

Tennessee Valley Authority
Regulatory Submittal for Kingston Fossil Plant

Documents submitted:

Non-Time-Critical Removal Action Embayment/Dredge Cell Action Memorandum

Date Submitted:

05/12/2010

Submitted to whom

Craig Zeller

Concurrence

Received Not Applicable

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TVA

Anda Ray *ARR*
Steve McCracken *SM*
Kathryn Nash *KN*
Dennis Yankee *DY*
Michelle Cagley *MC*
Mark Hastings *MH* *DMH*

Received Not Applicable

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Jacobs

Steve Richardson *SR*
Bruce Haas *BH*

Approvals

TVA *Anda Ray* Date *5-14-10*
EPA *Craig Zeller* Date *5-18-10*

cc:

- Anda Ray, TVA
- Barbara Scott, TDEC
- Leo Francendese, EPA
- Craig Zeller, EPA
- Dennis Yankee, TVA
- Kathryn Nash, TVA
- Cynthia Anderson, TVA
- Steve McCracken, TVA
- EDM
- Julie Pfeffer, Jacobs
- Steve Richardson, Jacobs
- Michelle Cagley, TVA
- Greg Signer, TVA
- KIF Incident Document Control
- Katie Kline, TVA
- Gretchen Wahl, Jacobs
- Dannena Bowman, EPA
- Jeff Gary, Jacobs
- Robert Pullen, Jacobs



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

MAY 18 2010

MEMORANDUM

SUBJECT: Request for Approval of Action Memorandum for Non-Time Critical Removal Action Embayment/Dredge Cell; TVA Kingston Fossil Fuel Plant Release Site; Roane County, Tennessee.

FROM: Craig Zeller, P.E. *RCZ*
Remedial Project Manager *slid10*

TO: Franklin E. Hill, Director
Superfund Division
U.S. EPA Region 4

The purpose of this memorandum is to formally request your approval of the Action Memorandum for the Non-Time Critical Removal Action for the Embayment/Dredge Cell at the TVA Kingston Fossil Fuel Plant (KIF) Release Site in Roane County, Tennessee.

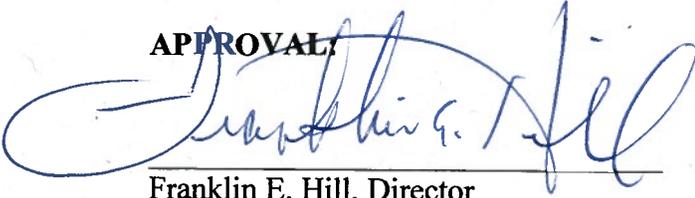
In accordance with the May 11, 2009 Administrative Order and Agreement on Consent (AOC) with EPA, TVA prepared an Engineering Evaluation/Cost Analysis (EE/CA) Work Plan to address coal ash in the embayments and tributaries west of Dike #2; coal ash on upland areas and surface soils; restoration of area waters impacted by the coal ash release per the Jurisdictional Assessment; and proper disposal of all coal ash material recovered during these efforts. Following EPA approval of the EE/CA Work Plan, TVA prepared an EE/CA Report that evaluated, screened, and developed removal action alternatives to address the identified Removal Action Objectives (RAOs). Three alternatives were developed and evaluated in detail in the EE/CA Report, and a 75 day public comment period on the report was conducted from January 19 – April 5, 2010.

TVA has prepared the Action Memorandum for the embayment/dredge cell which also contains the Responsiveness Summary (Appendix B) and the ARARs table (Appendix C). TVA has selected Alternative 3B in the Action Memorandum which involves removal of 2.5 Million cubic yards (CY) of ash from the Swan Pond Embayment, consolidation and on-site disposal of ash in the failed dredge cell and ash pond, installation of an enhanced perimeter containment system around the closed out cell using deep soil-cement mixing techniques, and restoration of the embayment ecosystem to pre-spill conditions. Alternative 3B was selected because it meets the RAOs, complies with ARARs, effectively and safely contains the ash, minimizes off-site transportation and disposal impacts, reduces uncertainty associated with acceptability of off-site disposal, and is the most cost effective.

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

Based on the above, I formally request your approval for Alternative 3B for the Non-Time Critical Removal Action for the Embayment/Dredge Cell at the KIF ash release site in Roane County, Tennessee.

APPROVAL:



Franklin E. Hill, Director
Superfund Division
US EPA Region 4

5/18/2010

DATE

DISAPPROVAL:

Franklin E. Hill, Director
Superfund Division
US EPA Region 4

DATE



Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, Tennessee 37902

May 14, 2010

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

Dear Mr. Zeller:

Please find enclosed the Request for Removal Action at the Kingston Fossil Plant in Roane County, Tennessee. This Action Memorandum is for the Non-Time-Critical Removal Action required to remove the released coal ash from the Swan Pond Embayment and closure of the Dredge Cell and adjacent Ash Pond. This submittal meets 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 "Anda A. Ray".

Anda A. Ray

Enclosures

DATE: May 12, 2010
SUBJECT: Request for Non-Time- Critical Removal Action at the TVA Kingston Fossil Fuel Plant Release Site, Roane County, Tennessee
FROM: Steve McCracken, TVA, General Manager, Kingston Ash Recovery Project
TO: Anda A. Ray, TVA, Senior Vice President, Environment and Technology

This Action Memorandum for the Non-Time-Critical Removal Action for the Swan Pond Embayment and Dredge Cell at the Kingston Fossil Fuel Plant Release Site, Roane County, Tennessee has been prepared under my direction and is recommended for submittal to EPA.

Steve McCracken

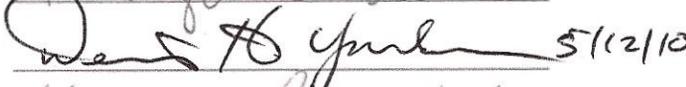


Concurrence

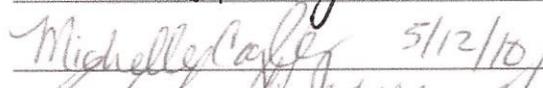
Kathryn Nash, TVA



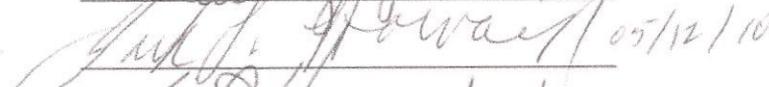
Dennis Yankee, TVA



Michelle Cagley, TVA



Steve Richardson, Jacobs *for*



Bruce Haas, Jacobs





**Kingston Ash Recovery Project
Non-Time-Critical Removal Action
Embayment/Dredge Cell
Action Memorandum**

**Prepared by:
Jacobs
for the Tennessee Valley Authority**

Revision	Description	Date
1	Draft AM for TVA Review	02 February 2010
2	Draft AM for EPA/TDEC Review	12 April 2010
3	Final AM for Public Comment	18 May 2010

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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 Swan Pond Embayment and Dredge Cell described herein for 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 is currently being removed under a time-critical removal action (TVA 2009a).

This non-time-critical removal action involves the removal, processing, and disposal of the remaining ash material that was released into the Swan Pond Embayment from the KIF. This removal action also involves the closure of the Dredge Cell and adjacent Ash Pond. Under CERCLA, the ash spill constitutes a release, as well as a potential for continued releases of hazardous substances into the environment. The release of hazardous substances at the Site poses a threat to public health and the environment pursuant to Section 104(a) of CERCLA and the 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 spilled 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 specific chemical

composition of fly ash depends on the source of the coal. KIF mostly burns eastern bituminous coal but also has used coal from Illinois and blends low-sulfur Western coal to reduce emissions. The principal components of fly ash are those that are typical of rock and soil. Oxides of silicon, aluminum, iron, and calcium, chemically combined in an amorphous form, comprise 95 to 99% of fly ash. Ash also contains variable amounts of magnesium, titanium, sulfur, sodium, and potassium (TVA 2001). Although the main chemical constituent of ash is silicon dioxide, the material may contain trace amounts of constituents that occur naturally in coal (TVA 2009a). The ash has therefore been tested for naturally-occurring metals and radionuclides. The constituents of interest in fly ash include arsenic, chromium, copper, lead, mercury, nickel, selenium, thallium, vanadium, zinc, and the naturally-occurring radionuclides, specifically isotopes of potassium, radium, thorium, uranium, and their short-lived daughter products. The fly ash contains cenospheres, which are inert, hollow balls of sand-like material.

2. Physical Location

The Site is located just off of Swan Pond Road in Roane County, Tennessee. Roane County had a total population of 53,399 in 2007. 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, 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 the response actions.

Drinking water in the immediate area has historically been primarily by residential groundwater wells. Over 400 wells were tested by the Tennessee Department of Environment and Conservation (TDEC) immediately after the event and were found to be within required drinking water limits (TVA 2009b). TVA is currently installing a new water distribution system to provide City of Kingston water to area residents.

3. Site Characteristics

Failure of the Dredge Cell filled most of the Swan Pond Embayment. The ash deposits are typically 20 to 40 ft thick, although thicker piles of ash have been constructed in the embayment area during time-critical removal actions. Residual ash in the Emory, Clinch, and Tennessee River system following the time-critical dredging activities will be addressed under a separate non-time-critical removal action. Further sampling and analysis of biotic and abiotic media is planned for the river system, which will be used to assess potential human health and ecological risks associated with the river system.

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).

More than 50 samples of the ash have been collected and analyzed for metals (excluding mercury); 11 samples have been analyzed for organic chemicals, mercury, and radionuclides. Metals, primarily arsenic, have been the focus of this monitoring. Arsenic is present in the ash at an average concentration of approximately 65 milligrams per kilogram (mg/kg), which is above EPA's residential Regional Screening Level (RSL) of 0.39 mg/kg and above EPA's industrial RSL of 1.6 mg/kg for the hazardous substance.

The EPA Toxicity Characteristic Leaching Procedure (TCLP) uses acid digestion to provide an indication of the potential for leaching metals and is used to define if a material will be considered a hazardous waste under the Resource Conservation and Recovery Act (RCRA). Several ash samples collected during the time-critical removal action were sent for TCLP analysis and all indicate that the ash is not considered a hazardous waste under RCRA.

Surface water samples have been collected from clean water ditches and settling basins constructed within the embayment area. More than 170 samples have been collected and analyzed by TVA since the clean water ditches were completed. As of March 11, 2010, the total arsenic concentration in surface water from the embayment area has averaged approximately 0.0278 milligrams per liter (mg/L), which is greater than TDEC's Ambient Water Quality Criterion (AWQC) of 0.010 mg/L. In addition, several concentrations of antimony and selenium have also exceeded water quality criteria.

Groundwater samples have been collected semiannually from monitoring wells surrounding the Dredge Cell in accordance with its industrial waste landfill permit requirements. Wells have been routinely analyzed for 16 metals and flouride. Currently, 6 wells are present in the Dredge Cell area. Arsenic was detected at concentrations exceeding the TDEC Water Quality Criteria for Domestic Water Supplies maximum contaminant level (MCL) of 0.010 mg/L in 2 out of 40 samples from these 6 wells since the ash release. Arsenic was detected in June 2009 at a maximum of 0.0297 mg/L in well AD-2. Results of subsequent monthly sampling through March 8, 2010, indicate that arsenic concentrations in well AD-2 have dropped to 0.00254 mg/L, below its MCL. Historically, arsenic concentrations in well 6A have remained less than 0.014 mg/L, which slightly exceeds its MCL; concentrations do not indicate either an increasing or decreasing trend. Arsenic concentrations in other wells have not exceeded the MCL. Historically, silver has occasionally been detected in one well (6A) at concentrations that exceed its MCL of 0.10 mg/L. However, in 2007 TDEC granted a site-specific standard of 0.18 mg/L for silver in recognition of the fact that silver is present in natural soil and groundwater sources, but is absent in ash.

5. NPL Status

The Site is not on the National Priority List, although, pursuant to the AOC, a preliminary assessment will be conducted at the Site at the completion of removal activities.

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 On-Scene Coordinator 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 2009c). 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.

2. Current Actions

The time-critical removal action is ongoing; ash removal east of Dike 2 is anticipated to be complete in May 2010 and offsite ash disposal is anticipated to be complete in November 2010. As part of the time-critical removal action, ash recovered from the river near the site of the release through mechanical dredging or land-based equipment is being transported to one of several onsite ash storage areas. Hydraulically-dredged material is being pumped into a Rim Ditch where solids settle out of the solution. The water continues flowing through the Sluice Trench into the Ash Pond and then into the Stilling Pond where further settlement occurs (Figure 1). Settled ash is removed from the ditches through mechanical excavation and windrowed to dry in an ash processing area. Processed ash is loaded into railcars, and is transported to the Perry County Associates (Arrowhead) Landfill in Alabama, for final disposal. Cenospheres and entrained river debris are also being removed from downstream coves and disposed with the processed ash. As of May 4, 2010, nearly 3.1 million cy of material have been removed from the river system and 2.0 million tons (approximately 1.5 million cy) of that material have been shipped offsite for final disposal.

C. STATE AND LOCAL AUTHORITIES' ROLE

1. State and Local Actions to Date

On January 12, 2009, the TDEC issued TVA a Commissioner's Order (TDEC 2009) which directed TVA to undertake numerous response activities at the Site including, but not limited to:

- Implement measures to prevent the movement of contaminated materials and minimize further downstream migration of contaminated sediments;
- Fully cooperate and support TDEC's review of all TVA fly ash impoundments located in the State;
- Submit all existing studies, reports, and memoranda that are potentially relevant to explaining or analyzing the cause of the catastrophic failure of the containment structures;
- Fully cooperate and provide support for TDEC's initial assessment of the impact of the ash release on all waters of the State;
- Prepare and submit a Corrective Action Plan (CAP) within 45 days after receipt of the Commissioner's Order, to include:
 - i. A plan for the assessment of soil, surface water and groundwater; remediation of impacted media; and restoration of all natural resources damaged as a result of the release;
 - ii. A plan for monitoring the air and water in the area during the cleanup process;
 - iii. A plan to ensure that public and private water supplies are protected and that alternative water supplies are provided if contamination is detected;

- iv. A plan for addressing both the short-term and long-term management of fly ash at the Site, including remediation and stabilization of the failed ash waste cells, proper management of the recovered ash, and a revised closure plan for the Class II ash disposal facility; and
- v. A plan to address any health and safety hazards posed by the ash to workers and the public.

On March 2, 2009, TVA submitted a draft CAP to EPA and TDEC for agency review and approval (TVA 2009a). Since the release, EPA, the State, and TVA have conducted extensive sampling of air, water, and ash material.

2. Potential for Continued State and Local Response

TDEC will continue to play a large role in the response activities at the Site and will continue to oversee activities under the Commissioner's Order that are not addressed by the AOC. 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 Dredge Cell and Ash Pond. It will also have responsibility for approving any off-site disposal locations in the State of Tennessee.

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:**

The area where the ash spilled is temporarily devoid of benthic life. The benthic invertebrates were smothered during the ash spill. This minimizes the food available to aquatic life, impacting the health of the aquatic environment in the area. The presence of naturally-occurring metal and radiological constituents in the ash, if and when resuspended in the water column, can also have an impact on the human receptors or the aquatic environment. Ash is exposed at the ground surface. Results of the human health risk assessment (Jacobs 2010) indicate that there is no unacceptable cancer risk or noncancer hazard to current human receptors; however, cancer risks could exceed the target risk range and noncancer hazards (toxic effects) could exceed the target threshold for future exposure scenarios if actions were not taken. Results of the screening-level ecological risk assessment (Jacobs 2010) indicate that based on the available evidence, the possibility of adverse risks for terrestrial and aquatic ecological receptors potentially exposed to inorganic constituents in ash as soil or as sediment cannot be excluded.

- **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. 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. The ash release eliminated these wetlands.

- **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:**

Although several steps have been taken to contain the ash in the Swan Pond Embayment (namely, Dike 2, clean water ditches, and settling basins), stormwater runoff during high precipitation or flooding events may exceed system capacity, resulting in potential migration of the ash into the Emory River. Direct contact between ash material in the embayment and water flowing through the embayment area into Watts Bar Reservoir may cause hazardous substances to migrate or be released into the Emory River. Similarly, erosion of ash and its constituents from the embayment or Dredge Cell into affected waters may occur during such times.

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 remove the remaining ash in the Swan Pond Embayment and permanently close the failed Dredge Cell and Ash Pond (including the Lateral Expansion area). These actions will minimize the potential for direct contact with human or ecological receptors exposed to the ash, direct contact with water flowing through the embayment, or migration from the embayment due to erosion. Material placed in the Dredge Cell for the test embankment will remain in the Dredge Cell. An Engineering Evaluation/Cost Analysis (EE/CA) has been prepared that evaluated alternative response actions with respect to their effectiveness, implementability, and cost (Jacobs 2010). The proposed action is to implement Alternative 3b, as evaluated in the EE/CA. Figure 2 presents a layout and cross-sectional sketch showing the end-state of the proposed action. A removal action work plan will be developed to implement the actions described below.

1. Proposed Action Description

Infrastructure. Ash from two outlying areas in the north embayment will be consolidated to a more centralized area where it can be dried and graded. Ash outside of the dirty water ditch along the western border of the north embayment will be excavated to isolate freshwater springs that flow into the ditch. A steel and concrete bridge will be constructed on Swan Pond Circle Road to allow trucks hauling ash to pass beneath the road; this will allow construction-related traffic to pass between the north and middle embayment areas without crossing Swan Pond Circle Road. A new haul road will be constructed from Swan Pond Circle Road across the middle embayment to the current East/West Haul Road.

Excavate the Swan Pond Embayment. Much of the ash in the Swan Pond Embayment is expected to be retrievable with excavators, dozers, and trucks. Admixtures, such as lime or other proprietary materials, may be used to help dry the ash so that it is retrievable. The ash will be piled, dewatered (dried) if needed, and when dry enough, transported to the onsite disposal areas. Trees that are retrieved either within the ash or that are removed will be chipped and either used onsite to stabilize the surface of the ash to support trucks or sent offsite for disposal. Periodically, disturbed ash will be sprayed with a component like Flexterra[®] to control dust.

Ash that is too wet to remove with traditional land-based equipment may be dredged from the embayment using a small dredge. The dredged material will be piped to the existing Rim Ditch, where the same processing system as used during the time-critical removal action will be used (Rim Ditch, Sluice Trench, Ash Pond, Stilling Pond). Discharges from the Stilling Pond will comply with the existing National Pollutant Discharge Elimination System (NPDES) permit. Any dredged ash will be recovered from the Rim Ditch/Sluice Trench, then processed on the Ash Processing Area (“Ball Field”) to allow it to dry sufficiently before being trucked back to the onsite disposal areas.

Remove Clean Water Ditches. A series of clean water ditches were installed during the time-critical removal action to bypass upgradient surface water around the ash. Nearly 5,900 linear ft of ditches, 4-ft deep and 16 to 20 ft across were constructed through the north and middle portions of the Swan Pond Embayment. At least one side of the ditch is made of ash and is covered in rock. This portion of the ditch, including the overlying rock, will be removed so as to remove the underlying ash. The rock will be disposed onsite with the ash, or cleaned and re-used onsite.

Remove Dike 2 and Settling Basins. Dike 2 is a temporary rock dike comprised of shot rock, riprap, and smaller-sized rock saturated with ash. The dike is approximately 1,400-ft long with an average height of 12 ft and average width of 30 ft at the top. The dike has served as a barrier to prevent ash from moving into the Emory River from the embayment and to serve as a haul road. Immediately adjacent to Dike 2 are several settling basins that serve as a treatment system for water that migrates over ash. Roughly 5 acres are used for the basins, which are lined with rock.

Both the dike and the settling basins must remain in service until the last of the ash is removed west of Dike 2. At that time, the rock and any accumulated sediment will be removed and transported to the onsite disposal area. Some of the larger rock may be washed of ash so that the clean rock may be used for onsite drainage and erosion control.

Restore Embayment Ecosystem. Following the removal of ash from the areas west of Dike 2, the embayment ecosystem will be restored to pre-spill conditions, as best determined from a jurisdictional assessment based on analysis of existing data and site observations, data collected from surrounding reference communities in a similar geomorphic position, and best professional judgment. The requirements for a jurisdictional assessment include maps of the site prior to the spill and following the non-time-critical removal action, areas/species/habitat impacted, habitat created or revegetated with selected species, channel slopes, and similar elements. The pre-spill topography of the embayment shoreline and surrounding areas will be reconstructed to an elevation that supports native plant communities. Restoration will incorporate the following actions:

- Achieving suitable elevations within the floodplain necessary to support the restoration of a complex mosaic of forested, scrub-shrub, and emergent wetland plant communities. This includes the restoration of floodplain microtopography and wetland hydrology (i.e., constructed vernal pools) that historically provided important off-channel, seasonal, aquatic habitat for amphibians, birds, and other semi-aquatic species.
- Restoring the island that was historically located on the northern perimeter of the middle embayment. The island was likely an aquatic habitat feature important to fish and other aquatic species. Restoration will include filling and/or regrading to establish pre-spill topography.
- Characterizing the bottom sediments exposed by excavation/dredging or filling/regarding for organic content and moisture retention capacities to determine if soil amendments will be necessary to support the restoration of native plant communities. Hydric soils were identified in the wetland

ecosystems surrounding the embayment. Given that the embayment appears subject to high sediment deposition, the bottom substrate of the embayment is expected to reestablish naturally.

The final planting will restore a complex mosaic of forested, scrub-shrub, and emergent wetland plants. Figure 3 presents a conceptual cross-section of the restored embayment, with reference to different native plant communities. Species composition and densities of restored plant communities will be based upon previously collected data within the embayment area, as well as data collected from surrounding reference communities in a similar geomorphic position.

Install Perimeter Containment. The foundation beneath the perimeter berms will be stabilized by constructing a grid of soil/cement columns that are installed using deep soil mixing techniques. Figure 4 presents a conceptual cross-section and plan view of the stabilized foundation zone. Selected foundation zones will be stabilized by mechanically mixing in-situ soil materials with a cement grout slurry using a hollow-stem paddle mixer. Auger drilling equipment will be used to create a soil/cement column. Successive columns will then be installed to create a contiguous subsurface “wall” of soil/cement. These walls will then be configured into the required grid pattern. The conceptual foundation zones, to be refined during final design, are anticipated to vary from 15-ft to 130-ft wide. A working platform, consisting of layers of geogrid, sand, and stone, will be built along the perimeter berm prior to stabilizing the underlying foundation material. A ditch will be constructed around the perimeter of the Dredge Cell and Ash Pond to divert surface drainage away from the site and to control runoff from the site.

Construct Working Platform/Stack Ash. A working platform, consisting of layers of geogrid, sand, and stone, will be constructed across the Dredge Cell and Ash Pond before dry ash is stacked to serve as a capillary break, and to provide a stable working base for construction equipment. Dried ash (near optimum moisture content) will be placed in relatively thin lifts, and each lift will be compacted.

Grade Dredge Cell. The former Dredge Cell will be regraded to a peak elevation of approximately 790 ft mean sea level (msl). The regrading will occur over time and will be coordinated with the construction of the working platform for the new perimeter berm and closure of the Ash Pond.

