly ash release; the strength of the response of local health care providers, local government, and the community; and the state of the art in risk assessment and education of the public.

Monitoring Ecosystems

With respect to the ecological risk assessment, there are studies that need to be completed and reported to the public. Keep in mind that absence of information in the literature, limitations on provisional and default values for comparison, and various uncertainties should not be equated with limited or no adverse effects. All COPECs that bioaccumulate in the food web need to be followed over time to ascertain whether these need to be included in long-term monitoring of surface water, sediment, biota and/or other environmental media. Simple monitoring of arsenic and selenium is not enough.

There is a need to provide a full characterization of all COPECs at the spill site and all river reaches upstream/downstream in our waterways and to identify known sources of pollution. We need: 1) an explanation for why each COPEC is included with comparison values; 2) specific plans for monitoring each COPEC including periodicity and agency responsibility; 3) citations for source documents that amplify the rationale and management authority; and 4) plans to report to the public from time to time. Specify which COPECs bioaccumulate in what biota and note which species are known to be consumed by people. State fishing advisories currently recommend: *“Where contaminants are elevated in fish, they may also be present in other aquatic life as well. Therefore, the public is advised to limit or avoid consumption of other animals such as turtles, crayfish and mussels in waterbodies with a fishing advisory.”* Longterm monitoring of bioaccumulation should include both fish and turtles which are known to be consumed by people, locally.

The EE/CA report does not clear up questions about the bioaccumulation of methyl mercury in fish and turtles, particularly in the Tennessee River which receives mercury from sources on both the Clinch and Emory Rivers. Also, dioxin was found upstream at the paper and pulp mill site on the Emory River as well as in fish from ponds upstream by the Clinch River near the K-25 site. More testing for dioxin is needed in the LWBR, and serious consideration needs to be given to the study of all endocrine disruptors, collectively, in sediment and surface water in all river reaches and perhaps other environmental media as well.

Is there any hope that people will be free to eat fish and turtles without constraints in the future? Do we know enough to estimate how long it will take to see a decline in ash-related and legacy COPECs so that it may be possible to lift fishing advisories and the ban on commercial fishing here? Can the supercomputer be used to project the decline of COPECs over time as was done so nicely with fly ash transport? We already know that the half-life of cesium-137 is 30 years so that is an easy one.

Monitoring Human Health

It is clear that every effort is being made to reduce or eliminate contaminant exposure so people remaining in the area and the public will not experience chronic exposure to contaminants. However, there is a need to provide additional information on the impact of the coal fly ash spill on the physical and mental health and social-well being of those affected by the release. Health screening by ORAU/Vanderbilt University did not begin until late in the first year so the only information on the acute and intermediate phase of potential contaminant exposure was a simple on-site survey of residents taken soon after the fly ash spill.

Not all of the results of the ORAU/Vanderbilt health screening program were fully explained. For

example, nearly one-half of participants had iron-deficiency anemia. This is an extraordinary finding! Whether or not it was related to the release of coal fly ash, it needs to be explained and

appropriate action taken. Likewise, a quarter of the participants had elevated levels of blood selenium. No mention was made of whether people with elevated blood selenium levels were eating locally caught fish nor has the public been informed of the possibility of a health risk associated with consumption of locally caught fish (which bioaccumulate selenium) in combination with dietary supplements that contain selenium. Cardiopulmonary findings and mental health considerations have been minimized heretofore.

If those directly affected by the spill have ongoing concerns, it would be wise to register people for followup health studies. Registration should include people who were relocated and those who continue to live in the area. This should be done under the auspices of ATSDR and TDH. At some point, it would be good to consider the results of human health studies in light of findings on the efficacy of environmental risk management and institutional controls.

Please keep in mind there are people waiting for decisions on *best practices* including health care providers who see patients in prenatal and well-child clinics and in private practice. These providers serve the population that is at highest risk for adverse health effects from eating locally caught fish and turtles--women during pregnancy and while nursing, infants, and young children who are regularly seen in local WIC clinics for nutrition/dietary guidance and support in acquiring supplemental food. A health care setting provides a good opportunity to focus on understanding fishing advisories and methods of food preparation that reduce contaminant exposure for those who consume locally caught fish and turtles. Bait shops reach the men; health care clinics reach the women, who often are the cooks.