Cover Dredge Cell and Ash Pond. A soil cover will be placed to control erosion, control dust generation, promote runoff and evapotranspiration, limit infiltration, and provide a surface for vegetative growth. A layer of clay and then topsoil will be placed over the entire area and contoured. Other low-permeability caps, such as a composite clay liner system, may also be used. Once the cover reaches final grade, it will be seeded and mulched.

Monitoring. Because ash will remain in the Dredge Cell and Ash Pond area, the groundwater underneath the cell and surface water flowing from the cell will be monitored quarterly for at least one year or until the results indicate stable conditions. Once stable conditions are confirmed for four quarters, the monitoring will be reduced to semi-annually for the 30-year post-closure monitoring. A permanent network of groundwater wells will be installed and monitored for metals and radionuclides. The containment system as well as the drainage systems will be periodically inspected. Monitoring and inspection results will be documented in a five-year review report to ensure the remedy remains effective and adequately protective of human health and the environment over the long-term. Air and surface water monitoring will be conducted during implementation of the removal action.

Institutional Controls. The Dredge Cell and Ash Pond area will be maintained as a disposal location for the foreseeable future. Under Tennessee solid waste regulations, access to the cell will be controlled. Institutional controls in the form of restrictive covenants will be recorded on the property in order to prohibit exposure to the contents of the Dredge Cell and Ash Pond disposal areas and to protect the integrity of the perimeter containment, cover, and other components of the remedy. Institutional controls

will also include a “Notice in Deed to Property” that will be recorded on the property pursuant to TDEC 1200-1-07-.04(8)(f) for the purpose of notifying persons that the property has been used as a disposal facility and its use is restricted in accordance with an approved closure/post-closure plan.

In addition the following existing plans will be revised to make them applicable to non-time-critical removal activities:

- Site Health and Safety Plan,
- Site Storm Water Management Plan,
- Site Dust Control and Air Monitoring Plan, and
- Surface Water Monitoring Plan for the Emory, Clinch, and Tennessee Rivers.

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 the removal of ash from the embayment with onsite disposal in the Dredge Cell and Ash Pond, offers the best tradeoff of effectiveness, implementability, and cost remedy evaluation criteria. The following summarizes the key considerations in selecting this action.

- a. **The proposed action is effective in meeting each of the removal action objectives (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 spilled ash in the Swan Pond Embayment. These threats or potential threats, as listed in Section III of this Action Memorandum, were evaluated in the screening-level human health and ecological risk assessments in the EE/CA, which indicated potential risk to human and ecological receptors due to exposure to naturally-occurring metals and radionuclides in the ash. 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. ***Minimize direct contact between ash material in the embayment and water flowing through the embayment area into Watts Bar Reservoir.*** By removing the ash from the embayment, direct contact between ash and water is eliminated, which effectively eliminates further migration of ash-laden sediment or surface runoff into the reservoir. Ash removal by both mechanical excavation and dredging has been shown to be effective during the time-critical removal action in the eastern embayment (east of Dike 2), based on results of visual observations of the excavation surface and examination of soil/sediment cores using polarized light microscopy.
 - ii. ***Minimize migration of ash and its constituents from the embayment, Dredge Cell, or Ash Pond into affected waters due to erosion.*** By removing ash from the embayment and capping of the ash during closure of the Dredge Cell and Ash Pond, erosion and transport of ash-laden runoff is eliminated, which effectively eliminates further migration of ash-laden sediment or surface runoff to the reservoir. The final 36-inch thick clay, soil, and vegetative cover over the ash will be graded and will have drainage facilities that will be effective in minimizing erosion of cover material, optimizing drainage, and are consistent with drainage in the surrounding area.
 - iii. ***Minimize direct contact exposure by human or ecological receptors to ash on the ground.*** By removing the ash from the embayment and capping the ash in the Dredge Cell and Ash Pond, direct contact by both human and ecological receptors is eliminated. The cover will be effective in eliminating direct contact exposure, and will provide sufficient thickness against dust generation or burrowing.

- iv. ***Restore the embayment to pre-spill conditions.*** By removing the ash from the embayment, and reestablishing pre-spill topography, plant communities, and habitat for fish, semi-aquatic amphibians, and bird species, the embayment will be restored to pre-spill conditions. The restoration of a complex mosaic of forested, scrub-shrub, and emergent wetlands along the embayment shorelines will be effective in establishing a riparian zone that will encourage natural repopulation of native faunal groups.
- v. ***Close the former Dredge Cell in accordance with Tennessee Solid Waste Rule 1200-1-7.*** The proposed action includes closure of both the Dredge Cell and adjacent Ash Pond in accordance with TDEC solid waste regulations. The proposed action will be in full compliance with these applicable or relevant and appropriate requirements (ARARs). Furthermore, the former Dredge Cell and Ash Pond will be closed by installing a safe and structurally-sound perimeter containment system, as described below, to prevent any future release of ash from the closed facility.
- vi. ***Dispose of waste streams from the removal action in accordance with ARARs.*** By disposing of the ash from the embayment in the on-site Dredge Cell and Ash Pond, waste streams will be disposed in accordance with TDEC regulations. Dry stacking of the ash in compacted lifts will be effective in providing a safe, stable fill with suitable shear strength and limited long-term settlement. Construction activities will be effectively implemented onsite to control fugitive dust emissions, erosion, and sedimentation in compliance with TDEC 1200-3-8 and TDEC 1200-4-10. Excavated ash will be characterized, managed, and disposed in compliance with 40 CFR 262.11 and TDEC 1200-1-11. As indicated above, closure will be in accordance with TDEC 1200-1-7.

Public comments on the EE/CA indicated a concern over groundwater remediation if ash were to be disposed onsite (see the Responsiveness Summary in Attachment B). However, groundwater remediation was specifically not identified as an RAO for the following reasons:

- There is no identified groundwater plume. As described in Section II above, groundwater samples have been collected at least semiannually from monitoring wells surrounding the Dredge Cell and routinely analyzed for 16 metals and fluoride. Since the ash release, 2 out of 40 samples exceeded the MCL for arsenic; those two samples were from well AD-2 at the south end of the Ball Field in June and July 2009. However, subsequent monthly sampling of well AD-2 over the past 7 months has shown that arsenic does not exceed the MCL in that well. Historically (over the past 10 years), arsenic concentrations in one well (6A) exceeded its MCL 6 out of 27 times; however the highest historical concentration (0.014 mg/L in December 2004) only slightly exceeded the MCL in that one well and since the spill, arsenic has not exceeded the MCL. Arsenic concentrations in other wells have not exceeded the MCL. Concentrations do not indicate either an increasing or decreasing trend. Historically, silver has occasionally been detected in one well (6A) at concentrations that exceed its MCL of 0.10 mg/L. However, in 2007 TDEC granted a site-specific standard of 0.18 mg/L for silver in recognition of the fact that silver is present in natural soil and groundwater sources, but is absent in ash. Therefore there is no identified groundwater contamination or groundwater plume associated with the former Dredge Cell or Ash Pond.
- Metals in the ash do not leach readily under site-specific conditions. Several lines of evidence support this conclusion. First, groundwater quality does not exceed drinking water standards after more than 50 years of the ash being in contact with groundwater. This overall evidence, which integrates the effects of site-specific geochemical,

hydrostratigraphic, and leaching characteristics, demonstrates that ash does not leach readily. Second, an EPA Science Panel review of potential selenium issues after the ash spill concluded that metals are not readily leaching off the ash particles spilled into the river, based on available surface water monitoring data. None of the downstream median concentrations of dissolved metals were found to be above the water quality criteria benchmarks for protection of aquatic life. Third, the U.S. Army Engineer Research and Development Center (ERDC) tested samples of ash taken from the Dredge Cell, Emory River, and Stilling Pond using sequential extraction procedures designed to remove metals from the ash with increasingly more “aggressive” solvents. Results of that study demonstrated that site-specific metals (such as arsenic and selenium) would not easily become mobile in normal aqueous environments, that is, they do not readily leach from the ash. Fourth, results of Toxicity Characteristic Leaching Procedure (TCLP) testing of ash samples for waste characterization purposes have shown that the TCLP leachate does not exceed threshold limits and that the ash is not a hazardous waste. This provides indirect evidence that the ash does not readily leach metals. Public comments on the EE/CA (see the Responsiveness Summary in Attachment B) suggest that alternate leaching procedures developed in EPA research studies could result in greater leaching of metals. However, such alternate procedures subject the ash to harsh pH conditions that are not representative of site-specific pH and redox conditions.

- Hydrostratigraphic conditions at the site mitigate transport (migration) of metals from the Dredge Cell to groundwater discharging at the river. A silty clay layer underlies the ash that has a thickness of approximately 10 ft and a hydraulic conductivity of approximately 1.9×10^{-6} cm/sec, which acts as a barrier to metal migration. Shallow groundwater movement is generally from upland areas toward the river, resulting in upward hydraulic gradients beneath the Dredge Cell, which impedes downward metal migration. It should be noted that the conceptual design for the Dredge Cell closure includes installation of a soil-cement perimeter foundation treatment zone that will impede lateral groundwater flow. The conceptual design for the Dredge Cell also includes a low-permeability clay cap over the ash, which will reduce infiltration of precipitation through the ash by an order of magnitude (14 inches/yr to 1.4 inches/yr) and reduce the rate of leachate generation.

For these reasons, groundwater remediation has not been identified as an RAO. Several public comments on the EE/CA (see the Responsiveness Summary in Attachment B) suggest that a liner and/or leachate collection system should be included in the closure design. However, because there is no identified groundwater contamination or groundwater plume associated with the former Dredge Cell or Ash Pond, metals do not readily leach from the ash, and hydrostratigraphic conditions impede metal migration, no liner or leachate collection system is warranted to protect human health or the environment. It should be noted, that up to 40 ft of ash will remain below grade, beneath the groundwater table, so that ash will remain in contact with the groundwater as it has for the past 50 years. It is unnecessary to install a synthetic liner beneath that ash and it would be ineffective to install a synthetic liner on top of that ash, prior to dry ash stacking. For these reasons, neither a liner nor a leachate collection system are included in the conceptual closure design.

It should be noted that the river system will be addressed in a separate EE/CA and Action Memorandum following additional investigation to confirm geochemical conditions and leaching characteristics for modeling fate and transport of metals and radionuclides to the river. Future sampling and analysis plans for characterization of the river system include additional leaching tests, hydraulic conductivity tests, geochemical and geotechnical tests, additional wells, and

sampling of groundwater at the shoreline, in sediment porewater and in epibenthic water immediately above the bottom of the river. This investigation will be used in quantitative fate and transport modeling to evaluate the flux of constituents to the river and to assess risks to human and ecological receptors. .

- b. **The proposed action is effective in safely containing the ash.** The perimeter berm, foundation stabilization system, and ash fill will be effective and stable over the long term, so that the closed Dredge Cell will not present a threat of future release. Analysis of the conceptual berm stability under static loading conditions resulted in safety factors greater than 1.5, which are indicative of stable conditions. The conceptual berm configuration and foundation design effectively address the four contributing factors cited by AECOM in their root cause analysis of the former dike failure:
- i. **Fill Geometry.** The former failed dike was constructed using small dikes stacked progressively up slope on top of nearly 80 feet of sluiced ash and a sensitive silt (“slimes”) layer. Total height of the dikes that surrounded the former Dredge Cell prior to its failure was elevation 820 ft msl. The proposed action will reconstruct the perimeter containment using a single compacted earthen berm placed on a crushed rock working platform. The perimeter berm will be built to a height of 765 ft msl; the Dredge Cell will be built to a maximum elevation of approximately 790 ft msl, which is 30 ft lower than the former Dredge Cell prior to its failure.
 - ii. **Fill Rates.** The elevation of the ash in the former Dredge Cell prior to failure was increasing at a rate of about 6 ft/yr, more rapidly compared to earlier years, which added load to the wet ash beneath the dikes. In particular, filling resulted in loose, wet ash saturated throughout its depth, which led to high porewater pressures at depth and low strength in the sluiced ash materials. The proposed action will reconstruct the cell fill by dry stacking using dewatered ash, compacted in thin lifts. Results of the test embankment have shown that such construction methods do not result in excess porewater pressures in the foundation ash materials under a controlled and monitored rate of filling.
 - iii. **Foundation Soils.** Creep deformations within the submerged loose slimes was occurring under the load of loose wet ash in the former Dredge Cell, which caused a reduction in the strength of the slimes and led to deep-seated failure of the dike. The proposed action will reinforce the perimeter berm foundation with soil-cement columns that will not rely on the strength of the soft foundation soil layer for stability, but will instead transfer the load substantially to the soil-cement columns. The foundation ash/soil layers beneath the perimeter berm will be mixed in-place with cement grout, to achieve a specified strength. The foundation improvements will be designed to support the internal pressures from the landfilled ash, even if a strong earthquake were to liquefy the saturated ash/soil layers beneath the ash fill.
 - iv. **Ash Fill.** The original sluiced ash was deposited under water, resulting in a high void ratio (very loose ash) that did not consolidate or densify under the surcharge weight of ash placed above it. As a result, the loose wet ash had a low undrained shear strength with a very sensitive structure. The proposed action will reconstruct the cell fill above current grades using dewatered ash, compacted in thin lifts on top of a constructed working platform that serves as a capillary break. Results of the test embankment study have shown that the shear strength of the compacted dry ash is much greater than loose

wet ash. The moisture content of the dry ash will be at the optimum level to achieve a specified shear strength.

The test embankment program was successful in demonstrating that stable embankments can be constructed across the Dredge Cell subgrade. The results verified key design parameters, including settlements, horizontal displacements, porepressures, strength, and drainage from the ash fill. The results also verified key construction methodology, including control of moisture content, compaction, daily lift thickness and filling rates, and erosion control. Successful completion of the test embankment program was primarily attributed to use of a working platform, geotechnical instrumentation and evaluation, moisture conditioning, embankment geometry and surface runoff, and erosion control. The test embankment results will be used as a basis for embankment design and construction.

For these reasons, the perimeter berm, foundation stabilization system, and ash fill will be effective and stable over the long term.

- c. **The proposed action minimizes offsite transportation and disposal impacts.** By disposing of the ash onsite, the proposed action will virtually eliminate inherent short-term risks associated with shipment of ash over public roadways or railways and will eliminate uncertainties in implementing offsite disposal. The following describe the reasons why onsite disposal is preferred over offsite disposal.
- i. ***Transportation risks.*** If ash were to be shipped offsite, short-term risks of railroad incidents or rail-vehicle intersection accidents would be proportionate to the number of trip-miles. Offsite transport of more than 2.8 million cy of ash would result in nearly 125,000 trip-miles by rail alone. Transportation risk calculations presented in the EE/CA indicate that an estimated 1 rail accident, 0.8 rail injuries, and 0.4 rail fatalities could occur. Hauling a portion of the ash by truck would reduce potential rail transportation risks, but increase the truck transportation risks accordingly. Offsite shipment of ash would involve more than 380 trains hauling for 19 months, which would result in continued disruption of local traffic and inconvenience to local residents. Greater volumes of offsite shipment would result in even higher transportation risks. Offsite shipments implemented during the time-critical removal action have received considerable objection from local residents. Several public comments on the EE/CA (see the Responsiveness Summary in Attachment B) expressed concern regarding truck hauling due to the increased danger of traffic and potential damage to area roadways. Onsite disposal will minimize these transportation risks.
 - ii. ***Acceptability of offsite disposal.*** Public opposition to use of a particular permitted disposal facility would complicate implementability of offsite disposal. Several public comments on the EE/CA (see the Responsiveness Summary in Attachment B) expressed concern over continued offsite disposal at the Arrowhead Landfill. Environmental Justice concerns were raised as to the public health, socioeconomic, and equity implications of continuing to dispose of ash from the non-time-critical action in a low-income and minority community. Landfill operation concerns were raised as to the ability of offsite landfills accepting coal ash to handle the specific regulatory and management controls needed. Operational concerns included control of air quality and fugitive dust, leachate treatment, surface water quality, and groundwater quality. These concerns and public opposition regarding the Arrowhead Landfill would likely be present if other permitted offsite disposal facilities were to be used. TVA does not have the ability to control the waste management practices at commercial offsite disposal

facilities. Onsite disposal will eliminate these concerns regarding acceptability of offsite disposal.

Several public comments on the EE/CA (see the Responsiveness Summary in Attachment B) expressed a preference that all ash be removed from the area, not only the ash from the embayment, but all the ash remaining on the site, so as to achieve a vision for the site that is entirely free of ash. However, offsite disposal of such large quantities of material would have even greater negative impacts to the community due to long-term shipments, and would further compound the problems discussed above regarding transportation risks, disposal capacity, and acceptability. Onsite disposal will protect the health of local residents and persons that use the river and avoid significant offsite transportation and disposal risks.

- d. **The proposed action results in comparable time to achieve RAOs.** The proposed action is expected to be complete in less than 5 years, including final closure of both the Dredge Cell and Ash Pond. Closure will occur in phases, and must be carefully coordinated with the dry ash conversion project, dredged ash dewatering operations, and long-term wastewater management facilities needed to support the operating power plant. The time to complete the action is not substantially different from other alternatives that were considered. Although offsite disposal could likely be completed in less than 4 years, TVA does not consider the difference in these duration estimates to outweigh the disadvantages of offsite transportation and disposal.
- e. **The proposed action is the most cost-effective.** The proposed action is estimated to cost the least of the alternatives considered, primarily due to the high cost of offsite transportation and disposal associated with the other alternatives. Long-term operation and maintenance costs are expected to be the same for all alternatives. This lower estimated cost, combined with the lower transportation and disposal risk and the effectiveness in meeting RAOs and safely containing the ash, provides the best tradeoff of effectiveness, implementability, safety, 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 a lower cost approach that would have the least impact on electric rate payers in the region.

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 future remedial actions that are anticipated at the Site. A Preliminary Assessment will be conducted at the completion of the removal work to address whether additional assessment or remedial work is necessary to address any residual contamination remaining at the Site, predominantly within the river system.

4. Description of Alternative Technologies

The use of alternative technologies is not anticipated at this time. For low-level threat waste found at metals-in-soil sites, the EPA presumptive remedy is containment, although excavation with disposal and other institutional controls have also been used. The proposed removal action will use a combination of these presumptive remedy technologies.

The EE/CA presented an evaluation of alternative technologies for the embayment/Dredge Cell, including phytoremediation, separation by screening or sieving, electrokinetic separation, soil washing, chemical extraction, immobilization, and vitrification. These other technologies are not considered cost-effective nor implementable at this site.

The EE/CA also presented an evaluation of other alternatives for the embayment/Dredge Cell. One alternative would have excavated the ash and other materials in the embayment and disposed of this material offsite. A berm would have been installed to keep ash in the Dredge Cell from entering the embayment in the future and the Dredge Cell would have been graded for drainage. The height of the closed cell would have been approximately 790 ft msl. The embayment would have been restored to an aquatic and riparian environment. The actions under this alternative would have been designed to avoid returning any spilled ash back into the Dredge Cell and to close the remainder of the Dredge Cell in place. This alternative was not selected because of the large volume of material (more than 2.8 million cy) that would have been transported by rail and/or truck offsite, corresponding transportation risks, and uncertainties in acceptability of the final disposal site. This alternative would not have provided any greater environmental protectiveness, yet would have resulted in capital costs that are 60% higher than the selected action.

Another alternative would have excavated the ash and other materials in the embayment, plus enough ash from the Dredge Cell to limit long-term reliance on a dike between the cell and the embayment, yet would have left enough ash to provide buttressing for the remaining dikes. The removed material would have been disposed offsite. The Dredge Cell would have been graded to a gradual slope, with a maximum height of the closed cell of approximately 780 ft msl at its highest point, although most of the Dredge Cell would have been below elevation 765 ft msl. The embayment would have been restored to an aquatic and riparian environment. The actions under this alternative would have been designed to minimize long-term reliance on a dike containment system by removing much of the ash from the Dredge Cell above the surrounding ground level. This alternative was not selected because of the very large volume of material (more than 6.8 million cy) that would have been transported offsite, primarily by rail, corresponding very high transportation risks, and high uncertainties in the acceptability of the final disposal site. This alternative would not have provided any greater environmental protectiveness, yet would have resulted in capital costs that are 160% higher than the selected action.

Another alternative, similar to the selected action, would have excavated the ash and other materials in the embayment and placed them fully in the Dredge Cell, which would have been closed as part of the removal action. The adjoining Ash Pond would have been closed at a later date, which would have avoided complications in project phasing needed to coordinate closure of the Ash Pond with completion of dredging and with the KIF dry ash conversion project. This alternative was not selected because closing the two areas separately would have resulted in greater time and cost, primarily due to closing the Ash Pond at a later date and increasing the foundation stabilization needed for perimeter berm construction. This alternative would have resulted in capital costs that are 15% higher than the selected action.

Several other options were considered, but not retained as alternatives, as explained in the EE/CA. Those options included leaving all materials within the embayment and either covering them in-place or placing a liner beneath them; excavating all ash from the embayment and replacing with clean fill dirt; excavating all ash from the embayment and placing them in a new onsite lined landfill, and excavating all ash from both the embayment and the entire Dredge Cell.

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

The EE/CA for the embayment/Dredge Cell (Jacobs 2010) 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 January 19, 2010. Following a 75-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).

Closure of the Dredge Cell will be in accordance with Tennessee Solid Waste Rule 1200-1-7, thereby complying with terms of the TDEC Commissioner's Order. The final cover system will be at least 36 inches thick, consisting of a compacted soil layer at least 24 inches thick which has a permeability no greater than 1×10^{-7} cm/sec, and a second soil layer at least 1-ft thick for the support of vegetative cover. An alternate final cover system may be used provided that it provides equivalent or superior performance in minimizing infiltration. The final surface will be graded and/or have drainage facilities that minimize erosion of cover material, optimize drainage, and are consistent with drainage in the surrounding area.

Restoration of the embayment will restore waters of the state and the associated floodplain and wetland areas impacted by the ash in compliance with TDEC 1200-4-3 and associated ARARs. Removal of the ash will remove the naturally-occurring metals and radionuclides that could produce toxic effects on the health and safety of humans or animals. Water quality will be restored to meet AWQC in surface water within the embayment. Waters will therefore not contain residual pollutants from the ash that may impair the usefulness of the river water as a source of domestic or industrial water supply, recreation, or irrigation, or that may impair the health of fish or aquatic life.

Pursuant to the AOC, TVA agrees that it will comply with Clean Water Act Section 404(b)(1) guidelines to restore waters of the United States to the functional level occurring prior to the ash release. In order to identify the full extent of response activities necessary to meet this ARAR, TVA will conduct a jurisdictional assessment of the Site, to the extent not previously evaluated, which will identify all waters of the United States impacted by the release. The jurisdictional assessment will be performed in accordance with the requirements of the AOC.

Site preparation, construction, and excavation activities will be conducted in compliance with TDEC 1200-3-8 and TDEC 1200-4-10, including precautions to control fugitive dust emissions, erosion, and sedimentation. Dredged material removed from the embayment will not be placed into an aquatic ecosystem, in compliance with 40 CFR 230.10(a).

Excavated ash will be characterized, managed and disposed in compliance with 40 CFR 262.11 and TDEC 1200-1-11. Because ash will be disposed onsite, rules pertaining to offsite disposal or transportation of hazardous materials are not applicable.