Other Local/State Actions

1. Evaluate education of the general public on relevant current issues including understanding fishing advisories and other institutional controls designed to reduce contaminant exposure.
2. Include consumers in the development and testing of educational programs, materials, and web sites (e.g., TDEC fishing advisories.)
3. Identify agencies represented in the Watts Bar Interagency Working Group (WBIWG) and specify the enabling authority. Consider adding an independent member of the public (e.g., a CAG member) and representatives of local government (e.g., Roane County Boards of Health and Environmental Review, and OES) in an ex officio capacity to make people aware of current issues and pending actions in dredging local waterways.

Coda (concluding remarks)

The volume of information presented in the EE/CA report was too much to review in a short period of time so forgive me if I have missed, misunderstood, or misconstrued any salient points. I understand that all remediation alternatives are expected to reduce contaminant exposure to one degree or another. Those of us who live here need ongoing reassurance that this objective is being addressed well; that the big picture includes monitoring COPECs from multiple environmental sources; and that remediation measures are efficacious. There is plenty of time to address these matters in Phase 3; and if need be, we can create a Phase 4. *LMR*

COMMENTS FROM: JONI MORGAN, ROANE COUNTY, TN (CITIZEN)

My home sits right across the Emory River from the Kingston Power Plant, where the holding pond broke 3 years ago and dumped coal ash slurry into the river and onto surrounding properties. I personally think that TVA and EPA have done a remarkable job of getting so much of the coal ash retrieved and making our community safer. However, what has been done – and what is proposed – is a long way from “making the community as good or better than it was” on the day before the spill, as Mr. Tom Kilgore has gone on record as saying.

The EE/CA offers 3 options for the final cleanup procedures. Option number 1 (monitored natural recovery) does nothing to further the cleanup; it simply waits for nature to take its course. Some of this recovery has already begun. Numbers 2 (in-situ capping) and 3 (dredging) offer some additional progress toward recovery – but to be frank, neither really appear to add much in the long run – except for additional traffic in the Swan Pond area, additional dust and debris, additional noise and potential blockades of the river, and in general lots more headaches for those people whose lives were most affected by the original disaster. They would also take us two giant steps backwards, because the work would demolish much of the recovery that has already taken place.

My personal choice would be for TVA and EPA to select Option number 1, monitored natural recover, and let our community make some real progress toward healing.

HOWEVER – none of these options truly make our community “as good or better than it was.” The white sand beaches are still gray from ash, and will remain that way for some time. Some of my friends have docks that are much more shallow than they used to be – but TVA won’t dredge them. The houses on Emory River Road which were bought by TVA are being maintained, but there is absolutely no information on when – or even if! – they will be put back on the market so that I will live in a real community again. Those same houses had docks that were destroyed by the disaster – if the houses are put on the market, will those new residents be able to build docks? Or have the properties lost their “permits” now that there are no more docks? So many questions, so much uncertainty – and no answers except for “we haven’t decided yet.”

And most of all – the public perception is STILL that our community is contaminated, dangerous to live in, undesirable. My community IS NOT WHAT IT WAS, nor will it be in the foreseeable future. Yes, it is markedly better than it was on January 2009. But there is still so much work to be done. We need major help in publicizing the clean up that has already been done, the safety of our waters, and the anticipated progress from this point on. Our County is not a rich one; we lost lots of property tax revenue by TVA buying 180 houses and removing them from the tax rolls, and we don’t know if any of them will ever be returned. Please provide funding for a national informational program, much like what BP has done for the Gulf Coast, to tell the world that we are at least much better than we were, and that we DO expect eventual recovery.

Thank you for allowing the community to contribute comments.

Sincerely,
Joni Morgan
Emory River Road, Kingston TN

COMMENTS FROM: DON SIMON, ROANE COUNTY, TN (CITIZEN)

I support the GAG Group proposal holding all accountable to fund & restore entire area to Mr Kilgore statement of making area better than pre spill. I also feel they should fund mixed river front development at Kingston Gravel Pit .It should be promoted with docking for boats, shopping & signage as a complete recreation area to visit by boat or auto to visit Roane County. Funds should not be given to General Fund or Mayors must be directed to a committee to secure a developer to bring mixed business that would enhance area. This would generate much needed revenue, plus promote the beauty & strongest strength the area has to offer.