B. PROJECT SCHEDULE

The proposed removal action will be implemented within an estimated 4.25 years following design of the removal action. Figure 5 shows a conceptual schedule for construction sequencing. A removal action work plan will be developed to provide more details on the anticipated productivity of the excavation, dredging, foundation stabilization, berm construction, ash stacking, and final cover construction. The schedule is highly dependent on weather and availability of specialty contractors.

C. ESTIMATED COSTS

Capital costs associated with implementing the proposed removal action are estimated at \$268.2 million (2009 dollars). Subsequent operation and maintenance costs are estimated at \$686,000/year (2009 dollars).

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

The timing of the decision on the embayment and Dredge Cell is important. The ongoing time-critical action is scheduled to be completed in spring 2010. Construction and transportation activities will have been underway for over a year to accomplish this goal. The remaining ash in the embayment will have been contained by constructing drainage features to separate clean water runoff from the ash. Although the clean water ditches have been designed for a 25-year recurrence interval, some of the drainage features in the embayment (sediment basins) have been sized for a storm event having only a 2-year recurrence interval; a delay in the decision would increase the risk of future ash releases during greater storm events. Implementation of the proposed removal action scope is needed by spring 2010 to allow for continuation of removal activities and smooth transition from time-critical to non-time critical actions.

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. 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 the restoration of the Swan Pond Embayment and closure of the Dredge Cell 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

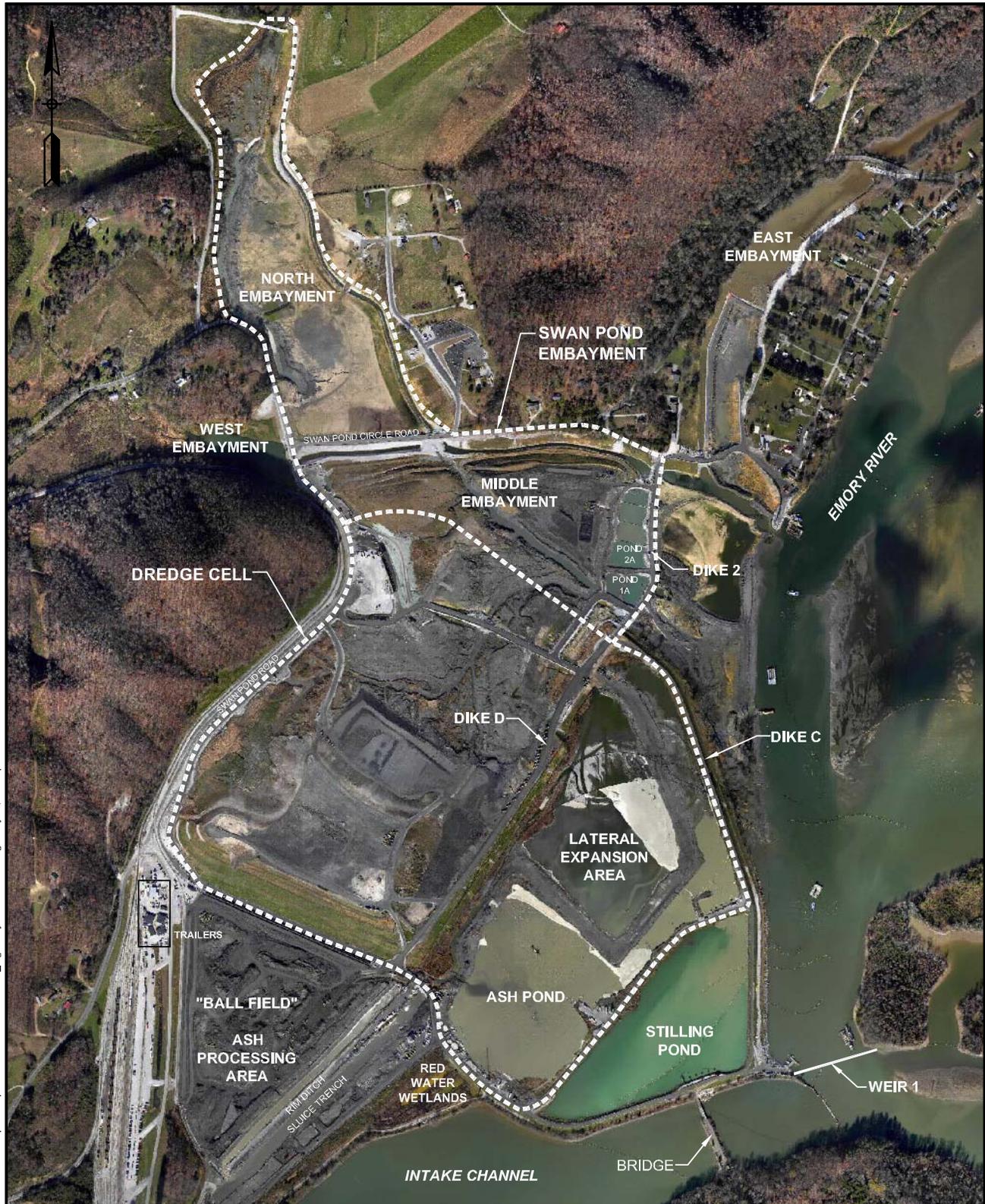
- U.S. Environmental Protection Agency (EPA). 2009a (May 11). *Administrative Order and Agreement on Consent, Docket No. CERCLA-04-2009-3766, Region 4.*
- Jacobs 2010. (January 15). *Kingston Ash Recovery Project, Non-Time-Critical Removal Action, Embayment/Dredge Cell, Engineering Evaluation/Cost Analysis (EE/CA).*
- Tennessee Department of Environment and Conservation (TDEC) 2009 (January 12), *Commissioner's Order, Case No. OGC09-0001, Division of Water Pollution Control.*
- Tennessee Valley Authority (TVA) 2001. *Material Safety Data Sheet, Class "F" Fly Ash, MSDS No. BP-001.*
- TVA 2009a (March). *Final Environmental Assessment, Emergency Dredging for the Kingston Fossil Plant Ash Dike Failure, Roane County, Tennessee.*
- TVA 2009b (March 2). *Corrective Action Plan for the TVA Kingston Fossil Plant Ash Release, Roane County, Tennessee.*
- TVA 2009c (August 4). *Action Memorandum: Request for Removal Action at the TVA Kingston Fossil Fuel Plant Release Site, Roane County, Tennessee.*

X. ATTACHMENTS

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

ATTACHMENT A
Figures

T:\0002 ENGINEERING\01 DRAWINGS AND SPECS\Report Graphics\N/C Action Memo\076_Fig 1 Key Site Features.dwg May 07 2010 -aperano



DATE OF PHOTO: 25 NOV 2009

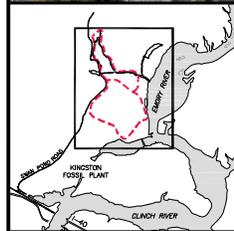
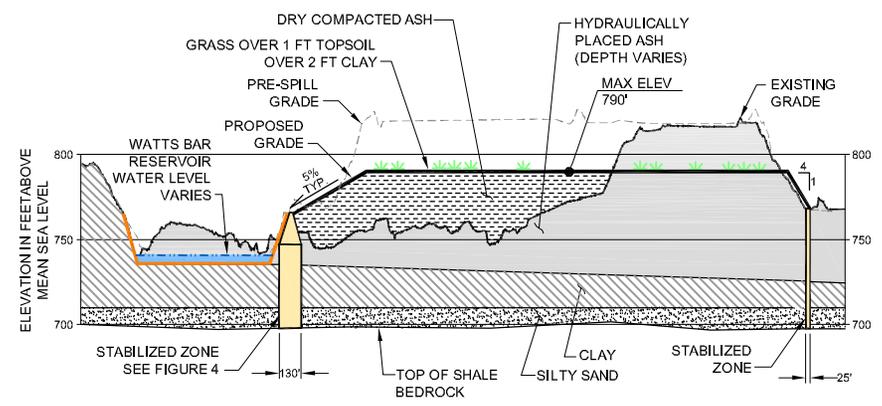
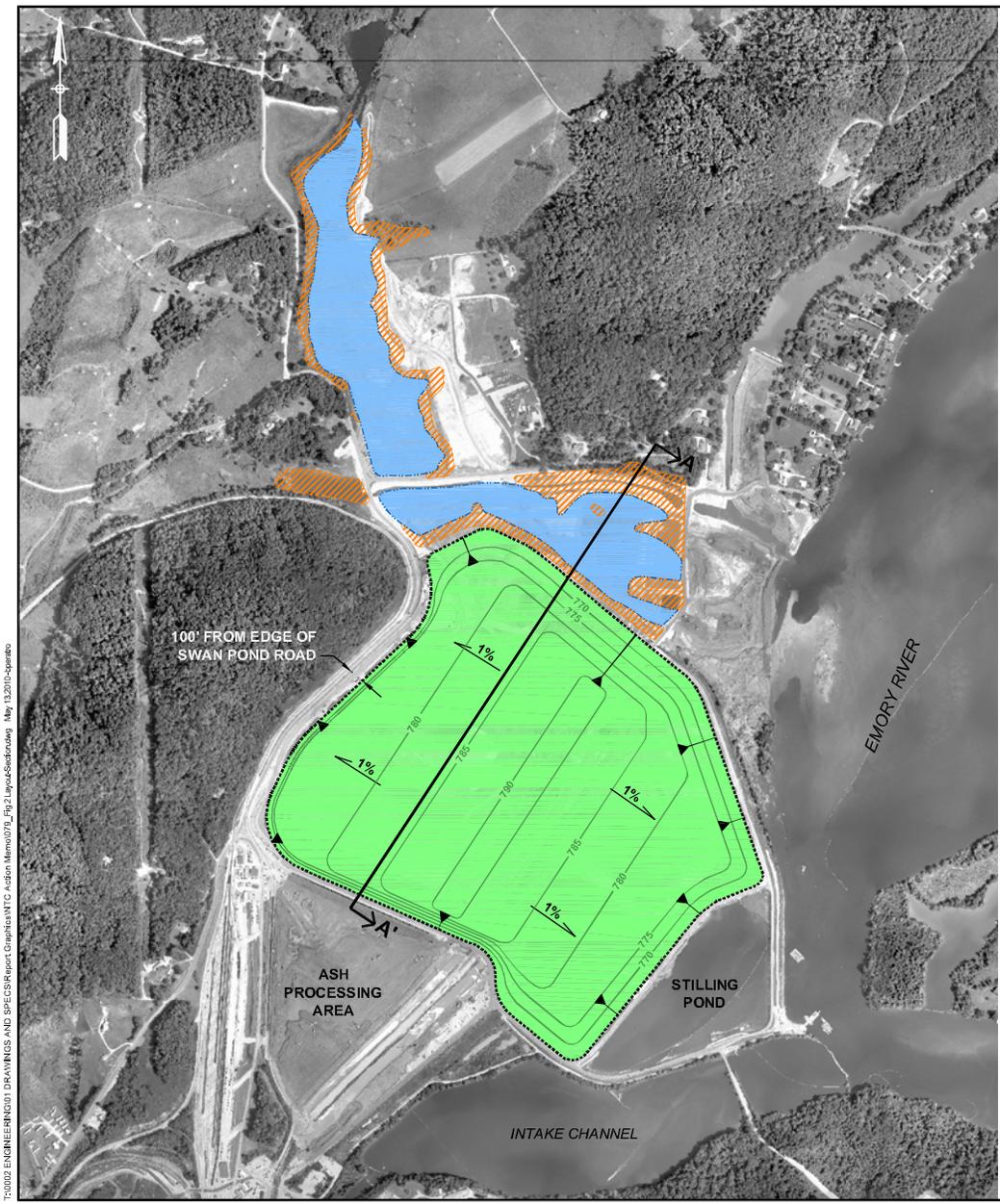


FIGURE 1 KEY FEATURES OF THE SITE

TENNESSEE VALLEY AUTHORITY

DATE: 7 May 10

PHASE: Non-Time-Critical Action Memorandum



SECTION A-A'
NOT TO SCALE

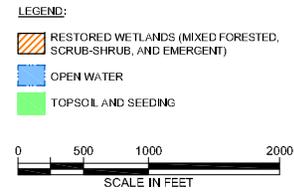
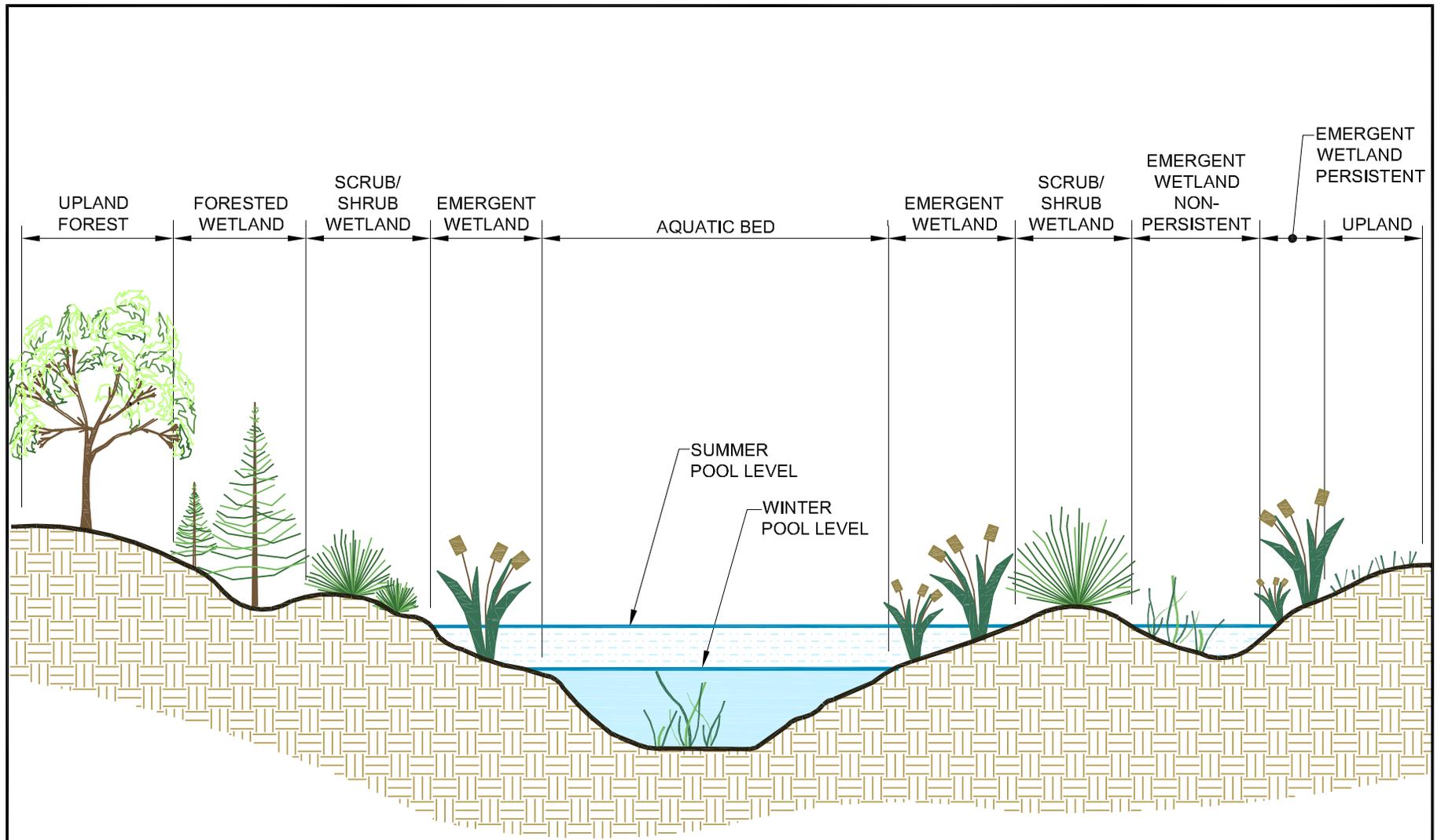


FIGURE 2
CONCEPTUAL LAYOUT & CROSS-SECTION
OF THE PROPOSED ACTION
TENNESSEE VALLEY AUTHORITY

DATE: 7 May 10	PHASE: Non-Time-Critical Action Memorandum
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NOTE:

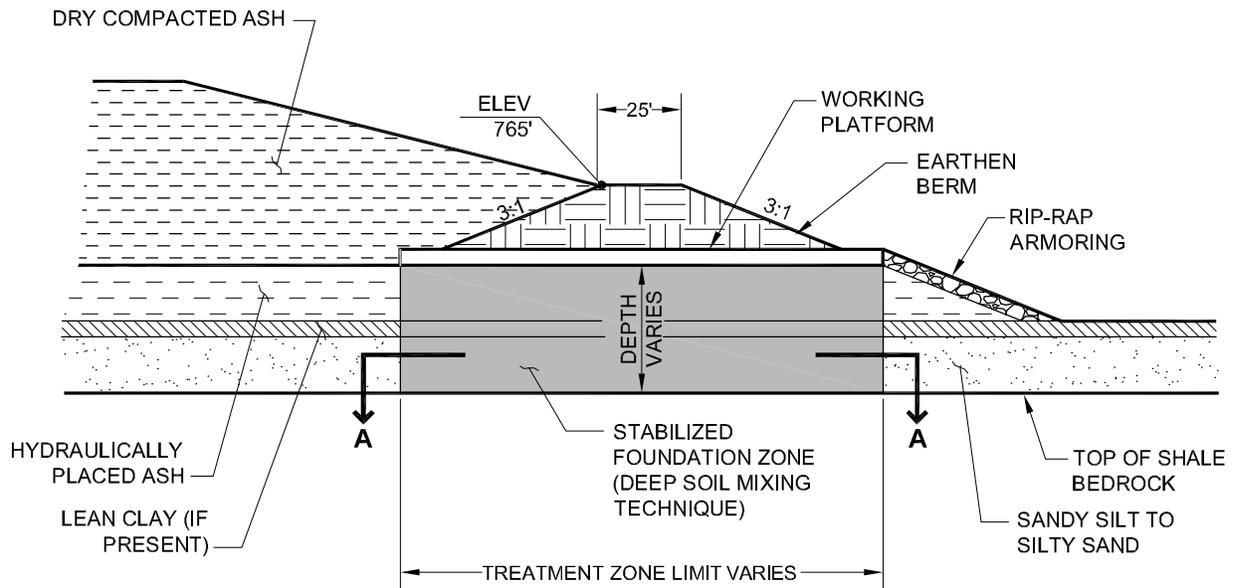
EXAMPLE OF COMPLEX MOSAIC OF NATIVE PLANT COMMUNITIES PROXIMATE TO THE RESTORED EMBAYMENTS. NOTE THE MICRODEPRESSION ON THE LEFT AND RIGHT SIDE OF THE AQUATIC BED THAT FACILITATES THE RESTORATION OF FORESTED AND EMERGENT WETLAND COMMUNITIES IN THE FLOODPLAIN.

FIGURE 3
CONCEPTUAL CROSS SECTION OF
THE RESTORED EMBAYMENT
 TENNESSEE VALLEY AUTHORITY

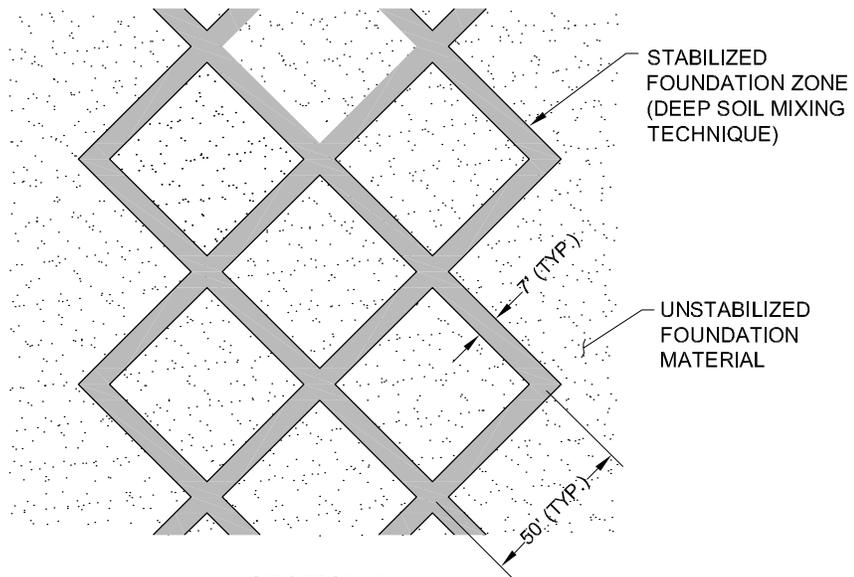
DATE: 7 May 10

PHASE: Non-Time-Critical Action Memorandum

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**CONCEPTUAL FOUNDATION
STABILIZATION SECTION**



SECTION A-A

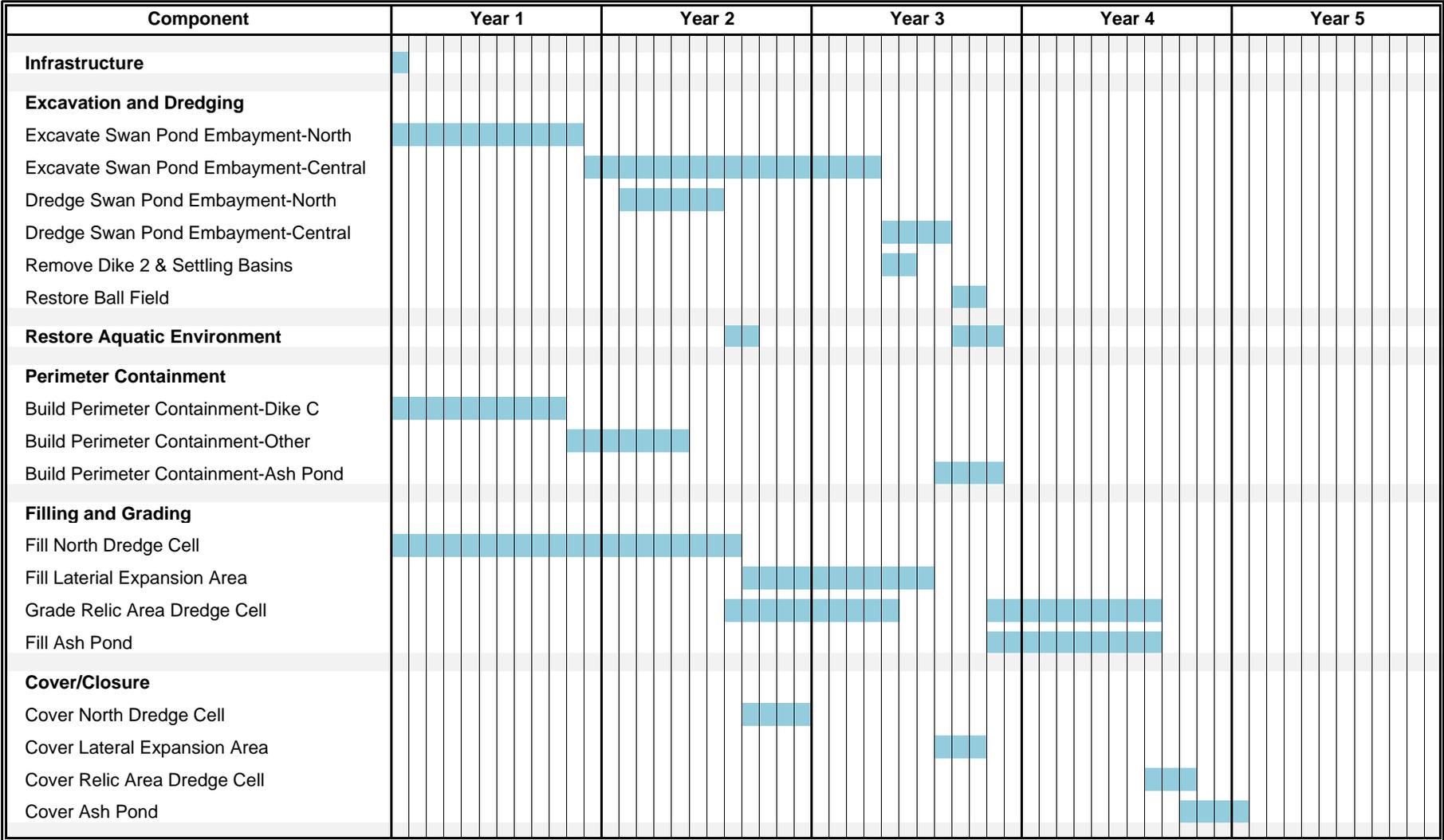


**FIGURE 4
CONCEPTUAL CROSS-SECTION OF
THE PERIMETER IMPROVEMENTS
TENNESSEE VALLEY AUTHORITY**

DATE: 7 May 10	PHASE: Non-Time-Critical Action Memorandum
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FIGURE 5
CONCEPTUAL SCHEDULE FOR THE PROPOSED ALTERNATIVE

(Duration represented in months after start of non-time-critical action)



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, Embayment / Dredge Cell
Engineering Evaluation/Cost Analysis (EE/CA)
Public Comment Period January 19 – April 9, 2010**

An Administrative Order and Agreement on Consent was signed between the U.S. Environmental Protection Agency (EPA) and TVA on May 11, 2009 providing the regulatory framework for restoration efforts. Since that time, restoration efforts have been conducted as a time-critical removal action. The EE/CA for the embayment / Dredge Cell describes and evaluates alternatives for conducting a non-time-critical removal action to restore the embayment and close the Dredge Cell and adjacent Ash Pond. Three alternatives developed in the EE/CA are:

Alternative 1 - Excavation of the embayment and off-site disposal. This alternative would remove the ash from the embayment and from the test embankment within the Dredge Cell and dispose of the ash offsite. A berm would be installed to keep ash in the cell from entering the embayment in the future, and the Dredge Cell would be graded for drainage and closed. The height of the closed cell would be approximately 790 feet (ft) above mean sea level (msl). A total of approximately 2.8 million cubic yards (cy) of removed material would be disposed offsite using rail transport. A subalternative (1b) would haul a portion of the ash offsite by truck for disposal.

Alternative 2 - Excavation of the embayment and portions of the Dredge Cell, both with offsite disposal. This alternative would remove the ash from the embayment and test embankment, plus enough ash from the dredge cell to limit long-term reliance on a berm between the cell and the embayment. Enough ash would be left in the Dredge Cell to provide buttressing for the remaining berms. The Dredge Cell would be graded to a gradual slope and closed, with a maximum height of approximately 765 to 780 ft msl at its highest point. A total of approximately 6.8 million cy of removed material would be disposed offsite using rail transport. A subalternative (2b) would haul a portion of the ash offsite by truck for disposal.

Alternative 3 – Excavation of the embayment and on-site disposal in the Dredge Cell. This alternative would use the Dredge Cell as a disposal facility. No material would be taken offsite. The ash in the embayment would be removed and stacked in the dredge cell. Material placed in the cell for the test embankment would remain in the cell. A berm would be installed to keep ash in the cell from entering the embayment in the future, and the dredge cell would be graded for drainage and closed. The height of the closed cell would be approximately 790 to 800 ft msl. A subalternative (3b) would place some of the ash in the adjacent Ash Pond and close both the Dredge Cell and Ash Pond at the same time.

A 30-day public comment period on the Embayment/Dredge Cell EE/CA report was initiated on January 19, 2010. The public comment period was extended by EPA to April 5, 2010. This Responsiveness Summary lists the comments received from the public by email or mail, and TVA's responses to the comments.

Some of the public comments on the EE/CA indicated a concern over groundwater remediation if ash were to be disposed onsite. However, groundwater remediation was specifically not identified as a Removal Action Objective (RAO) for the following reasons:

- There is no identified groundwater plume. Groundwater samples have been collected semiannually from monitoring wells surrounding the Dredge Cell and routinely analyzed for 17 metals. Since the ash release, 2 out of 40 samples exceeded the Maximum Contaminant Level (MCL) for arsenic; those two samples were from well AD-2 at the south end of the Ball Field in June and July 2009. However, subsequent monthly sampling of well AD-2 over the past 7 months has shown that arsenic does not exceed the MCL in that well. Historically (over the past 10 years), arsenic concentrations in one well (6A) exceeded its MCL 6 out of 28 times; however the highest historical concentration (0.014 mg/L in December 2004) only slightly exceeded the MCL in that one well and since the spill, arsenic has not exceeded the MCL. Arsenic concentrations in other wells have not exceeded the MCL. Concentrations do not indicate either an increasing or decreasing trend. Historically, silver has occasionally been detected in one well (6A) at concentrations that exceed its MCL of 0.10 mg/L. However, in 2006 the Tennessee Department of Environment and Conservation (TDEC) granted a site-specific standard of 0.18 mg/L for silver in recognition of the fact that silver is present in natural soil and groundwater sources, but is absent in ash. Therefore there is no identified groundwater contamination or groundwater plume associated with the former Dredge Cell or Ash Pond.
- Metals in the ash do not leach readily under site-specific conditions. Several lines of evidence support this conclusion. First, groundwater quality does not exceed drinking water standards after more than 50 years of the ash being in contact with groundwater. This overall evidence, which integrates the effects of site-specific geochemical, hydrostratigraphic, and leaching characteristics, demonstrates that ash does not leach readily. Second, an EPA Science Panel review of potential selenium issues after the ash spill concluded that metals are not readily leaching off the ash particles spilled into the river, based on available surface water monitoring data. None of the downstream median concentrations of dissolved metals were found to be above the water quality criteria benchmarks for protection of aquatic life. Third, the U.S. Army Engineer Research and Development Center (ERDC) tested samples of ash taken from the Dredge Cell, Emory River, and Stilling Pond using sequential extraction procedures designed to remove metals from the ash with increasingly more “aggressive” solvents. Results of that study demonstrated that site-specific metals (such as arsenic and selenium) would not easily become mobile in normal aqueous environments, that is, they do not readily leach from the ash. Fourth, results of Toxicity Characteristic Leaching Procedure (TCLP) testing of ash samples for waste characterization purposes have shown that the TCLP leachate does not exceed threshold limits and that the ash is not a hazardous waste. This provides indirect evidence that the ash does not readily leach metals. Public comments on the EE/CA (see the Responsiveness Summary in Attachment B) suggest that alternate leaching procedures developed in EPA research studies could result in greater leaching of metals. However, such alternate procedures subject the ash to harsh pH conditions that are not representative of site-specific pH and redox conditions.
- Hydrostratigraphic conditions at the site mitigate transport (migration) of metals from the Dredge Cell to groundwater discharging at the river. A silty clay layer underlies the ash that has a thickness of approximately 10 ft and a hydraulic conductivity of approximately

1.9×10^{-6} cm/sec, which acts as a barrier to metal migration. Shallow groundwater movement is generally from upland areas toward the river, resulting in upward hydraulic gradients beneath the Dredge Cell, which impedes downward metal migration. It should be noted that the conceptual design for the Dredge Cell closure includes installation of a soil-cement perimeter foundation treatment zone that will impede lateral groundwater flow. The conceptual design for the Dredge Cell also includes a low-permeability clay cap over the ash, which will reduce infiltration of precipitation through the ash by an order of magnitude (14 inches/yr to 1.4 inches/yr) and reduce the rate of leachate generation.

For these reasons, groundwater remediation has not been identified as an RAO.

Some of the public comments on the EE/CA suggest that a liner and/or leachate collection system should be included in the closure design. However, because there is no identified groundwater contamination or groundwater plume associated with the former Dredge Cell or Ash Pond, metals do not readily leach from the ash, and hydrostratigraphic conditions impede metal migration, no liner or leachate collection system is warranted to protect human health or the environment. It should be noted, that up to 40 ft of ash will remain below grade, beneath the groundwater table, so that ash will remain in contact with the groundwater as it has for the past 50 years. It is unnecessary to install a synthetic liner beneath that ash and it would be ineffective to install a synthetic liner on top of that ash, prior to dry ash stacking. For these reasons, neither a liner nor a leachate collection system are included in the conceptual closure design.

It should be noted that the river system will be addressed in a separate EE/CA and Action Memorandum following additional investigation to confirm geochemical conditions and leaching characteristics for modeling fate and transport of metals and radionuclides to the river. Future sampling and analysis plans for characterization of the river system include additional leaching tests, hydraulic conductivity tests, geochemical and geotechnical tests, additional wells, and sampling of groundwater at the shoreline, in sediment porewater and in epibenthic water immediately above the bottom of the river. This investigation will be used in quantitative fate and transport modeling to evaluate the flux of constituents to the river and to assess risks to human and ecological receptors.

TVA has concluded that no comments were received that disclosed facts or considerations that indicate that the EE/CA is inappropriate, improper or inadequate. The EE/CA presents a range of alternatives and evaluates tradeoffs between them with respect to effectiveness, implementability, and cost evaluation criteria. Results of those evaluations are sufficient to support selection of a proposed action for the embayment restoration and Dredge Cell closure.

EE/CA Comments Received by email

- 1) As a board member of Bowling Green Municipal Utilities, it is my recommendation that the cleanup of Kingston be completed with all ash remaining onsite and non-hauled. This is clearly the most economical and beneficial for our customers and appears to be the most logical from the research and review that I have viewed.

Alex Nottmeier, CCIM, SIOR, Neal Turner Realty
1401 Scottsville Road, Bowling Green, KY 42104

TVA Response: TVA appreciates receiving your comment recommending that all ash remain onsite and non-hauled and will take your recommendation under consideration during selection of the preferred removal action.

- 2) To parties concerned, I personally feel the remaining coal ash be stored on an on-site storage facility. The steam plant has other areas safely stored and so do power plants all across the country. I feel TVA has done a remarkable job in the clean up procedures and I believe they will monitor their storage sites very closely in the future. Hauling the ash on the highways is a larger threat to the general public's welfare than storing it in a safe place.

Name withheld in confidence

TVA Response: TVA appreciates receiving your comment recommending that all ash be stored onsite in a safe place and be closely monitored and will take your recommendation under consideration during selection of the preferred removal action.

- 3) After reading and going over the options for ash removal or storage I would like to see alternate 3 put in place because of cost to customers as well as keeping the ash from the dangers of travel.

Name withheld in confidence

TVA Response: TVA appreciates receiving your comment recommending that Alternative 3 be put in place due to cost and travel dangers and will take your recommendation under consideration during selection of the preferred removal action.

- 4) This e-mail is in regards to the Kingston ash spill. I am strongly in favor of alternate 3. I think the ash should be stored on site. I think this is the best option environmentally and the most cost effective approach.

Rody Blevins, rblevins@vec.org

TVA Response: TVA appreciates receiving your comment recommending Alternative 3 (ash stored on site) as an environmentally sound and cost-effective approach and will take your recommendation under consideration during selection of the preferred removal action.

- 5) I reside in Kingston at 909 Neighborwood St. It is my input to utilize Alt. 3B for subject.

W. Scott Woodlee, Volunteer Energy Cooperative, www.vec.org
Decatur, TN

TVA Response: TVA appreciates receiving your comment recommending that Alternative 3 be utilized and will take your recommendation under consideration during selection of the preferred removal action.

- 6) My wife and I favor Alternative #1. However, we also favor the project taking four additional months and be accomplished 100% by rail. Not only are our roads not good enough for that much truck traffic but most of those trucks would not be from Roane County. Thank you.

William M. Griffin and Jean N. Griffin
741 Bowman Bend Road, Harriman, TN 37748

TVA Response: TVA appreciates receiving your comment recommending Alternative 1, with 100% shipment by rail due to road conditions and local economic considerations and will take your recommendation under consideration during selection of the preferred removal action.

- 7) None of the alternatives addresses the potential for leaching and contaminant transport by groundwater. As such, all of the alternatives fail to meet the first of the Removal Action Objectives (RAOs) of the Engineering Evaluation/Cost Analysis (EE/CA) that states “Minimize direct contact between ash material in the embayment and water flowing through the embayment area into Watts Bar Reservoir.” Research on surface water-groundwater interaction within the Conasauga Group on the nearby Oak Ridge Reservation has demonstrated a close linkage between surface water and shallow groundwater systems. Because of this, the term “...water flowing through...” must be interpreted as including the shallow groundwater system. No features of any of the alternatives address any aspect of groundwater monitoring or groundwater containment/treatment.
1. Characterization of the groundwater flow system at the Kingston coal ash site is totally inadequate. Therefore, the relative importance or non-importance of the groundwater exposure pathway for risk assessment is incomplete. Research at waste disposal areas on the nearby Oak Ridge Reservation underlain by the Conasauga Group (Melton Valley sites at ORNL and Bear Creek Valley sites at the Y-12 Plant) demonstrates that groundwater movement is strongly controlled by flow through fractures and is spatially anisotropic. Because of this, potential contaminant transport pathways are typically spatially restricted and cannot be adequately addressed without first identifying likely groundwater flowpaths. As such, data from sampling of surrounding wells is largely irrelevant to determining the potential nature and extent of any groundwater migration of coal ash contaminants unless such wells happen to be located and completed in the appropriate geologic formation and flowpaths. A coherent analysis of groundwater flow conditions at the Kingston coal ash site must be completed before the protectiveness and adequacy of any of the alternatives can be determined. Because of this, should one of the alternatives be implemented, it must be recognized that the action may not be fully protective of human and ecological health, and that additional, potentially substantive actions may be required.
 2. Inspection of the engineering drawings in the EE/CA suggests that all of the alternatives leave some amount of coal ash in contact with the groundwater. As such, the potential for long-term leaching of contaminants from the ash must be investigated. While the EE/CA and information provided at public meetings provide scattered information regarding this topic, no coherent analysis of the leaching characteristics of the Kingston coal ash has been presented to date. Until such an analysis is forthcoming, the protectiveness of the alternatives must be considered unproven. For example, because of the potential for significant partitioning of contaminants among the various components of the ash, a statistically robust sampling of the heterogeneity of the fly ash for TCLP leach testing must be considered in a technically defensible analysis of the leachability of Kingston coal ash.

3. All of the alternatives leave significant quantities of coal ash in place. As such, they amount to leaving potentially hazardous material in place, without complete treatment. While the final status of coal ash with respect to it being classified as a hazardous waste has not been made at this time, all alternatives must include provision for such a future determination.

Typical practices at RCRA and CERCLA sites for situations in which hazardous waste is left in place include at a minimum: (1) establishment of long-term monitoring programs to ensure adequate performance of the selected alternative; (2) establishment of a long-term management and operation fund, and mechanism to ensure proper maintenance of the remedy; (3) periodic review of the alternative and identification of a mechanism to implement contingency actions should the remedy be demonstrated to not be functioning as anticipated; and (4) posting of bond by the responsible party to ensure adequate funding to implement the previous steps.

4. As proposed, all alternatives only serve to mitigate the inhalation risk of the ash and prevent the catastrophic dam failure and any resultant spill in the future. It does not necessarily address the pathway of contaminant ingestion. The EE/CA uses the current maximum contaminant limit (MCL) for arsenic of 10 µg/L. Yet, data suggest that this MCL may not be protective of human health. In June of 2000, the EPA proposed an MCL for arsenic as low as 5 µg/L using their own data, as well as other credible data sets. However, in January 2001, the EPA promulgated the current standard of 10 µg/L based on a cost/benefit analysis. The EPA stated that it would be too costly for smaller utilities to treat groundwater to the lower arsenic level. With this in mind, a robust monitoring program by an independent (certainly not TVA, and perhaps not EPA) agency becomes increasingly important for the Kingston ash spill.

In summary, because all of the proposed alternatives leave coal ash waste in place and in hydrologic contact with the groundwater system, all of the alternatives are incomplete and should be rejected, as proposed, until substantive modifications are made. Minimum actions to be considered for addition to all of the alternatives in order to make them acceptable would include actions to address the issues raised in paragraphs 1 through 4 above.

Helen L. Haase, RPG, and C. Stephen Haase, PhD, RPG, helennsteve@highland.net
632 Catoosa Ridge Road, Rockwood, TN 37854

TVA Response: Closure of the Dredge Cell will further reduce the potential for migration of metals to groundwater. Please see the Introduction to this Responsiveness Summary.

In response to your specific comments: (1) Additional investigation is being planned as part of the river system Sampling and Analysis Plan; analysis of groundwater transport to the river system will be included in the EE/CA for the river system. This investigation will include paired piezometers and wells at multiple depths and hydrogeologic units (including the Conasauga shale bedrock) to provide quantitative modeling of groundwater flow. Additional monitoring of groundwater quality will also be conducted to address groundwater conditions vertically and laterally. Please note that, unlike sites on the Oak Ridge Reservation, groundwater beneath the former Dredge Cell and Ash Pond discharges directly to the Watts Bar Reservoir due to the presence of the Emory River and embayments surrounding the site. (2) It is correct that ash will remain onsite in contact with groundwater, as it has for 50 years. Additional investigation for the river system will include leaching tests and modeling

of the fate and transport through the ash and groundwater. Note that sampling of the ash has demonstrated that the ash is relatively homogenous, so that the partitioning of constituents can be appropriately modeled. (3) Results of TCLP testing of the ash have demonstrated that the ash is non-hazardous. TVA recognizes that on May 4, 2010, EPA published a proposed rule for coal combustion residuals, including coal ash. That proposed rule considers two possible options: one to regulate coal ash as special waste regulated under Subtitle C of RCRA, and the other to regulate it as non-hazardous waste under Subtitle D of RCRA. As neither option has been adopted and the rule has not been promulgated, TVA cannot speculate on what the final rule will require regarding classification of coal ash. Note that the fate and transport modeling to be conducted as part of the Sampling and Analysis for the river system does not depend on this classification status. (4) Please note that the human health risk assessment presented in the EE/CA did address ingestion of groundwater as a potential exposure pathway. Results of groundwater testing conducted since the ash spill have not shown exceedance of the MCL for arsenic of 10 ug/L. TVA cannot speculate on future changes in regulations regarding the promulgated MCL. Long-term post-closure care for the closed Dredge Cell and Ash Pond will be in accordance with TDEC rule 1200-1-7, which includes groundwater monitoring. TVA will be responsible for conducting and reporting the results of such monitoring to TDEC.

- 8) In regard to the three options laid out by TVA. I believe that option 2 or 3 would provide the best result for area residences. I am concerned that TVA is the ONLY agency deciding which option is the best. There should be a joint decision by EPA, Tennessee Wildlife Management, and the Health Department.

Name withheld in confidence

TVA Response: TVA appreciates receiving your comment recommending Alternative 2 or 3, and will take your recommendation under consideration during selection of the preferred removal action. Please note that, although TVA is the lead Federal agency, both EPA and TDEC are involved in deciding which option is preferred, and have been working jointly with TVA in this decision-making process.

- 9) Dear Local, State and Federal Regulators and Administrators: Thank you for your availability and responses at the public meeting at the Roane County High School last night. Confirming our public conversation in the question and answer period following the presentations, it is my understanding that air quality is a paramount consideration at the Kingston spill site because of the potential dangers to health of airborne coal ash. Leo Francendese elaborated at length about the extensive air quality monitoring systems and their backup systems which were used in a period when TVA failed to adequately provide air monitoring results. Steve McCracken with TVA described the multiple systems and practices in place to insure that coal ash particles do not become airborne. He also emphasized that TVA monitors air quality extensively and frequently at the Kingston spill site. Craig Zeller affirmed that if Alternative 3, on site disposal of the non-critical spill ash, were utilized, extensive air quality monitoring and preventive measures would be used to avoid airborne coal ash. When asked under what regulatory authority this monitoring and prevention was required, he answered EPA and CERCLA.

As Alternative 3 in dealing with the remaining spill ash is onsite storage of coal ash, this method would seem to share some characteristics with a coal ash landfill. When asked what TDEC air quality regulations would apply to a coal ash landfill in Tennessee, Quincy Stykes with TDEC responded that landfills in Tennessee monitor for methane, that the national ambient air quality requirements apply, and that there is a fugitive dust law.

As a property owner on Smith Mountain Road in Cumberland County, Tennessee where a coal ash landfill is proposed, I am concerned that air quality issues at coal ash landfills are not adequately regulated in Tennessee and that this should be a consideration of EPA, TVA, TDEC and health agencies. While exhaustive monitoring and prevention is taking place at Kingston with good results, and while considerations of scale do apply, there seems to be an absence of consideration of air quality issues when TVA ash is contracted off site for disposal. Among these considerations should be: a) appropriate siting of coal ash landfills, i.e. excluding windy sites such as near the top of Smith Mountain; extensive regulated monitoring of air quality and required preventive measures at a coal ash landfill; air quality monitoring on transportation routes.

In addition to air quality issues associated with offsite coal ash landfills, transportation method and safety are obvious and apparently unregulated concerns. For example, the eight miles of narrow winding roads to the proposed coal ash landfill near the top of Smith Mountain pose a significant hazard from accidents and spills as up to 600 (applied for) coal ash trucks daily wind their way up and down the mountain during all daylight hours six days a week for years without end.

Finally, TVA should begin to take continuing responsibility and liability for its waste product and not place that burden on communities which are often ill equipped to handle the complexity of the issue and the long term effects. Thank you all for your continuing communication with the public you serve. Your efforts are appreciated.

Flo Hopkins, Fhopkins851@gmail.com
581 Catoosa Ridge Rd, Rockwood, Tennessee 37854

TVA Response: TVA will continue to implement measures to monitor air quality and control fugitive dust emissions at the site, particularly during ash handling or landfilling activities. If the decision were to be made to dispose of the retrieved ash offsite, TVA would safely dispose of that ash in permitted landfills that are operated in accordance with their respective operating permits, as governed by the respective state's regulatory authority. Air quality regulations would be governed by that authority. Please note that transportation safety (accidents/spills) was evaluated in the EE/CA for those alternatives that would involve offsite disposal of the ash. TVA recognizes the concerns you have raised with respect to Smith Mountain and will only dispose of the ash retrieved under this non-time-critical removal action in an existing, permitted facility.

- 10) I would pick alternative-3B it is the only one that makes sense to me. I have lived here all life and the ash has been here for fifty years. The ash has no effect on me I am sixty three years old and live about 3/4 of a mile from the ash.

Name withheld in confidence

TVA Response: TVA appreciates receiving your comment recommending Alternative 3B, and will take your recommendation under consideration during selection of the preferred removal action.