Regards Don Simon

ATTACHMENT C
Applicable or Relevant and Appropriate Requirements (ARARs)

**ARARs and TBC Guidance for the Non-Time-Critical Removal Action for the River System
Kingston Fly Ash Recovery Project, Roane County, Tennessee**

Media/Resource/Action	Requirement	Prerequisite	Citation
Chemical-specific ARARs			
Restoration of Rivers classified for <i>Domestic Water Supply</i>	Waters shall not contain toxic substances, whether alone or in combination with other substances, which will produce toxic conditions that materially affect the health and safety of man and animals, or impair the safety of conventionally treated water supplies.	Presence of pollutant(s) in waters of the State as defined in TCA 69-3-103(33) — relevant and appropriate	TDEC 1200-4-3-.03(1)(j)
	May not exceed AWQC in surface water(s) for the listed toxic substances.		TDEC 1200-4-3-.03(1)(j)
	Shall not violate physical and chemical parameters or conditions related to Dissolved Oxygen, pH, Total Dissolved Solids, Solids, Turbidity, and Temperature.		TDEC 1200-4-3-.03(1)(a) through (g)
	Waters shall not contain other pollutants in quantities that may be detrimental to public health or impair the usefulness of the water as a source of domestic water supply.		TDEC 1200-4-3-.03(1)(k)
Restoration of Rivers classified for <i>Industrial Water Supply</i>	The waters shall not contain toxic substances whether alone or in combination with other substances, which will adversely affect industrial processing.	Presence of pollutant(s) in waters of the State as defined in TCA 69-3-103(33) — relevant and appropriate	TDEC 1200-4-3-.03(2)(i)
	Shall not violate physical and chemical parameters or conditions related to Dissolved Oxygen, pH, Total Dissolved Solids, Solids, Turbidity, and Temperature.		TDEC 1200-4-3-.03(2)(a) through (g)
	Waters shall not contain other pollutants in quantities that may adversely affect industrial processing.		TDEC 1200-4-3-.03(2)(j)

**ARARs and TBC Guidance for the Non-Time-Critical Removal Action for the River System
Kingston Fly Ash Recovery Project, Roane County, Tennessee
(continued)**

Media/Resource/Action	Requirement	Prerequisite	Citation
Restoration of Rivers classified for <i>Fish and Aquatic Life</i>	Waters shall not contain toxic substances or a combination of substances including disease-causing agents that, by way of either direct or indirect exposure through food chains, may cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions, physical deformations, or restrict or impair growth in fish or aquatic life or their offspring.	Presence of pollutant(s) in waters of the State as defined in TCA 69-3-103(33) — relevant and appropriate	TDEC 1200-4-3-.03(3)(g)
	May not exceed AWQC in surface water(s) for the listed toxic substances.		TDEC 1200-4-3-.03(3)(g)
	Shall not violate physical and chemical parameters or conditions related to Dissolved Oxygen, pH, Total Dissolved Solids, Turbidity, and Temperature.		TDEC 1200-4-3-.03(3)(a) through (g)
	Waters shall not contain other pollutants that will be detrimental to fish or aquatic life.		TDEC 1200-4-3-.03(3)(h)
	The waters shall not contain iron at concentrations that cause toxicity or in such amounts that interfere with habitat due to precipitation or bacteria growth.		TDEC 1200-4-3-.03(3)(i)
	The waters shall not be modified through the addition of pollutants or through physical alteration to the extent that the diversity and/or productivity of aquatic biota within the receiving waters are substantially decreased or adversely affected, except as allowed under 1200-4-3-.06.		TDEC 1200-4-3-.03(3)(m)
	The quality of stream habitat shall provide for the development of a diverse aquatic community that meets regionally-based biological integrity goals. Types of habitat loss include, but are not limited to: channel and substrate alterations, rock and gravel removal, stream flow changes, accumulation of silt, precipitation of metals, and removal of riparian vegetation. For wadeable streams, the instream habitat within each subcoregion shall be generally similar to that found at reference streams.		TDEC 1200-4-3-.03(3)(n)

**ARARs and TBC Guidance for the Non-Time-Critical Removal Action for the River System
Kingston Fly Ash Recovery Project, Roane County, Tennessee
(continued)**