- 11) I wish to provide my input on the EE/CA plan and the specific alternative I support for the remediation of the spill area. Alternative 3, with sub-option A or B certainly seems to make the most technological, ecological, and financial sense over the other alternatives from both a time to complete, transportation and cost perspective. Within alternative 3, I support sub-option B because it completes the remediation in a shorter time and lowers the estimated

cost \$50 million. Additionally, it lowers the height of the remaining closed cell to approximately 30 feet above the ground versus sub-option A which results in a height of 45 feet above the ground. As a long-time property tax paying resident of East Tennessee and a rate-payer on multiple TVA distributor accounts, I have a vested interest in the alternative chosen to complete the remediation. Consequently, I am making my selection based on all facets of the remediation and not just those that will promote a given social or political agenda. Completing the remediation using alternative 3B will not only return the area to its pre-spill condition, it will VASTLY improve it. Please consider my comments and my support for alternative 3B as you move forward.

Henry J Collins
236 Ivy Gate Lane, Knoxville, TN 37934

TVA Response: TVA appreciates receiving your comment recommending Alternative 3B because it completes the remediation in a shorter time, lower cost, and lower height. TVA will take your recommendation under consideration during selection of the preferred removal action.

- 12) This email is response to the request for public comment on the Non-Time-Critical Ash Removal. My choice for the ash removal would be Alternative 2.

James D. Gann
126 Indigo Bunting Dr., Harriman, TN 37748

TVA Response: TVA appreciates receiving your comment recommending Alternative 2 and will take your recommendation under consideration during selection of the preferred removal action.

- 13) The coal ash spill at the Kingston Steam Plant has changed the lives of many Roane Countians including me. I have been actively involved for over 14 months on two important committees which are working to help Roane County overcome the negative impact the ash spill has caused. Serving as vice chairman of the Roane County Advisory Group and also serving as a member of the Roane County Long Term Recovery Committee has given me a unique perspective of the views of residents all over the county and also those of the Swan Pond area. But today I am writing as a concerned member of this community and Roane County. I am very concerned with the long term effects the ash spill will have on Roane County. While I applaud the efforts that have been made to clean up the river I believe the only way for our county to come out from under the cloud which the ash spill has caused is for Roane County to be declared an “ash free” county. It is for this reason I am recommending Alternative 2 as the proper option to clean up the remainder of the ash spill.

This option will provide the following:

1. Reduced time of clean up because both rail and trucks will be used to transport the ash.
2. Transporting the ash by truck to Chestnut Ridge landfill will provide a much needed economic stimulus for Roane County. It is only right to allow Roane County to benefit from this tragedy because we are the ones who have suffered because of the spill.
3. Many merchants, including convenience stores, tire stores, auto parts stores and many others will benefit by the circulation of money in Roane County if Alternative 2 is chosen.

Finally this option will allow Roane County to be promoted as an “ASH FREE” county which will allow us to come out of this tragedy stronger than we were before. Allowing the ash to remain on site is an option that I and I believe most Roane Countians find unacceptable. As a lifelong and 6th generational Roane County and Swan Pond Community member I have a

personal and unique perspective of this tragedy. December 2008 changed and drastically altered the lives of many individuals and families, mine included. December 2008 changed and drastically altered the image and progress of Roane County. The only acceptable option is for Roane County to be able at the end of this tragedy to declare we are “ASH FREE”. It is for this reason I strongly recommend Alternative 2.

Randy Ellis
Harriman, TN

TVA Response: TVA appreciates receiving your comment recommending Alternative 2 and your support for the subalternative that includes use of both rail and truck hauling. TVA will take your recommendation under consideration during selection of the preferred removal action.

- 14) Currently we are hauling gravel for TVA. With the economy being the way that it is, we appreciate any and all work that is sent our way. We do a lot personally in Roane County. My family and I camp at Caney Creek Campground at least 6 times a year for at least 3 days at a time, sometimes more. We love it there, it is so beautiful. We also eat at all the area restaurants such as Cracker Barrel, Ruby Tuesday's, Gondolier, Shoney's and both of the Mexican restaurants. Also my family and I shop at the fresh produce market as well as Wal-Mart and surrounding stores. My wife's first car was also bought from there. We enjoy rides through Kingston on our motorcycle several times in the year. I also have family that owns a business there. My parents & brother's and their families live in Spring City, and 90% of their shopping is done in Roane County. We also buy our tires from Tim's Tires there in Coalmont. Roane County has a lot to offer us and my family and I spend a lot of our revenue there instead of where we live, which is in Dayton, TN. We really do appreciate and enjoy working and hauling gravel out of there. Also we have an excavating business and we do a lot of work in the Crystal Cove Sub-division as well as Eagle Furnace. As previously said we love to work in that area, and we do our best to make everyone happy with the jobs that we do. Again...thanks for all the work, we really do appreciate it and Roane County.

Name withheld in confidence

TVA Response: TVA appreciates receiving your comment and your support of Roane County.

- 15) I support alternative 3 that would leave the ash to be managed on-site. Thank you for the opportunity to comment.

Roger and Judy Carpenter
10512 Hwy 58 S., Decatur, TN 37322

TVA Response: TVA appreciates receiving your comment recommending Alternative 3 (that all ash be managed onsite) and will take your recommendation under consideration during selection of the preferred removal action.

- 16) With each day that goes by I have to face the unknown of this disaster - my family worries daily. The long term effects are unknown. Our once quiet safe life was turned upside down on 12-22-08 and has, to date not returned to normal. Please remove all this from our community. I ask that Alternative 2 be used to remove everything.

Sheila Steelman

TVA Response: TVA appreciates receiving your comment recommending Alternative 2 (that all ash be removed) and will take your recommendation under consideration during selection of the preferred removal action.

- 17) The coal ash spill at the Kingston Steam Plant has destroyed our lives and caused our homes to be unhealthy with the irritants that we now have to breath. My family and I live day to day wondering what the next day will bring. It has changed and destroyed my family's lives as well as the community we once called home. We are among many in this area that are forced to worry day to day as to what TVA has in store for our future. As a lifelong citizen of Roane County and a resident of what was once called Swan Pond Road I am very concerned with the long term effects the ash spill will have on us. Roane County and especially the Swan Pond Road area citizens feel the only way to be relieved from some of the stigma that has been placed upon it -is for TVA to remove all the ash from our area. Our community needs to be ash free. That is why we recommend Alternative 2 as the proper option.

Since this spill our community has been labeled as Fly Ash Rd – we no longer enjoy life here. We no longer have friends over for their fear of being near the ash as it is air borne. Again, this disaster has destroyed our lives and put fear in each person of the long term risks we are forced to face. We have been left behind to deal with this. Allowing ash to remain in this area is unacceptable. TVA may not see it this way because this is a more costly removal option, but we had no voice in the ash being deposited on us. I do hope we will, at the least, have a voice for which way it is removed.

Stephen Ellis

TVA Response: TVA appreciates receiving your comment recommending Alternative 2 (that all ash be removed) and will take your recommendation under consideration during selection of the preferred removal action. TVA recognizes your concern over long-term effects and will close the Dredge Cell and Ash Pond to reduce potential long-term risks of air-borne ash.

- 18) After reviewing all the options, it seems that a substantial amount of ash will be left regardless of the option chosen. I have heard a lot about an ash-free zone but in each case we will end up with over 10 million cubic yards of ash regardless of the option selected. Given the substantial amount of ash my comments will be directed to Mr. Kilgore's statement that TVA will make Roane County better than it was. Regardless of the option, I would like to see a significant effort taken by TVA to utilize local contractors in this clean up effort, including the hauling of the clay and topsoil for the capping off of whatever option is selected. I understand, due to the length of time and to the amount of cost involved in removing all the ash, why that option was taken off the table. However, I do hope that TVA will use a substantial portion of the savings that will result to make Roane County better, including capital enhancement for pools, community centers, senior centers and recreational parks to enhance the image of Roane County and to draw investors, new residents and economic development to our wonderful county. I would also like to see some money set aside in an economic development revolving loan fund that could be administered by the Foundation that has been established to assist individuals who would like to come and start businesses in Roane County, using local citizens. I think any of these options, falling short of an ash free zone, are acceptable. The savings realized of stopping short of an "ash free zone" should then be utilized to help not only the restoration of the water but the restoration of the economy of Roane County.

Responsiveness Summary – Embayment/Dredge Cell EE/CA

Mike Farmer, Roane County Executive

TVA Response: It is correct that ash will remain onsite regardless of the option selected. TVA appreciates receiving your comment recommending use of local contractors in the cleanup effort, including material hauling. TVA will continue to support the Roane County community.

19) As a member of the Roane County Long Term Recovery Committee, I would like to give a few comments on the EE/CA documents. I have considered the different alternatives for the non-time-critical ash removal and would support alternative 3B for several reasons.

It is lowest cost approach and would have the least impact on the electric rate payers in the region. It has the least off site traffic and would be less likely to have traffic related issues.

The final dredge cell height is 790 ft. above sea level, which is the same or less than all the other options except the most expensive (and I assume least likely) alternative 2. By choosing the lowest cost alternative for the actual ash removal process it should make other indirect projects easier to fund. Indirect project requests I would make concerning the clean up would be:

- Sports facilities be provided at some location. This could be accomplished by using some of the land acquired for the cleanup if needed. The area off Berkshire Lane, the Sams Farm, or some land off Swan Pond Road comes to mind. If an area other than the ash cell would allow night lighting, this would be preferred.
- A park type area could be developed around the lake shoreline where possible. This could include the Swan Pond embayment and the area between the ash cell and the Emory River. Walking and bike trails, along with fishing access and parking could be included.
- A deep water boat launch should be constructed in the area. Right now the closest boat launch is at the Kingston Plant near the interstate on the Clinch River. The fisherman in the Swan Pond Circle area would appreciate a good launch facility.
- Fishing access to the skimmer wall area should be developed. Just as the water discharge from the plant provides good fishing, the water intake area does too. In the past access to this area was limited and restricted.
- TVA could work with TWRA to look at wildlife and/or waterfowl refuge potentials for the area. If the ash cell is covered with one foot of topsoil it could be planted and managed with wildlife in mind.
- TVA should also provide fish habitat improvements in the area. This should include both the main channel of the Emory River and also the bays and coves in the area.
- There will be a considerable amount of rock and gravel not needed on the site as the clean up progresses. This could be donated to the county and surrounding cities for any projects that would need rock and gravel.
- Some of the surplus rock and gravel could be used to build a road overpass of the train tracks on Swan Pond Road. The local residents would benefit greatly by having an overpass that would eliminate the railroad crossing. The rail crossing is a safety issue for the area because emergency vehicles can get stopped by train traffic.
- If there are educational and research opportunities related to the ash storage area, these should be considered and plans included in the design to make these possible.

Thank you,
Mark E. Hall

TVA Response: TVA appreciates receiving your comment recommending Alternative 3B (due to its lower cost and lower impact on ratepayers, lower traffic impact, and lower height).

TVA will take your recommendation under consideration during selection of the preferred removal action. TVA will continue to support the Roane County community.

- 20) My name is Lauren Wilson. I am a resident of Harriman. I recently relocated here from Crossville. Although I previously lived in Roane County for approximately eight years during my childhood. My concern is that the relocation of the ash to a facility off site is only going to elongate the reach of contamination. What assurance does the public have that the mistakes previously made by TVA resulting in this multi-million dollar travesty doesn't repeat itself. After years of waste and "accidental" contamination in the Roane Co. area, not restricted to local waterways and real estate, why encourage the same defecation of other untouched regions. It is your responsibility to ensure the safety of the public, wildlife, and nature surrounding the areas you inhabit with your multi-million dollar facilities. Take responsibility for your actions and resolve this in a manner suitable for your loved ones, for your communities.

Lauren Wilson

TVA Response: TVA appreciates your concern regarding relocation of ash to an offsite facility that is not impacted by ash and will take your concern under consideration during selection of the preferred removal action. TVA accepts responsibility for the safety of public and environment surrounding TVA facilities and the communities in which they are located.

- 21) Please remove all use alternative 2. This is my request for our communities' future please remove it all.

James Steelman
Harriman, TN 37748

TVA Response: TVA appreciates receiving your comment recommending Alternative 2 and will take your recommendation under consideration during selection of the preferred removal action. Please note that none of the options call for removal of all the ash at Kingston.

- 22) I live on the Emory River, just above the Kingston Coal Fired Power Plant, and I am submitting my comments on the EE/CA. My family and I feel that the best action for TVA to take would be to make some plans to store all ash locally - I believe it is irresponsible to transport ash, that may be hazardous waste, to other communities and leave it for them to deal with. It not only harms other communities, but it can't help but leave a trail of detritus all along its wake, whether it be trucked or sent by rail. And we've already seen problems with the landfill in Alabama that may not have been as prepared for it as they thought they were. Not only that, but constant shifting of the ash from lake to drying ponds to piles to railroad cars does nothing but add to local air-borne pollution. Moving it fewer times seems to be a more environmentally responsible solution. However, I don't believe that Option 3, as it stands now, will "make us whole" or "make us better than we were." TVA/EPA personnel have admitted that with the current plan, there will still be both rainwater and river water leaching through the planned landfill, and it has nowhere to go but into the Emory River. This is unacceptable. Adding ANY amount of pollution to the already distressed waterway should NOT an option. The only way to do this in my opinion would be to fully line the storage area so that no ground water, rain water or lake water could seep through to carry off additional pollution. Please, wherever the recovered ash is to be stored, it MUST be dealt with properly and in accordance with modern science, knowledge and laws.

Joni Morgan
385 Emory River Rd.

TVA Response: TVA appreciates receiving your comment recommending that all ash be stored locally to avoid hazards during transport, to avoid problems at offsite landfills unable to properly manage the ash, and to minimize ash handling on-site to reduce potential for airborne ash. TVA will take your recommendation under consideration during selection of the preferred removal action.

Because there is no identified groundwater contamination or groundwater plume associated with the former Dredge Cell or Ash Pond, metals do not readily leach from the ash, and hydrostratigraphic conditions impede metal migration, no liner or leachate collection system is warranted to protect human health or the environment. Please see the Introduction to this Responsiveness Summary. Additional investigation is being planned as part of the river system Sampling and Analysis Plan that will include modeling of rainwater percolation, leaching, and groundwater flow into the Emory River. Because the existing Dredge Cell is up to 40 ft deep, placement of a liner and leachate collection system beneath the ash that was placed more than 50 years ago is not practical. Placement of a liner on top of that ash would not be effective, since ash would remain below the water table.

- 23) I want alternative 2 completed.
Don Simon

TVA Response: TVA appreciates receiving your comment recommending Alternative 2 and will take your recommendation under consideration during selection of the preferred removal action.

- 24) I think that on-site storage would have less impact on the environment and wholesale power rates. TVA owns the property and they have security established in the area. I feel that alternative three is the best route to take. Thank you for the opportunity to comment.
Clyde Jolley

TVA Response: TVA appreciates receiving your comment recommending that all ash be stored on-site to avoid impact on the environment or power rates. TVA will take your recommendation under consideration during selection of the preferred removal action.

- 25) I request that Alternative 2 be used to remove the ash from Swan Pond Community. We need all the ash removed to remove all the dangers it can cause. Thank You.
Cathy Randolph
Harriman, TN 37748

TVA Response: TVA appreciates receiving your comment recommending Alternative 2 (that all ash be removed) and will take your recommendation under consideration during selection of the preferred removal action.

- 26) I would like to see all the ash removed from this area. Not only have the ash removed that spilled from the broken dike, but also all ash remaining on the site. I see no other way for this community to recover into a desirable place to live. This would remove doubt of health and safety concerns. Any ash that is left could taint the waters of the Emory and Watts Bar Lake for many, many years to come. The citizens left in the Swan Pond area need all ash removed to allow us to recover from health concerns and property value devastation. Further, when the Berkshire slough and Swan Pond Embayments are restored there should

be added improvements to make this area attractive. Please consider adding the following improvements:

- widening of Swan Pond Circle Road between Berkshire slough and Swan Pond Embayment. The original road was very narrow, just allowing two way traffic. Fishermen often parked along the roadside.
- adding a parking area for the recreational functions at the area. Previously fisherman often parked along the roadside creating dangerous conditions for vehicle traffic.
- adding a dock to ease the above condition and create safe access
- add walking and biking trails, and benches throughout the restored areas in these two locations and other nearby spots.
- add a community center facility and recreation area for children ABOVE and BEYOND ball fields.

Thanks for your consideration of these requests. Please contact me if clarification or additional details are needed.

Cathy Willis

TVA Response: TVA appreciates receiving your comment recommending that all ash be removed. Please note that none of the options call for removal of all the ash at Kingston.

. TVA will continue to support the Roane County community and will consider the improvements mentioned.

27) My name is Mark Longmire, and I am a resident of Anderson County. Although I own my own excavation business, I am also a sub-hauler for Alliance Hauling. The ash spill at Kingston was a disaster that everyone wishes never happened. The economy has slowed and so has the work that I had been doing, but I am thankful that I have been able to pick up some work by hauling rock to the Kingston site. I don't know how many loads of rock have been hauled or how many from each quarry, but I would estimate more than 35,000 loads—maybe even double that amount. I have not heard of any accidents involving dump trucks. I have driven on roads around the plant and roads between the plant and rock quarry and have not noticed any noticeable damage to the roads. The drivers that I see when I haul seem to be very safe and skillful drivers. I know TVA wants to finish the clean up using the cheapest methods possible. I also know that whatever it costs will eventually be passed on to the users of TVA electricity. If a portion of the remaining ash needs to be removed from the site, I would like for TVA to consider the cost difference between rail cars and trucks. I don't know which is more cost effective. I do hope that if trucking is cheaper that TVA will not allow those who are opposed to hauling it with trucks affect their decision—especially since we, the electricity users, will eventually pay for it.

I think the Alliance truckers have proven themselves to be very safe and would do a good job. I know that a lot of people would think that I am thinking of myself. That would be true, but if the ash were hauled in trucks I think it would put a lot of money in the economy in this area. Maybe some people have jobs that have not been affected by the economy. I know some of these people, and I am glad they have not been affected. However, a lot of others, including me, have been affected. Hauling with trucks would mean a lot of money would be spent at local businesses, such as gas stations, fast food restaurants, parts stores. But movie theaters, clothing stores, and many other stores that provide goods and services that might not be considered necessities during this slow economy would also benefit.

Most of what I have written is my opinion, but the economy in this area is slow, and that is a fact. Any money that could be put into it would be a big help. I hope you will consider this as you make decisions concerning the removal of ash from the Kingston spill.

Mark Longmire

TVA Response: TVA appreciates receiving your comment recommending that if the ash were to be removed offsite, then truck hauling should be implemented as the cheaper option and as a support of the local economy.

28) This disaster took my lifelong residence in the Swan Pond Community and destroyed it. Yes I did choose to live in this community knowing that TVA was here. But, with my lack of knowledge on coal processing and storage, and with TVA being an agency that is not forthcoming with how their storage process of burnt coal is done I now know the dangers we have faced without our knowledge. With that said I request that Alternative 2 be the effort made by TVA to remove all these environmental dangers from this community. Yes I am very concerned about the long term health effects that have already been forced upon us and if this is left in the community we will be the ones forced to experience what any unknown effects will be to us. We had no voice in the deposit of this in our community so I pray we have a big voice (more so than others in Roane County) because we will be the ones dealing with the day to day and the long term unknown effects if it is left here. Please implement Alternative 2 and remove this from our once safe neighborhood.

Phyllis Ellis
Harriman, TN

TVA Response: TVA appreciates receiving your comment recommending Alternative 2 and will take your recommendation under consideration during selection of the preferred removal action. Please note that none of the options call for removal of all the ash at Kingston. TVA recognizes your concern over long-term effects and will close the Dredge Cell and Ash Pond to reduce potential long-term risks. In addition, TVA will continue to investigate the potential risks to human health and the environment associated with the river system, as part of the future river system EE/CA.

29) I live on the Clinch River, just across from the Kingston Coal Fired Power Plant, and I am submitting my comments on the EE/CA. I don't believe that Option 3 will "make us whole" or even "make us better than we were." There must be an impermeable liner between the stored ash and the surrounding environment. Protecting the surrounding land and waterways with an impermeable liner is required by law in many circumstances and is broadly accepted by the environmental science community as the best available option today. TVA/EPA personnel have admitted that with the current plan there will still be both rainwater and river water leaching through the planned landfill, and it has nowhere to go but into the surrounding waterways, like the Clinch and Emory Rivers. This is unacceptable. Adding ANY amount of pollution to the already distressed waterway is NOT an option. The ash must be stored properly. There has already been one disaster from improper storage, it is not prudent to continue taking short cuts. Proper storage is accomplished with an impermeable liner so that no ground water, rain water or lake water could seep through to carry off additional pollution. Please, it only makes sense to store the ash in accordance with current science, knowledge and laws. Any future storage of the ash must be in a facility with an impermeable liner.

Wendy Schneider, Paul Schneider, and Karin Schneider
326 Peninsula Road, Harriman, TN 37748

TVA Response: TVA appreciates receiving your comment recommending that an impermeable liner be provided between the stored ash and the environment. Please see the Introduction to this Responsiveness Summary. Additional investigation is being planned as part of the river system Sampling and Analysis Plan that will include modeling of

rainwater percolation, leaching, and groundwater flow into the Emory River. Because the existing Dredge Cell is up to 40 ft deep, placement of a liner and leachate collection system beneath the ash that was placed more than 50 years ago is not practical. Placement of a liner on top of that ash would not be effective, since ash would remain below the water table.

- 30) I have given a great deal of thought to the options presented for us to comment on. My personal feelings on the recovery project are based on fifteen months of meetings, phone calls, public gatherings, articles I have read, programs I have seen, etc. Having several different roles in this endeavor has given me a great deal of insight along with an even greater sense of responsibility. Choosing an option does not end our responsibility; how that option is carried out will be just as important to our community. I have made public statements that I am in favor of not transporting all of the material to other sites. It has been with us for decades with no problem until December 22, 2008 and if handled properly, I think it can stay with us for decades in the future in the Kingston Fossil Plant area. I have complete confidence that it will be handled properly.

Having said that, I lean towards the options that do not transport the material to other sites. I would strongly urge that the decision makers make continuing beneficial reuse of the area impacted by the spill as the strongest factor (after Health and Safety) in the formula they develop. We must take into consideration this decision will have an effect on this community for years to come. Creating something that can not only be used in a beneficial way, but that we can be proud of, will serve all of us well. With an option that does not remove all the material I think the opportunity is there to put some of the cost savings into maintaining the area well into the future. Thank you for your consideration,

Troy Beets,
Mayor, City of Kingston -
Chair, Roane County Commission -
Member, Long Term Recovery Committee -
Chair, Roane County Economic Development Foundation

TVA Response: TVA appreciates receiving your comment recommending that ash not be transported to other sites, but handled properly onsite, and will take your recommendation under consideration during selection of the preferred removal action. TVA will continue to support the Roane County community and will consider the improvements for beneficial reuse mentioned.