Media/Resource/Action	Requirement	Prerequisite	Citation
	Stream or other water body flows shall support the fish and aquatic life criteria.		TDEC 1200-4-3-.03(3)(o)
Restoration of Rivers classified for <i>Recreation</i>	Waters shall not contain toxic substances, whether alone or in combination with other substances, that will render the water unsafe or unsuitable for water contact activities including the capture and subsequent consumption of fish and shellfish, or will propose toxic conditions that will adversely affect man, animal, aquatic life or wildlife	Presence of pollutant(s) in waters of the State as defined in TCA 69-3-103(33) — relevant and appropriate	TDEC 1200-4-3-.03(4)(j)
	May not exceed AWQC in surface water(s) for the listed toxic substances (applies to waters classified for both recreation & domestic water supply)		TDEC 1200-4-3-.03(4)(j) As written in TDEC 1200-4-3-03
	Shall not violate physical and chemical parameters or conditions related to Dissolved Oxygen, pH, Solids, Total Suspended Solids, Turbidity, and Temperature		TDEC 1200-4-3-.03(4)(a) through (e)
	Waters shall not contain other pollutants in quantities that may have a detrimental effect on recreation		TDEC 1200-4-3-.03(4)(k)
Restoration of Rivers classified for <i>Irrigation and/or Livestock Watering and Wildlife</i>	Waters shall not contain toxic substances, whether alone or in combination with other substances, that will produce toxic conditions that adversely affect the quality of the waters for irrigation and/or livestock watering and wildlife.	Presence of pollutant(s) in waters of the State as defined in TCA 69-3-103(33) — relevant and appropriate	TDEC 1200-4-3-.03(5)(f) and (6)(f)
	Shall not violate physical and chemical parameters or conditions related to Dissolved Oxygen, pH, Solids, and Temperature.		TDEC 1200-4-3-.03(5)(a) through (e); and TDEC 1200-4-3-.03(6)(a) through (e)
	Waters shall not contain other pollutants in quantities that may be detrimental to the waters used for irrigation and/or for livestock watering and wildlife.		TDEC 1200-4-3-.03(5)(g) and (6)(g)

**ARARs and TBC Guidance for the Non-Time-Critical Removal Action for the River System
Kingston Fly Ash Recovery Project, Roane County, Tennessee
(continued)**

Media/Resource/Action	Requirement	Prerequisite	Citation
Location-specific ARARs			
Aquatic resources			
Within area impacting stream or any other body of water – <i>and</i> - presence of wildlife resources (e.g., fish)	The effects of water-related projects on fish and wildlife resources and their habitat should be considered with a view to the conservation of fish and wildlife resources by preventing loss of and damage to such resources.	Action that impounds, modifies, diverts, or controls waters, including navigation and drainage activities — relevant and appropriate	Fish and Wildlife Coordination Act (16 <i>USC</i> 661 <i>et seq.</i>)
Endangered, threatened, or rare species			
Presence of Tennessee nongame species as defined in <i>TCA 70-8-103</i>	May not take (i.e., harass, hunt, capture, kill or attempt to kill), possess, transport, export, or process wildlife species.	Action impacting Tennessee nongame species, including wildlife species which are “in need of management” (as listed in TWRCPC 94-16 and 94-17) — relevant and appropriate	TCA 70-8-104(c)
	May not knowingly destroy the habitat of such wildlife species.		TWRCPC 94-16(II)(1)(a) and TWRCPC 94-17(II) (TBC guidance)
	Upon good cause shown and where necessary to protect human health or safety, endangered or threatened species may be removed, captured, or destroyed. Provisions for removal, capture, or destruction of nongame wildlife for the purposes set forth above shall be set forth in regulations issued by the executive director pursuant to § 70-8- 104(a).		TCA 70-8-106(e) and TWRCPC 94-16(II)(1)(c) (TBC guidance)
Presence of federally endangered or threatened species, as designated in 50 CFR 17.11 and 17.12 or critical habitat of such species	Actions that jeopardize the existence of a listed species or results in the destruction or adverse modification of critical habitat must be avoided or reasonable and prudent mitigation measures take.	Action that is likely to jeopardize fish, wildlife, or plant species or destroy or adversely modify critical habitat — applicable	16 U.S.C. § 1536(a)(2) – Sect. 7(a)(2)

ARARs = applicable or appropriate and relevant
 AWQC = ambient water quality criteria
 CERCLA = Comprehensive Environmental Response,
 Compensation, and Liability Act
 CFR = *Code of Federal Regulations*

RCRA = Resource Conservation and Recovery Act
 TBC = to be considered
 TCA = *Tennessee Code Annotated*
 TDEC = Tennessee Department of Environment and
 Conservation

TWRCPC = Tennessee Wildlife Resources Commission
 Proclamation
 USC = *United States Code*
 WAC = waste acceptance criteria