- 31) My vote/opinion for the ECA is to remove all ash from the embayments and haul it out of Roane County. Whatever is left in the old cell can be left, leveled and capped with topsoil. However, I would not be opposed to moving the ash in the embayments to the old cell, leveled and capped either. Either way will save TVA substantial money and I believe the future design of the new cell will be 100% safe. If either of these choices are taken I would like to see the TVA invest a sizable “donation” to the residents of Swan Pond in the form of ballparks, athletic facility, pool etc. For the amount of savings and what has transpired there I think it would be a wise move, not to mention it will help raise the resale value of the homes in that area that the TVA will eventually put back on the market. This will aid in the resale through auction or traditional resale process and help recover much of the money spent acquiring those homes.

Chris Mason

TVA Response: TVA appreciates receiving your comment recommending that ash from the embayment either be removed from Roane County or be moved to the old cell and that the

ash remaining in the cell be capped with topsoil. TVA will take your recommendation under consideration during selection of the preferred removal action. TVA will continue to support the Roane County community and will consider the improvements mentioned and impact on home values.

- 32) I live on the Clinch River, just across from the Kingston Coal Fired Power Plant, and I am submitting my comments on the EE/CA because I am concerned that the three options currently being considered for ash removal and storage do not present adequate resolutions for the situation. None of the three options provide for storage in lined landfills, as is recommended by the EPA and now required by law in many circumstances. It would be irresponsible and shortsighted for the TVA not to take this opportunity to implement the best available technology in order to protect the health of residents and the surrounding environment. Unlined storage areas allow for leaching of rain and river water through the landfills and into the Emory River. It is unacceptable that any amount of pollution be allowed to leach into the already polluted river. All ash recovered, and new ash produced, should be stored only in lined landfills.

Dale Strasser, Ann VanSlyke, Emily Strasser, Kurt Strasser, and Jane Strasser
326 Ninsula Road, Harriman, TN 37748

TVA Response: TVA appreciates receiving your comment recommending that a lined landfill be provided for the stored ash. Please see the Introduction to this Responsiveness Summary. Because the existing Dredge Cell is up to 40 ft deep, placement of a liner and leachate collection system beneath the ash that was placed more than 50 years ago is not practical. Placement of a liner on top of that ash would not be effective, since ash would remain below the water table. Building of a new lined landfill in the area would not be implementable in a reasonable time frame, although TVA is studying such an option for management of new ash produced from the Kingston Fossil Fuel Plant in the future.

EE/CA COMMENTS FROM THE ROANE COUNTY ENVIRONMENTAL REVIEW BOARD

The Roane County Environmental Review Board (RCERB) exists in an advisory role reporting to the Roane County Executive. The RCERB's purpose is to identify environmental issues and recommend plans and programs to the appropriate organizations for the promotion and conservation of the natural resources and for the protection and the improvement of the quality of the environment with the objective of ensuring the protection of public health and safety, visual acceptability and long term human habitability within Roane County; and advises the appropriate personnel and governmental agencies, including, but not limited to, the County Executive, County Commission, county planning commission, local planning commissions, industrial development boards and recreation and park boards. The RCERB has reviewed the subject EE/CA documents and is hereby submitting the following comments. This opportunity to participate in this decision is appreciated.

The RCERB
Frank Kornegay, Chairman
Gail Okulczyk, Vice Chair
Minna Andriulli
Robert Capell
Robert Davis
Bruce Kimmel
Mary Anne Koltowich
David Reichle

1. Overall, the base document does a good job with background information, summary of contaminant data, risk evaluations, and alternatives evaluation.

TVA Response: TVA appreciates the comment.

2. TVA has a responsibility to restore wetlands damaged by the ash spill. While there is federal statute to require wetlands restoration, there is none *per se* to cover riparian habitat. The Roane County Environmental Review Board (RCERB) encourages TVA and EPA to take a progressive approach and include mitigation of both riparian habitat and wetland losses in these plans. Riparian habitat was a major ecological feature impacted by the ash spill and a critical resource in the Emory watershed. RCERB encourages TVA/EPA to secure expert advice and assistance from state and national organizations with experience in wetlands mitigation to guide a suitable restoration program focused in the Emory Watershed.

TVA Response: As described in Appendix D of the EE/CA, TVA's conceptual plan for the embayment restoration would restore a complex mosaic of forested, scrub-shrub, and emergent wetland plant communities. This plan therefore would cover the riparian habitat. TVA has secured expert advice from state and national organizations and ecological consultants as part of a Technical Working Group addressing investigation, assessment, and restoration of the river system. Detailed designs for the restoration of Swan Pond Embayment will be prepared prior to construction.

3. Page x of the base document, Alternative 3 paragraph, next to last sentence: Suspected typo: "...lower height of closed cell to 390 ft msl." Should be "...to 790 ft msl."

TVA Response: Correct, 790 ft msl. TVA regrets the typographical error.

4. All three alternatives evaluated would fully meet stated requirements for the Remedial Action Objectives.

TVA Response: Correct, all three alternatives would fully meet the RAOs.

5. Information presented in Table 4-1, Summary of Comparative Analysis of Alternatives, suggests that Alternative 1 should be the preferred alternative in that it involves a smaller volume of ash to be shipped off-site (capacity for off-site disposal is more feasible than for Alternative 2), a moderate volume of ash to remain on site requiring stabilization and management, and an intermediate cost relative to Alternatives 2 and 3.

TVA Response: Table 4-1 is not meant to suggest a preference for any alternative, but to summarize differences or tradeoffs between them. It is correct that Alternative 1 would involve a smaller volume of ash to be shipped offsite relative to Alternative 2, but Alternative 2 would involve a much greater volume of ash to be shipped offsite relative to Alternative 3. It is correct that Alternative 1 would result in volume of ash remaining onsite intermediate between the other 2 alternatives and would result in cost intermediate between the other 2 alternatives.

6. Avoiding disposal and transportation costs and impacts and achieving lower cost in Alternative 3 are, unfortunately, offset by the necessity of retaining, stabilizing and long-term management of the entire ash volume on site.

TVA Response: TVA appreciates receiving your comment suggesting that the lower disposal and transportation costs and impacts would be offset by the retaining, stabilizing, and long-term management of the ash on site. Please note that the costs of Alternative 3 reflect the cost of retaining and stabilizing the greater volume of ash in storage. Note also that all three alternatives include the cost of management of the ash on site.

7. Alternative 1b and 2b include the transport and disposal of 990,000 cubic yards offsite using trucks. It is not evident these options fully evaluate the risks and impacts of 35,000 100-mile round trips. Movements on the order of 3.5 million truck-miles are likely to result in serious accidents, significant damage to roads that are not mitigated by current road taxes, increases in air pollutants as a result of the truck travel, increased risks of ash spillage due to a truck accident, and significantly greater consumption of fuel than alternatives that rely exclusively on rail for off-site transport. For these reasons, neither Alternative 1b nor 2b should be considered.

TVA Response: TVA appreciates receiving your comment recommending that neither Alternative 1b nor 2b be considered, due to the greater risks (accidents, spills, and air quality), damage to roadways, and fuel consumption as a result of truck hauling.

8. Although each of the three alternatives leave a substantial amount of ash on site permanently, the trade-offs between amounts of ash removed and disposed of elsewhere are identified.

TVA Response: Correct, the trade-offs are identified.

9. A balance between costs and impacts of ash movement versus the impacts of amount of materials remaining on-site is the critical consideration. Assuming that the enhanced stability for the dikes works as planned, and the clay caps over the roughly 240-acre ash cell

adequately address infiltration, it appears Alternative 3 would have the least impact on ratepayers while maintaining an acceptable impact to Roane County. The height of the reclaimed ash pile is, to a first approximation, the key difference between the options.

TVA Response: Correct, Alternative 3 would have lower capital costs; the height of the closed Dredge Cell is a key difference between the options, because it affects the amount of conceptual foundation improvements needed.

10. If the significantly larger remaining ash volume is thought to be a significant impediment to Roane County's recovery from the ash spill, then Option 1, with no off-site movement of ash by truck, strikes the better balance between options 1 and 2.

TVA Response: TVA appreciates receiving your comment recommending that Alternative 1a be selected over Alternative 2a, if the remaining ash volume is thought to significantly impede Roane County's recovery from the ash spill. However, TVA does not consider the relative difference in volume remaining onsite to significantly affect the County's recovery, since closure of the Dredge Cell will be similar under all three alternatives.

11. The RCERB recommends that Alternative 1a be the chosen option for the Non-time Critical Cleanup for Restoration of the TVA Kingston Site.

TVA Response: TVA appreciates receiving your comment recommending Alternative 1a, and will take your recommendation under consideration during selection of the preferred removal action.

EE/CA COMMENTS FROM THE ROANE COUNTY COMMUNITY ADVISORY GROUP

The Roane County Community Advisory Group (RCCAG) is pleased to submit our comments to the Kingston Ash Spill Non Time-Critical Engineering Evaluation / Cost Analysis (EE/CA). Our detailed comments are compiled in a spreadsheet attached to this letter. In addition to our attached comments, the RCCAG would like to emphasize that we find the EE/CA incomplete and the three proposed alternatives unacceptable for the following reasons.

- A complete identification and analysis of all technically feasible alternatives has not been performed.
- A project-specific risk assessment addressing all risks associated with all alternatives was not prepared. Aspects that should have been more thoroughly addressed include transportation risk, including an assessment of the impact of the increase of all types of vehicular traffic to local residents, including large vehicles and heavy earth-moving equipment.
- An analysis of the impacts of groundwater flow and fluxuating lake levels on the ash left in the ground in the Dredge Cell and its affect to the environment and human health has not been performed.
- Isolation of the ash (with a liner and leachate collection) from the waters of the Emory River and Watts Bar Lake has not been included in any alternative.

With the understanding and inclusion of the above comments as part of our response to the Kingston Ash Spill Non Time-Critical EE/CA, we do support the development of alternatives that maximize the amount of ash removed, including development of an alternative to remove all ash to native soils and shipping all ash to off-site disposal locations. We do not support any alternative that leaves ash on site in a configuration that does not meet the requirements for construction of a new hazardous waste landfill, including hydraulic isolation (at a minimum, a liner with leachate control) of the closed Dredge Cell from the Emory River and Watts Bar Lake.

We believe a more robust analysis of all alternatives will lead to the development of a technically defensible EE/CA and the selection of a preferred alternative that protects the human health of local residents and users of the Emory River and Watts Bar Lake, and the environment. Additionally, the preferred alternative should protect and enhance the economic value of all Roane County property owners and, at a minimum, provide the same protection as would be required for disposal of similar hazardous material in any other location in the United States.

Thank you for your time and attention. We look forward to receiving your responses and discussing them with you.

Sincerely,
Brenda Timm, Chairperson
Roane County Community Advisory Committee

Roane County Community Advisory Group Specific Comments:

1. General: Suggest figures follow their references in the document so the document is easier to follow. Doing so will increase a reader's ability to find referenced figures. Also, the electronic references are linked incorrectly to wrong figures.

TVA Response: Figures are presented at the end of the text for easier reference.

2. Executive Summary: According to the Engineering Evaluation/Cost Analysis Annotated Outline, the executive summary must be printed on blue paper. The reviewer understands

that it is impossible to show this in the review cycle, however, this comment just serves as a reminder.

TVA Response: CERCLA does not require that the EE/CA Executive Summary be prepared on blue paper.

3. Page iii: The title of Figure 4 on the "List of Figures" is inconsistent with the actual title on Figure 4. It should read "Hydrogeologic Features of the KIF Site".

TVA Response: TVA regrets the typographic error.

4. The title of Figure 11 on the "List of Figures" is inconsistent with the actual title on Figure 11. It should read "Dredge Cell/Embayment Area Perimeter Improvements". Ref: Page iii

TVA Response: TVA regrets the typographic error.

5. Pg. vii, 5th paragraph; page 4, Sec. 1.1.7, 2nd paragraph: These two parts of the document discuss the upward groundwater gradients near the river and on page 4 correlation coefficients are listed. There are no tables or figures that support this information. Include a figure (graph) showing screen depth vs. potentiometric level (actual data rather than conceptual).

Question 1: How many wells were used for the analysis?

Question 2: The correlation may be good but what is the slope of the regression line?

TVA Response: Five wells at the Dredge Cell and six in the gypsum pond area were used in the analysis; the slope of the regression line for the Dredge Cell area is 0.48 and for the gypsum pond area is 0.04. The correlations were made using results from the existing wells at the Dredge Cell and gypsum pond sites to provide a conceptual model of site hydrogeologic conditions. Additional investigation is being planned as part of the river system Sampling and Analysis Plan that will include paired piezometers and wells at multiple depths and hydrogeologic units to provide quantitative modeling of groundwater flow.

6. Pg. vii, 5th paragraph; page 4, Sec. 1.1.7, 1st paragraph: This section states that groundwater moves from upland areas to stream valleys, ultimately discharging to the Emory River. The last sentence of the 1st paragraph in Section 1.1.7 states that it is "likely" that shallow groundwater on the dredge cell site discharges directly to the Emory River. That implies there is potential that groundwater may be forced downward into the bedrock (depending on potentiometric head in the dredge cell) or laterally down gradient (in the alluvial materials) for some distance before discharging to the river. Any groundwater monitoring program needs to be developed so that it is adequate to address these potential migration pathways effectively.

TVA Response: Additional investigation is being planned as part of the river system Sampling and Analysis Plan that will include paired piezometers and wells at multiple depths and hydrogeologic units to provide quantitative modeling of groundwater flow. Additional monitoring of groundwater quality will also be conducted to address groundwater conditions vertically and laterally.

7. Pg. viii, 2nd paragraph: This paragraph states that two monitoring wells were destroyed although one was replaced. Were the two wells removed (with the void being grouted) or do

they remain in an inoperable condition? Depending on their condition if left in place, they may act as preferred conduits for contaminant migration.

TVA Response: Please note that the wells were destroyed as part of the ash release and cannot be relocated. Note also that they were previously located at the perimeter of the cell, and will therefore be incorporated into any permanent perimeter containment system.

8. Pg. ix, RAOs: Although the risk assessment indicates a potential future groundwater risk, there are no remedial action objectives that address contaminant migration from the closed dredge cell to the river. This risk needs to be fully analyzed in this Non Time-Critical EE/CA.

TVA Response: The RAOs were developed to be consistent with the Administrative Order on Consent. Additional groundwater investigation is being planned as part of the river system Sampling and Analysis Plan that will include modeling of groundwater transport and evaluation of potential future risk due to exposure to groundwater.

9. Page x, 3rd bullet: The bullet which begins with "several options" should include the response to a no-action option since the Annotated Outline states its inclusion in the EE/CA. The reviewer suggests rewording the second sentence to "Those options included no action, leaving all materials within the embayment....." In addition, add TVA's response detailed in the comment summation "The no action alternative has been specifically rejected by TDEC and EPA because it violates the requirements of both the TDEC Commissioner's Order and the EPA Administrative Order on Consent" to the end of the bullet.

TVA Response: Please note that an option leaving materials in the embayment was considered, but rejected; a no action alternative has been specifically rejected by TDEC and EPA for the reasons cited. CERCLA does not require the evaluation of a no action alternative for a Removal Action.

10. Pg. xii, 5th paragraph: The transportation risks for Alternative 1 (2 rail injuries and 0.9 rail fatalities) do not agree with the risks presented on page 67 (last paragraph).

TVA Response: Agree. TVA regrets the typographical error. For Alternative 1a, transportation risks are estimated at 1 rail accident, 0.8 rail injuries, and 0.4 rail fatalities.

11. Pg. 4, Sec. 1.1.7, 3rd para.: This section states that any ash-related constituents entering shallow groundwater beneath the affected area would be transported a short distance to local streams. This seepage has presumably been occurring (with respect to the Ash Pond and Dredge Cell) for approximately 50 years.

Question 1: Has monitoring been adequate, with respect to groundwater or surface water seepage, to detect contaminants migrating into the river?

Question 2: Will future monitoring (groundwater and surface water) be upgraded to do a better job monitoring these impacts?

TVA Response: Historical monitoring has included wells at multiple depths surrounding the Dredge Cell and Ash Pond area, and has therefore been adequate to detect contaminants migrating to the river. Additional investigation is being planned as part of the river system Sampling and Analysis Plan that will include paired piezometers and wells at multiple depths and hydrogeologic units to provide quantitative modeling of groundwater flow. Additional monitoring of groundwater quality will also be conducted to address groundwater conditions vertically and laterally.

12. Ref: Pg. 4, Section 1.1.7, 1st paragraph and Figure 5: The conceptual groundwater model (Figure 5) does not seem to account for the potential for groundwater migration along bedding planes or fractures that are possible in the underlying bedrock. Hydraulic conductivity along bedding planes and fractures will be higher than that perpendicular to bedding planes. In addition, these features may allow groundwater to move laterally downgradient prior to entering the river. Please revise the conceptual groundwater model to account for the possibility of groundwater migration in this manner.

TVA Response: Additional investigation is being planned as part of the river system Sampling and Analysis Plan that will include paired piezometers and wells at multiple depths and hydrogeologic units to provide quantitative modeling of groundwater flow. This modeling will consider hydraulic conductivity, bedding planes and fractures as they may affect groundwater flow. The conceptual groundwater model will be revised at that time to indicate bedrock flow pathways.

13. Page 6, Section 1.2, 3rd paragraph: Change "Sluice Ditch" to "Sluice Trench" in the second sentence to be consistent with Figure 3.

TVA Response: TVA will attempt to use Sluice Trench as consistent terminology.

14. Sec 1.3: Question 1. Was geochemical modeling considered or performed to evaluate the conditions beneath the ash disposal areas and how those conditions might affect the migration of metals or how the ash may alter the geochemical conditions over time?
Comment 1: Suggest the analysis is not complete without performing this modeling.

TVA Response: Additional investigation is being planned as part of the river system Sampling and Analysis Plan that will include paired piezometers and wells at multiple depths and hydrogeologic units to provide quantitative modeling of groundwater flow. This will include geochemical modeling of fate and transport of metals over time. TVA will be assessing the geochemical conditions and conducting additional leach/column tests based on recommendations from EPA's National Risk Management Research Laboratory (Groundwater and Ecosystem Restoration Division) in Ada, Oklahoma.

The analysis of groundwater transport to the river system will be evaluated as part of the river system EE/CA. Closure of the Dredge Cell will reduce the potential for migration of metals to groundwater and construction of the perimeter foundation stabilization zone will reduce groundwater flow through the site. Please see the Introduction to this Responsiveness Summary.

15. Page 6, Section 1.3.1, 2nd paragraph: Add "(Figure 6)" to describe sample locations after (locations PR-1 through PR-4 and PR-7 through PR-10). This is mentioned in the 3rd paragraph. The reviewer recommends moving it to the 2nd paragraph for clarification.

TVA Response: As indicated in the comment, sample locations are shown on Figure 6.

16. Pg. 13, Sec. 1.3.3, last para.: This paragraph states that the flux of constituents in groundwater could conceivably impact the river system.

Question 1: If the future hydrogeological assessment determines that to be the case, how will that affect the decision made in the current EE/CA regarding the dredge cell and Ash Pond?

Question 2: Won't modification to the Non Time-Critical EE/CA be needed to address groundwater migration from the closed dredge cell?

TVA Response: Additional investigation is being planned as part of the river system Sampling and Analysis Plan; analysis of groundwater transport to the river system will be included in the EE/CA for the river system. Closure of the Dredge Cell will reduce the potential for migration of metals to groundwater and construction of the perimeter foundation stabilization zone will reduce groundwater flow through the site. Therefore, the future hydrogeological assessment of groundwater flux to the river will not affect the decision made in the current EE/CA regarding the Dredge Cell and Ash Pond. The Non-Time-Critical EE/CA will not need to be modified to address groundwater migration from the closed Dredge Cell; a separate EE/CA will be prepared for the river system addressing groundwater flux to the river.

17. Pg. 13, Sec. 1.3.3, last para.: This paragraph states that results of surface water sampling to date have not shown any exceedances of water quality criteria in the river.

Question: Does the sampling in the river occur close to the shore where seeps would be expected and account for laminar flow where the seepage interacts with the river or is the river sampled farther out from the site?

TVA Response: Surface water sampling to date has been conducted within the river system both upstream and downstream of active dredging operations, and did not target the river close to shore. Additional investigation is being planned as part of the river system Sampling and Analysis Plan. This investigation will include groundwater sampling at the shoreline just prior to discharge to the river, porewater sampling within the sediment at the bottom of the river, and surface water sampling at multiple depths within the river (including the epibenthic water located less than 3 feet above the bottom of the river).

18. Pg. 15, Table 1-5: Table 1-5 shows the depth of the wells but it's not clear if they all monitor the alluvial materials or do any monitor other zones or materials (well 13B is presumably a bedrock monitoring well)?

Comment: Suggest an upgraded groundwater monitoring plan incorporate clustered wells to allow measurement of water levels and contaminant concentrations at different levels.

TVA Response: Additional investigation is being planned as part of the river system Sampling and Analysis Plan that will include paired piezometers and wells at multiple depths and hydrogeologic units to provide quantitative modeling of groundwater flow and monitoring of contaminant concentrations at different levels.

19. Page 19, Section 1.4.4 Risk Characterization, Subsection 1.4.4.1 Current Exposure Scenarios: Although the text correctly points out that the highest current risk is to an onsite adolescent trespasser, the risk to an offsite outdoor worker is still greater than 1×10^{-6} . Please address where and to whom this risk is occurring, along with how long this risk will occur.

TVA Response: Please refer to Appendix A, page A-8. Under current land use assumptions, an offsite individual involved in routine outdoor work may be exposed to ash that has been deposited by wind or tracked by human or vehicle traffic to a point of exposure. Note that the results of the risk assessment show that risks to current offsite outdoor workers do not exceed EPA's acceptable risk range or target hazard; this current risk scenario will continue until the ash is capped. Future risks would be even lower, as the

ash would be capped onsite, so that there would be no exposure pathway to an offsite outdoor worker.

20. Page 19, Section 1.4.4 Risk Characterization, Subsection 1.4.4.2 Future Exposure Scenarios: The text in paragraph 1 of Subsection 1.4.4.2 states the following: "There is uncertainty in these estimates in that levels of arsenic and radioactivity in the ash are generally similar to those of typical regional soils. An exception is that levels of radium-226 in ash generally exceed the range typical of regional soils. The estimates may therefore overestimate risks above normal regional background levels."
Comment. The text only addresses arsenic and radioactivity. What about the other toxic materials? Please address levels of all Constituents of Interest (COI).

TVA Response: Please note that the other metals (those identified as Constituents of Interest) do not contribute to the cancer risk estimate. That is why they aren't discussed here. Please refer to the detailed tables in Appendix A that show that these other metals do not contribute to the cancer risk.

21. Page 19, Section 1.4.4 Risk Characterization, Subsection 1.4.4.2 Future Exposure Scenarios: The text in paragraph 1 of Subsection 1.4.4.2 states the following: "There is uncertainty in these estimates in that levels of arsenic and radioactivity in the ash are generally similar to those of typical regional soils. An exception is that levels of radium-226 in ash generally exceed the range typical of regional soils. The estimates may therefore overestimate risks above normal regional background levels."
Comment. The text states the ash is similar to regional soils in content. In conversations with TDEC, it was determined that this is not accurate. Please remove the statement. Also, please provide a table that identifies each Constituents of Interest (COI), comparing those COI contents in ash to contents and concentrations of these COIs found in local area soil.

TVA Response: Please refer to Table A-10 which lists ranges of concentrations of metals and radionuclides reported in Tennessee soil. Please note (as stated on page 7 of the EE/CA) that ash is not natural soil, and therefore direct comparisons of "background" concentrations cannot be made. Note also that the risk estimates for exposure to ash have been calculated using total measured concentrations for all constituents of interest, regardless of their concentrations in typical regional soils.

22. Page 20, Section 1.5.2: Please identify, in tabular form in the text of the document, for ease of reference, the constituent of interest details addressed in this section.

TVA Response: Please refer to Table B-10, which lists the constituents of interest details addressed in the screening-level ecological risk assessment.

23. Please identify, in tabular form in the text of the document, for ease of reference, the constituent of interest details addressed in this section. Ref: Page 20, Section 1.5.3

TVA Response: Please refer to Table B-10, which lists the constituents of interest details addressed in the screening-level ecological risk assessment.

24. Provide details in the text to support the conclusions in the last paragraph. Tabularize as well for ease of reference. Ref: Page 21, Section 1.5.3, Last Paragraph

TVA Response: The conclusion is that a potential for adverse ecological effects exists; that conclusion is supported by the details provided in Appendix B. The SLERA further concludes that a BERA is not warranted because the EE/CA alternatives will remove the ash and cap the ash onsite, eliminating the potential exposure pathways for ecological receptors. Please note that the EE/CA for the river system will include a detailed BERA, which will be prepared following additional investigation of the river.

25. Page 23, Section 2.1 Scope and Purpose, 3rd paragraph: The time of the decision may have some relevance to the decision. However, this paragraph is written in the manner to minimize remobilization costs and downtime associated with Phase II. Choice of the best alternative should not be totally dependent on time (and therefore cost). Suggest rewording the paragraph and ensuring the correct choice is balanced with risk, cost, and schedule, not just cost and schedule driven.

TVA Response: As stated in the text, the timing of the decision is important. However, the choice considers tradeoffs between effectiveness, implementability, and cost per CERCLA guidance and as detailed in Section 4 of the EE/CA. The choice is not cost and schedule driven.

26. The effect of groundwater on the closed dredge cell and its impact to the river system needs to be addressed in this Non Time-Critical EE/CA to determine the best alternative to minimize the impact from the Constituents of Interest that would be transported out of the Closed Dredge Cell to impact local residents and those persons who use the lake for numerous purposes. Ref: Page 23, Section 2.1 Scope and Purpose, 5th paragraph

TVA Response: Additional investigation is being planned as part of the river system Sampling and Analysis Plan; analysis of groundwater transport to the river system will be included in the EE/CA for the river system. The effect on groundwater of the closed Dredge Cell has been addressed in the EE/CA. Closure of the Dredge Cell will reduce the potential for migration of metals to groundwater and construction of the perimeter foundation stabilization zone will reduce groundwater flow through the site. Because groundwater at the site meets current drinking water standards, remediation of groundwater is not a part of this current removal action. Please see the Introduction to this Responsiveness Summary.

27. Page 24, Section 2.2, 1st paragraph: Add "of" to 1st sentence between words exposure and naturally to read ".....potential risk to human and ecological receptors due to exposure of naturally occurring metals....."

TVA Response: TVA regrets the typographical error.

28. Page 24, Section 2.2 Goals and Objectives: Text should be added to the second bulleted item to address groundwater contamination from the Dredge Cell, not just erosion across the cell.

TVA Response: Groundwater remediation is not an RAO for this Removal Action. Please see the Introduction to this Responsiveness Summary.

29. Page 27, Section 3.1 Technology Identification, 5th Paragraph: Containment of Constituents of Interest as a result of their transportation by groundwater flow and "tidal pumping" is not addressed in this EE/CA. It will be too late to address the topics during Phase III since under each alternative already identified, the Dredge Cell will already be closed by the time

analytical studies are complete. Modeling should be done during Non Time-Critical EE/CA to determine their impacts to the Emory River, Watts Bar, and personnel in close proximity and those who use them for whatever purpose.

TVA Response: Additional investigation is being planned as part of the river system Sampling and Analysis Plan that will include modeling of rainwater percolation, leaching, and groundwater flow into the Emory River. Because groundwater at the site meets current drinking water standards, remediation of groundwater is not a part of this current removal action. Closure of the Dredge Cell will reduce the potential for migration of metals to groundwater and construction of the perimeter foundation stabilization zone will reduce groundwater flow through the site. Please see the Introduction to this Responsiveness Summary.

30. Page 27, Section 3.1 Technology Identification, 6th Paragraph: The document states the following: Because contaminants are typically bound to the ash, and because shallow groundwater discharges to local streams without encountering wells or springs, the reduction of infiltration offered by clay caps is appropriate at the site.

Comment/Question: This is a statement backed up by no analytical data, sampling, or referenced research. On what is this statement based?

Question: What effect does groundwater have on the Constituents of Interest left in the Dredge Cell to local residents and persons that use the lake both locally and downstream in the long term?

Comment: Modeling should be done during development of the Non Time-Critical EE/CA.

TVA Response: Please note that groundwater at the site meets current drinking water standards, so that remediation of groundwater is not a part of this current removal action. A clay cap is appropriate for compliance with TDEC solid waste regulations; other low-permeability caps, such as a composite clay liner system, may also be used. As the text points out, there are no wells or springs used for water supply between the Dredge Cell and the river. Additional investigation is being planned as part of the river system Sampling and Analysis Plan that will include paired piezometers and wells at multiple depths and hydrogeologic units to support quantitative modeling of groundwater flow. The effect of groundwater flux to the river will be evaluated further as part of the EE/CA for the river system.

31. Page 28, Table 3-1 Identification and Screening of Technologies: Liners and leachate systems for collection are not addressed in this table; nor are they addressed in the Analysis of Alternatives selection. We believe this absence represents a void in the current analysis of alternatives.

TVA Response: Because there is no identified groundwater contamination or groundwater plume associated with the former Dredge Cell or Ash Pond, metals do not readily leach from the ash, and hydrostratigraphic conditions impede metal migration, no liner or leachate collection system is warranted to protect human health or the environment. Please see the Introduction to this Responsiveness Summary. .

32. Page 29, Section 3.1, Identification and Screening of Technologies, Last Paragraph: Ash that is dispositioned to any landfill in the United States must be placed in a hazardous waste landfill that is lined and has in use a leachate system to capture materials to prevent migration of materials off-site. Lining the Dredge Cell is an alternative that was not documented, considered, and analyzed.

Comment: Please explain to the RCCAG why the local residents and those residents that use the lake for any reason must be subject to a lesser degree of health protection than anyone else in the US.

Comment: Please include this alternative in the list of alternatives for consideration. Then, if that alternative is not chosen, it will have been scientifically analyzed and chosen or eliminated with a documented basis.

TVA Response: Because there is no identified groundwater contamination or groundwater plume associated with the former Dredge Cell or Ash Pond, metals do not readily leach from the ash, and hydrostratigraphic conditions impede metal migration, no liner or leachate collection system is warranted to protect human health or the environment. Please see the Introduction to this Responsiveness Summary, which further explains why the health of local residents and persons that use the lake are protected. Local residents and persons that use the lake will be further protected by removing the ash in the embayment and eliminating the potential threat of future release of ash to the river system. In addition, potential groundwater flux to the river will be evaluated in the EE/CA for the river system and human health risk assessment will be conducted to evaluate protection of residents and persons that use the lake.

The existing Dredge Cell is up to 40 ft deep, so that placement of a liner and leachate collection system beneath the ash that was placed more than 50 years ago is not practical. This is explained further in Section 3.2 of the EE/CA.

33. Page 31, Section 3.2 Development of Alternatives: The last two alternatives listed in the "considered, but not retained for further consideration" have no documented cost or scientific and technical supporting documentation. These two alternatives are viable options that should have been investigated to demonstrate all viable options were considered when choosing an alternative.

Comment: Writing a few paragraphs of text explaining both options away is not technically defensible. Please incorporate analysis of these two options in to the Non Time-Critical EE/CA.

TVA Response: As stated on Page 29, the EE/CA has developed a range of alternatives that meet the RAOs and that represent a range of possibilities for restoration of the embayment so that tradeoffs between them can be clearly defined and evaluated. The rationale for not developing alternatives for complete excavation of ash and placement either in an onsite lined landfill or offsite landfill is provided on page 31 of the EE/CA.

34. Page 32, Section 3.2.1, 1st paragraph: Recommend changing the word "but" to "and" as the second word in the second line of text in the paragraph.

TVA Response: The suggestion is noted.

35. Page 32, Section 3.2.1, Table 3-2: Action: Transport the ash offsite. The last sentence in the paragraph under Summary - Alternative 1b is a combination of train and truck transportation, not just truck transportation.

TVA Response: Correct. Alternative 1b, which combines train and truck transportation, would transport ash from the northern part of the embayment by truck to an offsite landfill.

36. Page 32, Section 3.2.1, Table 3-2: Action: Restore embayment. There are more actions needed to restore the embayment besides introducing aquatic plants in the remediated area.

TVA Response: Please refer to Appendix D, which provides further details of the conceptual restoration design.

37. Infrastructure. Space between "to" and "10" Ref: Page 32, Section 3.2.1, 2nd paragraph

TVA Response: TVA regrets the typographical error.

38. Page 32, Section 3.2.1, 3rd paragraph: Infrastructure. Will the project method of accomplishment still include use of a conveyor?

TVA Response: As of the time of writing this EE/CA, TVA had been considering use of a mechanical conveyor. Additional means of conveyance have also been evaluated; currently TVA plans to install a bridge and underpass to transport ash beneath Swan Pond Circle Road.

39. Suggest changing "Ball Field" to "Ball Field Area" throughout the document. Ref: General

TVA Response: The suggestion is noted.

40. Page 33, Section 3.2.1: Excavate the Swan Pond Embayment. The last two sentences do not appear to contain a complete description of the transportation methods for ash.

TVA Response: Please note that under Alternative 1b, ash from the northern part of the embayment would be transported offsite by truck; ash from the middle part of the embayment would be hauled to the Ball Field for offsite disposal by rail.

41. Page 33, Section 3.2.1: Excavate the Swan Pond Embayment. Would the last sentence of the first paragraph be more accurate if the word "in" in the next to last line was changed to "from"?

TVA Response: The suggestion is noted.

42. Page 33, Section 3.2.1: Excavate the Swan Pond Embayment. Why is there a distinction between the north portion of the embayment for dump truck removal and Swan Pond Embayment for articulating truck?

TVA Response: The distinction is only that under Alternative 1b, ash from the northern part of the embayment would be transported offsite by truck (dump trucks); ash from the middle part of the embayment would be hauled to the Ball Field (using articulating trucks) for offsite disposal by rail.

43. Page 33, Section 3.2.1: Excavate the Swan Pond Embayment. Place a "%" symbol after 20.

TVA Response: The suggestion is noted.

44. Page 33, Section 3.2.1: Excavate the Swan Pond Embayment. Into what are the 50 truckloads of timber included?

TVA Response: The alternative includes the removal of an estimated 50 truckloads of timber.

45. Excavate the Swan Pond Embayment. Suggest changing the word "for" to "in" in the last line of the paragraph. Ref: Page 33, Section 3.2.1

TVA Response: The suggestion is noted.

46. General. The appendices references need to be checked throughout the document. The appendices do not appear to be effectively referenced in the end of the EE/CA. (Specific Reference Page 35, Section 3.2.1) - Restore Embayment. The reference is to Appendix D but it appears the Restoration Plan is not Appendix D. Recommend appendix coversheets to introduce each Appendix. It is hard to figure out which document is in any particular appendix.

TVA Response: Please note that Appendix D is the Conceptual Restoration Design, as the reference correctly states. TVA regrets that the Appendix coversheets were omitted from the online document.

47. Page 35, 1st incomplete paragraph: Consider adding the word "on" to the 2nd complete sentence between words "up" and "the" to read ".....loading stations would be set up on the northern embayment area with....."

TVA Response: The suggestion is noted.

48. The terms for the various bodies of water (embayments) have different names within the EE/CA and in the reference documents in the Appendices. These names should be consistent.

TVA Response: TVA regrets the confusion. In future documents, TVA will refer to the "northern embayment" and the "middle embayment", which are portions of the overall Swan Pond Embayment.

49. Bullet starting with "Dike D corridor" - Remove period after 60-ft deep. Ref: Page 38, 2nd bullet

TVA Response: TVA regrets the typographical error.

50. Page 39, Section 3.2.2: Infrastructure. Will the project method of accomplishment still include use of a conveyor?

TVA Response: Please see response to comment no. 38 above.

51. Page 40, Section 3.2.2, Table 3-3: Action: Transport the ash offsite. The language in Table 3.3 would be better than the current similar language in Table 3.2.

TVA Response: The suggestion is noted.

52. Page 40, Section 3.2.2, Table 3-3: Action: Restore embayment. There are more actions needed to restore the embayment besides introducing aquatic plants in the remediated area.

TVA Response: Please see response to comment no. 36 above.

53. Throughout Section 3.2.2: If reference is made to language and/or actions in Section 3.2.1, instead of repeating the text in Section 3.2.2, please provide the location of the referenced text in each appropriate section of 3.2.2.

TVA Response: The suggestion is noted.

54. Page 43, Section 3.2.3, Table 3-4: Action: Restore embayment. There are more actions needed to restore the embayment besides introducing aquatic plants in the remediated area.

TVA Response: Please see response to comment no. 36 above.

55. General Comment: It is improper grammar to start a sentence with the word "This" without a subject. A specific example occurs in the second sentence of the paragraph on Page 45, Section 3.2.4, Environmental, Safety, and Health.

TVA Response: The text is grammatically correct as written.

56. Place a comma between "Environmental" and "Safety". Ref: Page 45, Section 3.2.4 Components Common to All Alternatives, Environmental Health and Safety

TVA Response: The text is grammatically correct as written.

57. Three places in the paragraph refer to the Sluice Ditch. This should be changed to Sluice Trench to be consistent with Figure 3. Ref: Page 46, 1st complete paragraph

TVA Response: TVA will attempt to use Sluice Trench as consistent terminology.

58. Page 46, Section 3.2.4: Dewatering and Water Management. Remove the words "so as" from the first sentence.

TVA Response: The text is grammatically correct as written.

59. The last sentence states the only constituent exceeding criteria is arsenic found at "low levels (near its MCL)." That sounds fairly subjective and not exactly accurate. The arsenic levels (maximum) detected in groundwater were approximately 3 times the MCL. Please correct this inaccuracy with objective data. Ref: Pg. 49, 3rd full paragraph

TVA Response: Please refer to section 1.3.3 for further discussion of groundwater monitoring results.

60. Pg. 49, 3rd full paragraph: Comment 1: In the discussion of the low permeability cover and its impact on reducing infiltration from 14.9 inches/yr to less than 1.4 inches/yr, please provide EPA's modeling report (HELP input parameters, etc).

Comment 2: Please provide information relative to how infiltration is expected to increase over time (see comment # 63 below).

TVA Response: Calculation packages, including HELP model outputs, can be made available upon request. Infiltration is not expected to increase over time, with proper design, construction, and maintenance of the landfill cap.

61. Add "will" between words month and not to read "Maximum loading rates of 5 ft per month will not produce excessive....." Ref: Page 49, last paragraph, last sentence

TVA Response: TVA regrets the typographical error.

62. Change the word "that" to "than" - ".....which is 40 to 55 ft lower than the top of the....." Ref: Page 50, bullet number 1, 2nd sentence from end of paragraph

TVA Response: TVA regrets the typographical error.

63. Section 4: All alternatives include a 24-inch low-permeability barrier. A paper on compacted clay covers (Field Performance of a Compacted Clay Landfill Final Cover at a Humid Site by William Albright and others) suggests preferential flow paths develop in the clay barriers soon after construction, likely due to desiccation cracking. After 4 years of service of a studied cap, the hydraulic conductivity of the clay barrier increased approximately 3 orders of magnitude (from $\approx 10^{-7}$ to $\approx 10^{-4}$ cm/s).

Comment: The Non Time-Critical EE/CA should consider and address this change in the hydraulic conductivity.

Comment: The Non Time-Critical EE/CA should be revised so that it contains plans or details on the design and construction of the low permeability cover, or the measures that will be employed to prevent desiccation or root intrusion following construction.

TVA Response: Final design of the landfill cap will consider material specifications for the low-permeability cover and protective soil materials. Proper cover design, construction, and maintenance avoids the formation of desiccation cracks or root intrusion. Alternative materials, such as geosynthetic liners or clay composite liner materials will also be considered during final design, as stated in the EE/CA, Section 3.1. The final cap will be designed and constructed in compliance with TDEC landfill closure requirements.

64. Sections 4.1.1.1, 4.1.2.1, and 4.1.3.1 Effectiveness, Compliance with ARARs, First Sentence: The RCCAG agrees the closure of the dredge cell does meet the intent of the TDEC Commissioner's Order and will minimize surface water's ability to transport COIs from the closed Dredge Cell. However, the RCCAG does not believe meeting that requirement adequately protects the citizens of Roane County or anyone else using the waters of the Emory River or Watts Bar Lake for any reason. Adequate provisions need to be engineered and implemented to prevent any future leachate or groundwater containing COIs from entering the Emory River.

TVA Response: Because there is no identified groundwater contamination or groundwater plume associated with the former Dredge Cell or Ash Pond, metals do not readily leach from the ash, and hydrostratigraphic conditions impede metal migration, no liner or leachate collection system is warranted to protect human health or the environment. Closure of the Dredge Cell will reduce the potential for migration of metals to groundwater and construction

of the perimeter foundation stabilization zone will reduce groundwater flow through the site. Please see the Introduction to this Responsiveness Summary.

65. Sections 4.1.1.1, 4.1.2.1, and 4.1.3.1 Effectiveness of Restoration, first and second indented paragraphs: The statement implies that flora affected by the ash spill will not be completely restored because "loss of native soil in some areas may required previous riparian forest communities being restored to a wetland emergent community or a great areal extent of open water habitat than the pre-spill condition".

Comment: TVA management and EPA have stated that "everything will be better than before". That statement will not be true without repairing all areas to pre-spill conditions and restoring vegetation as it was pre-spill. One alternative would be to truck native top soil into the affected areas and plant the appropriate pre-spill vegetation back.

TVA Response: The addition of soil amendments to the native sediments has been included in the conceptual restoration design. Note that adjustments to the proportions of ecological habitat types (riparian forest and wetland and open water) will not substantively alter habitat types existing prior to the spill, so that TVA's stated RAO of restoring the embayment to pre-spill conditions remains a firm commitment. Please note that TVA will restore a complex mosaic of forested, scrub-shrub, and emergent wetlands that will enhance diverse habitats for fish, semi-aquatic amphibians, and bird species, as described in Appendix D.

66. Sections 4.1.1.1, 4.1.2.1, and 4.1.3.1 Effectiveness, Effectiveness of cover containment, first paragraph See comment #64.

TVA Response: Please see response to comment #64 above.

67. The RCCAG agrees that a gas collection system is not required. However, the RCCAG does not agree that a leachate collection system is not required. See comments #32 and #64. Ref: Sections 4.1.1.1, 4.1.2.1, and 4.1.3.1 Effectiveness, Effectiveness of cover containment, last paragraph

TVA Response: Please see response to comments #32 and #64 above.

68. Sections 4.1.1.1, 4.1.2.1, and 4.1.3.1 Implementability, Next-to-last paragraph: The RCCAG does not believe natural repopulation of fish and terrestrial fauna would occur immediately. Suggest removing the word "immediately".

TVA Response: The suggestion is noted. Mobile fish species are expected to repopulate the Swan Pond Embayment within days; less mobile fish with smaller foraging areas or home ranges may repopulate the embayment over a longer period of time.

69. Sections 4.1.1.1, 4.1.2.1, and 4.1.3.1, Implementability, Last paragraph: The RCCAG believes the long-term monitoring of groundwater should be addressed under this EE/CA since that topic should be integral with the closure of the Dredge Cell.

TVA Response: Agreed. As stated in the EE/CA, each alternative would include long-term monitoring of groundwater as part of closure of the Dredge Cell. This monitoring is to be further addressed under the EE/CA for the river system.

70. Section 4.2 COMPARATIVE ANALYSIS OF ALTERNATIVES, Section 4.2.1 Effectiveness, Overall Protectiveness: The RCCAG agrees that erosion can be managed to eliminate future migration of ash to the river in stormwater runoff. Subsurface impacts to the river have not been addressed in this EE/CA.

Comment: Without addressing and analyzing subsurface impacts to the Emory River, an inadequately protective alternative may be constructed that would allow COIs to enter the river as a result of groundwater flow or tidal pumping. Just because operations have been ongoing for numerous years under a permit that does not protect the local residents or persons that use the Emory River or Watts Bar Lake does not mean operations should be allowed to continue as they were being done and the permit not revised to better protect the environment and human health.

TVA Response: Because there is no identified groundwater contamination or groundwater plume associated with the former Dredge Cell or Ash Pond, metals do not readily leach from the ash, and hydrostratigraphic conditions impede metal migration, no liner or leachate collection system is warranted to protect human health or the environment. Closure of the Dredge Cell will reduce the potential for migration of metals to groundwater and construction of the perimeter foundation stabilization zone will reduce groundwater flow through the site. In addition, potential groundwater flux to the river will be evaluated in the EE/CA for the river system. Please see the Introduction to this Responsiveness Summary.

71. Section 4.2 COMPARATIVE ANALYSIS OF ALTERNATIVES, Section 4.2.1 Effectiveness, Effectiveness of restoration: See comment #65.

TVA Response: Please see response to comment #65 above.

72. Section 4.2 COMPARATIVE ANALYSIS OF ALTERNATIVES, Section 4.2.1 Effectiveness, Effectiveness of disposal: The alternative for disposing of all ash in an offsite location (either adjacent to the site or in another state) was not evaluated. It is a technically viable alternative that should have been addressed in the Non Time-Critical EE/CA because it is technically feasible. Elimination of the alternative should be an evaluated decision, not just a judgment call with no supporting data or analysis prior to preparing the EE/CA.

TVA Response: the EE/CA has developed a range of alternatives that meet the RAOs and that represent a range of possibilities for restoration of the embayment so that tradeoffs between them can be clearly defined and evaluated, as stated on page 29 of the EE/CA. The rationale for not developing alternatives for complete excavation of ash and placement either in an onsite lined landfill or offsite landfill is provided on page 31 of the EE/CA.

73. Figure 6: There are 2 locations for PR-2 and no location for PR-9. Please correct figure accordingly.

TVA Response: PR-9 is located alongside the northern embayment area. TVA regrets the typographical error.

74. APPENDIX A HUMAN HEALTH RISK ASSESSMENT, Section A.1.5 Uncertainty Analysis, A.1.5.1 Data Uncertainties, Last Paragraph (Page A-20): The following statement is located in the referenced section of the HUMAN HEALTH RISK ASSESSMENT.

- "There is considerable uncertainty associated with the bedrock groundwater dataset. The uncertainties are associated with the limited number of samples and the availability of data from only a single well. Therefore, the risks from potential exposure to

groundwater may be overestimated or underestimated, but the magnitude of such estimation is not quantifiable. TVA is planning for the installation of additional monitoring wells which will allow for better estimates of potential risks should exposures occur in the future."

Question: With this admitted risk associated with the lack of groundwater data and the COIs associated with the groundwater, how can an alternative be chosen to close the Dredge Cell (and subsequently designed) that will protect the local residents and any user of the Emory River or Watts Bar Lake?

Question: What process was followed to identify the number and location of wells that are needed to analyze the groundwater risk to the environment and human health. Ref:

TVA Response: Because there is no identified groundwater contamination or groundwater plume associated with the former Dredge Cell or Ash Pond, metals do not readily leach from the ash, and hydrostratigraphic conditions impede metal migration, no liner or leachate collection system is warranted to protect human health or the environment. Closure of the Dredge Cell will reduce the potential for migration of metals to groundwater and construction of the perimeter foundation stabilization zone will reduce groundwater flow through the site. In addition, potential groundwater flux to the river will be evaluated in the EE/CA for the river system. Please see the Introduction to this Responsiveness Summary.

The process to be followed to identify the number and location of wells that are needed to model groundwater flow and to analyze the groundwater risk to the environment and human health in the river system will be addressed in the Sampling and Analysis Plan for the river system.

75. APPENDIX A HUMAN HEALTH RISK ASSESSMENT, Section A.1.5 Uncertainty Analysis, A.1.5.2 Exposure Scenario Uncertainty, Third Paragraph: Why were future exposures to groundwater evaluated using data from a bedrock well only, rather than looking at all groundwater data?

TVA Response: As stated on pages A-5 and A-21 of Appendix A, the use of bedrock groundwater data quantitatively in the risk assessment is appropriate because drinking water wells are typically installed in bedrock rather than soil. Potential exposures to groundwater from unconsolidated wells are presented in the uncertainty analysis (Tables A-4 through A-8).

76. APPENDIX A HUMAN HEALTH RISK ASSESSMENT, Section A.1.5 Uncertainty Analysis, A.1.5.2 Exposure Scenario Uncertainty, Third Paragraph (Third Line, Page A-21): The following statement is located in the referenced section of the HUMAN HEALTH RISK ASSESSMENT.

- "TVA has active and aggressive dust control and air monitoring programs in place."

The RCCAG strongly disagrees. There is no evidence of a coordinated, integrated continuous air monitoring program that takes readings continually. Please provide documentation that the program exists and random reports that substantiate that assertion.

TVA Response: Please refer to the EPA website for dust control and air monitoring data. The Dust Control and Air Monitoring Plan has been approved by EPA and TDEC. EPA continues reviewing the air quality monitoring conducted by TDEC and TVA and confirms TDEC's belief that there is no known threat to public health from an air pollution exposure associated with the clean-up of the ash spill at the TVA Kingston Steam Plant. National ambient air quality standards for inhalable particulate (PM₁₀) and respirable particulate

(PM2.5) are being met. Air sampling continues to show no metal concentrations of concern. Persons wishing to view the monitoring data can see it at the following web address:
<http://www.state.tn.us/environment/kingston/air/>.

77. APPENDIX A HUMAN HEALTH RISK ASSESSMENT, Section A.1.5 Uncertainty Analysis, A.1.5.2 Exposure Scenario Uncertainty, Last Paragraph (Pages A-21 and A-22): The following statement is located in the referenced section of the HUMAN HEALTH RISK ASSESSMENT.

- "KIF is located in an area of groundwater discharge rather than recharge. Therefore, the movement of groundwater is upward and toward the Emory River rather than downward toward bedrock. However, to evaluate the uncertainties associated with potential exposures to ash related constituents via groundwater use scenarios, analytical data from overburden monitoring wells were used to derive cancer risk and noncancerous hazard estimates (Tables A-4 through A-8 [Attachment A-1]). Whereas cancer risk estimates for potential exposures to groundwater from bedrock monitoring wells ranged from 2E-05 (indoor workers) to 3E-05 (adult residents), those from overburden monitoring wells ranged from 2E-04 (indoor workers) to 4E-04 (adult residents). The cancer risk estimates are driven by ingestion of arsenic. Similarly, whereas noncancerous hazard estimates for potential exposures to groundwater from bedrock monitoring wells ranged from 0.3 (indoor workers) to 2 (child residents), those from overburden monitoring wells ranged from 4 (indoor workers) to 29 (child residents). The hazard estimates are driven by ingestion of manganese and arsenic. This suggests that risks from future exposure to groundwater may be underestimated if concentrations in bedrock groundwater were to increase to concentrations measured in overburden groundwater."

"Data from monitoring well 6A were not used in this evaluation because it is a non-standard environmental monitoring well, featuring simply a 4-inch diameter riser with 0.25-inch diameter holes drilled into it. Well 6A had the highest detected concentrations of boron, chromium, iron, manganese, strontium, and vanadium. Had data from well 6A been included, the noncancerous hazard estimates would be higher for iron, manganese, and vanadium. The following presents a comparison of the analytical results for KIF groundwater wells."

The RCCAG has repeatedly stated concerns relative to groundwater transport of COIs from ash materials in the Dredge Cell to the Emory River. This text supports our concern and our belief that a more rigorous containment system needs to be designed to ensure COIs are not carried by groundwater to the Emory River, and consequently, Watts Bar Lake which would affect local residents and any users of the Emory River and Watts Bar Lake.

TVA Response: Because there is no identified groundwater contamination or groundwater plume associated with the former Dredge Cell or Ash Pond, metals do not readily leach from the ash, and hydrostratigraphic conditions impede metal migration, no liner or leachate collection system is warranted to protect human health or the environment. Closure of the Dredge Cell will reduce the potential for migration of metals to groundwater and construction of the perimeter foundation stabilization zone will reduce groundwater flow through the site. In addition, potential groundwater flux to the river of COIs will be evaluated in the EE/CA for the river system, as will the potential risks to local residents and any users of the river system. Please see the Introduction to this Responsiveness Summary.

78. APPENDIX A HUMAN HEALTH RISK ASSESSMENT, Section A.1.5 Uncertainty Analysis, A.1.5.4 Risk Characterization Uncertainty, Second Paragraph (Page A-23): The following

statement is located in the referenced section of the HUMAN HEALTH RISK ASSESSMENT.

"As stated in Section A.1.1.1, antimony, cadmium, and molybdenum were not detected in any ash samples collected by TVA. These constituents were detected in ash samples collected by EPA and TDEC. Additionally, analysis for lithium and total uranium was not conducted on EPA or TVA ash samples. These constituents were detected in samples collected by TDEC. Exclusion of these constituents from the risk assessment introduces uncertainty into the risk estimates. The maximum detected concentrations reported by EPA or TDEC of these noncarcinogenic constituents were compared to residential risk-based screening levels at a target hazard quotient level 0.1 (Table A-9 [Attachment A-1]). This comparison indicates that the maximum detected concentrations exceed their respective residential screen levels at the target hazard quotient level of 0.1. This suggests that the hazard estimates may be underestimated."

Question 1: Why were samples taken by EPA and TDEC ignored, using only samples taken by TVA, the entity that has the most at stake financially in this project?

Question 2: The Human Health Risk Assessment analysis should include all sampling results identified and taken in response to a planning DQO process to ensure proper protection to local residents and users of the Emory River and Watts Bar Lake. What methodology was established to ensure a defensible sampling methodology was performed?

TVA Response: Please note that the samples taken by EPA and TDEC have not been ignored. The cited text explicitly includes discussion of those results; Table A-9 presents the results of those data compared to risk-based screening levels. The EE/CA further concludes that the risks are unacceptable and that a removal action is warranted, and further evaluates alternatives to remove the ash from the embayment and to close the Dredge Cell. Therefore the uncertainty expressed in this section of the risk assessment is managed appropriately.

Sampling of ash deposits was performed in accordance with EPA-approved work plans. TVA has prepared a Quality Assurance Project Plan (QAPP), which has been approved by EPA, to establish a defensible data management process. Additional investigation of the river system is being planned to support a future risk assessment for users of the Emory River and Watts Bar Reservoir; a formal DQO planning process has been followed in accordance with EPA guidelines, to establish the sampling strategy. The DQOs and the sampling design will be presented in the Sampling and Analysis Plan for the river system.

79. The conclusions of the HUMAN HEALTH RISK ASSESSMENT and the SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT need to be summarized in some section of each document in a manner that is easy for the general public to understand.

TVA Response: The conclusions of the HHRA are presented in Section A.1.4; the conclusions of the SLERA are presented in Section B.3. Please note that these conclusions are further summarized in a manner that is easier for the general public to understand in both the Executive Summary and Sections 1.4 and 1.5 of the EE/CA.

80. The following statement is located in section B.3.1 Terrestrial Environment (Page B-8) of the SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT.

- "Sixteen inorganic constituents in ash as soil were selected as COPECs because maximum concentrations exceeded an HQ of 1."

Comment: Please provide a bulletized list of the COPECs below this statement in the document. Ref: APPENDIX B SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT,

TVA Response: Please refer to Table B-10, which lists the constituents of interest identified as COPECs in the screening-level ecological risk assessment.

81. The following two statements are located in section B.3.2 Aquatic Environment (Page B-9) of the SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT.

- "Seventeen inorganic constituents in ash as sediment were selected as COPECs because maximum concentrations exceeded an HQ of 1, an ESV was not available, or constituents were identified as COIs in fly ash."

- "Surface Water: Eleven inorganic constituents in surface water were selected as COPECs because maximum concentrations exceeded an HQ of 1, an ESV was not available, or constituents were identified as COIs in fly ash."

Please provide a bulletized list of the COPECs below each statement in the document.

TVA Response: Please refer to Table B-10, which lists the constituents of interest identified as COPECs in the screening-level ecological risk assessment.

82. The acronym DOE is Department of Energy, not Department of Defense. Ref: Page v, List of Acronyms

TVA Response: TVA regrets the typographical error.

83. Include the acronym BESA - Baseline Ecological Risk Assessment. Ref: Page iv, List of Acronyms

TVA Response: "BERA" is already included in the acronym list.

84. The reference to the year (2009) for the ANL study does not match the year of 1999 in the reference section. Ref: More than one instance

TVA Response: TVA regrets the typographical error. The ANL study was produced in April 1999.

85. Please define examples of "unauthorized purpose" of use of the closed Dredge Cell as mentioned in paragraph three under Evaluation of Alternatives. Ref: Page x, Evaluation of Alternatives, 3rd paragraph, last sentence

TVA Response: Unauthorized purposes are uses of the Dredge Cell that would conflict with the requirements of Tennessee Rules 1200-1-7-.02 or 1200-1-.04, which prohibit entry by unauthorized persons or disposal of unauthorized wastes.

COMMENTS RECEIVED FROM ENVIRONMENTAL INTEGRITY PROJECT

1920 L Street NW, Suite 800
Washington, DC 20036
www.environmentalintegrity.com

Overall Deficiencies in the EE/CA require additional investigation and clarification.

Overall, we support an action that removes as much coal combustion waste (“CCW”) as possible from the dredge cell and the embayment and minimizes long-term reliance on the failed dredge cell as a waste containment unit. We find, however, that there are some significant deficiencies in the EE/CA that require additional investigation and clarification. Specifically, we urge TVA to: (1) Prevent direct contact between CCW and water; (2) Minimize migration of CCW and its constituents into water, via groundwater discharge or surface water discharge; (3) Minimize direct contact between CCW and human or ecological receptors; (4) Restore the embayment to pre-spill conditions; (5) Close the former Dredge Cell to prevent further groundwater or surface water pollution, even if it requires exceeding minimum state standards for such closure; (6) Perform additional leach tests on the CCW to ensure accurate characterization and assessment of risk from the waste; (7) Safely dispose of CCW from the spill site in permitted, composite-lined landfills only after ensuring that such landfills are operating in a manner that protects the long-term health and environment of the host communities; (8) Refrain from any final decision regarding off-site disposal of CCW until existing issues regarding threats to air, groundwater and surface water as well as the sufficiency of the operating permit and financial assurance are fully resolved for the Arrowhead Landfill; and (9) Refrain from any final decision regarding off-site disposal until the host community has the opportunity to participate meaningfully in the determination of off-site placement, including the ability to employ technical advisors to assist the community. Because CCW disposal in the Arrowhead Landfill raises issues of environmental justice, TVA’s attention to the latter request is particularly important.¹

¹ TVA, Kingston Ash Recovery Project, *Non-Time-Critical Removal Action Embayment/Dredge Cell Engineering Evaluation/Cost Analysis (EE/CA)*, ix-x (Jan. 15, 2010) available at <http://www.tva.gov/kingston/eeca/index.htm>.

TVA Response: TVA acknowledges your support of an action that removes as much ash as possible from the dredge cell and embayment and minimizes long-term reliance on the dredge cell as a waste containment unit. TVA has addressed items (1) through (5) above, by meeting the Removal Action Objectives stated in the EE/CA. Items (6) through (9) above are not stated RAOs; the following indicate TVA’s response to those items:

(6) TVA will be performing additional leach tests to support groundwater fate and transport modeling associated with additional investigation of the river system. Please see the response to the specific comment below.

(7) If the decision were to be made to dispose of the retrieved ash offsite, the facility or landfill selected would have to comply with RCRA Subtitle D permitting requirements for operation and disposal of industrial wastes. These requirements include the use of a synthetic liner, leachate collection system, groundwater monitoring, financial assurance, and closure and post-closure care as provided in Section XVII of the AOC. In addition, prior to any offsite shipment, TVA would obtain EPA’s determination that the proposed receiving facility is operating in compliance with the requirements of 40 C.F.R. § 300.440, as well as appropriate health and safety standards.

(8) Please note that Alternatives 1 and 2 do not require disposal at any specific landfill; the Arrowhead and Chestnut Ridge Landfills were used as representative disposal options, however other permitted landfills could be used. If the decision were to be made to dispose of the retrieved ash offsite, the facility or landfill selected would have to comply with RCRA Subtitle D permitting requirements for operation and disposal of industrial wastes. These requirements include the use of a synthetic liner, leachate collection system, groundwater monitoring, air monitoring, surface water monitoring, financial assurance, and closure and post-closure care as provided in Section XVII of the AOC. In addition, prior to any offsite shipment, TVA would obtain EPA's determination that the proposed receiving facility is operating in compliance with the requirements of 40 C.F.R. § 300.440, as well as appropriate health and safety standards..

(9) As part of the EE/CA public comment period, which has been extended to 75 days, the host communities of potential offsite disposal facilities have had the opportunity to participate meaningfully in the public participation process. Comments have been received from members of the local host communities, in particular the Arrowhead Landfill community.

I. Undertake Further Study to Accurately Characterize CCW using EPA's New Leach Test Methods Instead of the Toxicity Characteristic Leaching Procedure (TCLP).

In the EE/CA, TVA relies exclusively on a single point leach test, the Toxicity Characteristic Leaching Procedure ("TCLP") to characterize the leaching potential of the coal ash.² However, several reports by the EPA's Office of Research and Development ("ORD"), published from 2006 to 2009, provide conclusive evidence that this single-point pH test is not sufficient for evaluating potential impacts from CCW disposal. According to the EPA, the TCLP should be replaced by a test that more accurately predicts the levels of toxic metals that can leach out of coal ash. The EPA describes its transition to a more sensitive and accurate leaching test for coal ash in the following studies:

2 Id. at pp. 10-11, Table 1-2.

- (1) "Characterization of Coal Combustion Residues from Electric Utilities Using Wet Scrubbers for Multi-Pollutant Control" (EPA/600/R-08/077) July 2008, available at: <http://www.epa.gov/nrmrl/pubs/600r08077/600r08077.htm>
- (2) "Characterization of Mercury-Enriched Coal Combustion Residues from Electric Utilities Using Enhanced Sorbents for Mercury Control" (EPA-600/R-06/008) February 2006; available at: <http://www.epa.gov/nrmrl/pubs/600r06008/600r06008.pdf>
- (3) U.S. EPA, Characterization of Coal Combustion Residues from Electric Utilities Using Multi-Pollutant Control Technology – Leaching and Characterization Data (EPA-600/R-09/151) December 2009; available at: <http://www.epa.gov/nrmrl/pubs/600r09151/600r09151.html>
- (4) Senior, C; Thorneloe, S.; Khan, B.; Goss, D. Fate of Mercury Collected from Air Pollution Control Devices; EM, July 2009, 15-21, available at: http://docs.google.com/viewer?a=v&q=cache:Ja3eLhFq5Y0J:oaspub.epa.gov/eims/eims_comm.getfile%3Fp_download_id%3D491053+Fate+of+Mercury+Collected+from+Air+Po llution+Control+Devices&hl=en&gl=us&pid=bl&srcid=ADGEEShUcTwEh2Rs8gD3Xao_5JiUFwhQYib4AYsrhvISgRhRsHDhU1Vtr9IqyeSf6cNj8GTiCwrZHRwJpYuSOyM3UO0IBk6c_0hbmJ9vo9dLas-U4yJyC2ux-8pNbmq6sbw5eiAxbHX&sig=AHIEtbRjyt8wc-CNU58RCc0YCDm6iOSaJA
- (5) Thorneloe, S., D. Kosson, G. Helms, and A. C. Garrabrants. Improved leaching test methods for environmental assessment of coal ash and recycled materials used on

construction. In Proceedings, 12th International Waste Management and Landfill Symposium, Cagliari, ITALY, October 05 - 09, 2009. (2009), available at: http://cfpub.epa.gov/si/si_public_record_Report.cfm?dirEntryId=210134

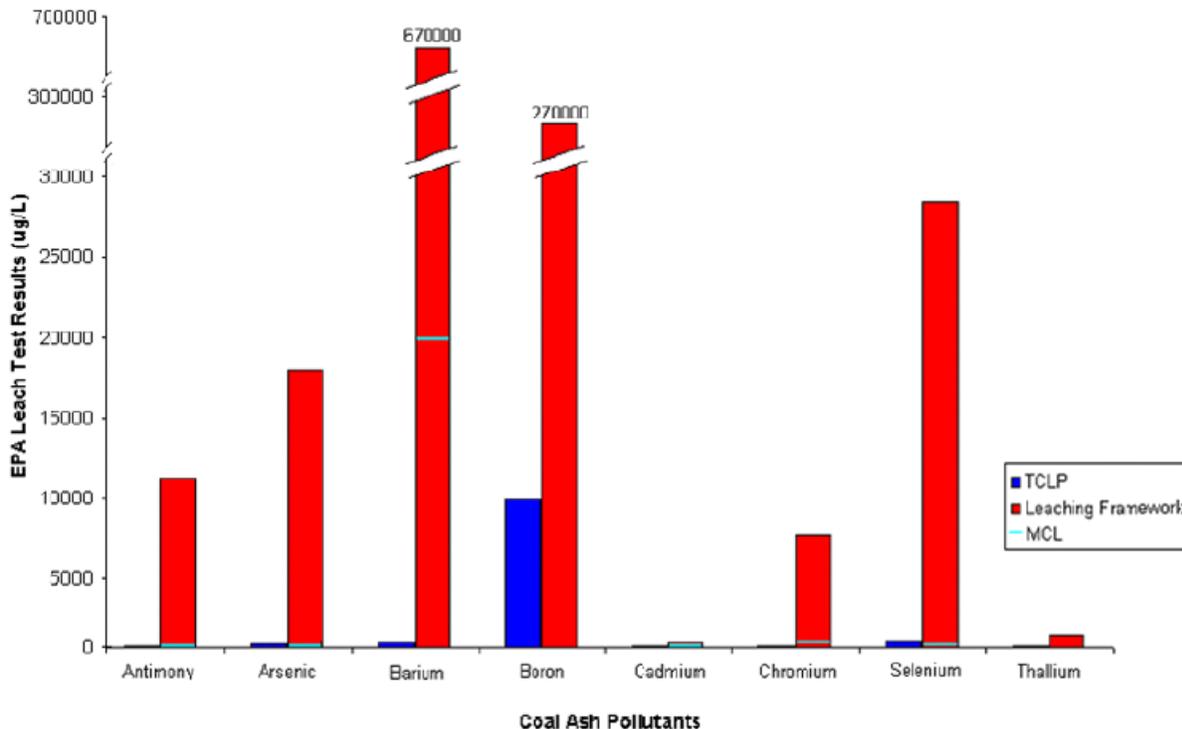
In the report published by the EPA ORD in December 2009, “Characterization of Coal Combustion Residues from Electric Utilities Using Multi-Pollutant Control Technology – Leaching and Characterization Data,” the EPA explained the use of a new leaching protocol: In developing data to characterize the leaching potential of [constituents of potential concern] from the range of likely CCRs resulting from use of state-of-the-art air pollution control technology, improved leaching test methods have been used. The principle advantage of these methods is that they consider the impact on leaching of management conditions. These methods address concerns raised by National Academy of Science and EPA’s Science Advisory Board with the use of single-point pH tests. Because of the range of field conditions that CCRs are managed during disposal or use as secondary (or alternative) materials, it is important to understand the leaching behavior of materials over the range of plausible field conditions that can include acid mine drainage and codisposal of fly ash and other CCRs with pyrites or high-sulfur coal rejects. The methods have also been developed into draft protocols for inclusion in EPA’s waste testing guidance document, SW-846, which would make them available for more routine use. (<http://www.epa.gov/osw/hazard/testmethods/sw846/index.htm>).

The selected testing approach was chosen for use because it evaluates leaching over a range of values for two key variables [pH and liquid-to-solid ratio (LS)] that both vary in the environment and affect the rate of constituent release from waste. The range of values used in the laboratory testing encompasses the range of values expected to be found in the environment for these parameters. Because the effect of these variables on leaching is evaluated in the laboratory, prediction of leaching from the waste in the field is expected to be done with much greater reliability.³

³ U.S. EPA, Characterization of Coal Combustion Residues from Electric Utilities Using Multi-Pollutant Control Technology – Leaching and Characterization Data (EPA-600/R-09/151) Dec 2009, <http://www.epa.gov/nrmrl/pubs/600r09151/600r09151.html>.

In fact, the data published in the EPA’s report reveal a dramatic difference between the leach test results derived from the TCLP test and the results from the EPA’s new leaching framework. The test results are illustrated in the graph below. The TCLP results on the graph represent the highest levels of coal ash pollutants documented in the EPA’s 1999 Report to Congress: Wastes from the Combustion of Fossil Fuels. These results are compared to the highest levels found in leachate from the most recent EPA report (December 2009) using the new leaching framework. For all of the pollutants shown, the new test reveals substantial increases in the concentration of metals in the leachate. For example, the concentration of antimony increases over 900 times in the 2009 test results, the barium concentration increases over 1800 times, and the chromium concentration increases over 125 times.

Comparison of EPA Leach Test Results for Coal Ash: TCLP (RTC 1999)¹ vs Leaching Framework (2009)²
 (Concentrations reflect highest level of contaminants documented by 1999 and 2009 EPA reports)



¹ USEPA, Report to Congress: Wastes from the Combustion of Fossil Fuels: Volume 2, Methods, Findings and Recommendations (EPA530-R-99-010) March 1999, <http://www.epa.gov/osw/nonhaz/industrial/special/fossil/volume2.pdf>. Toxicity Characteristic Leaching Procedure (TCLP) results for samples of waste managed in both surface impoundments and landfills. See Table 3-9 at 3-19.

² U.S. EPA, Characterization of Coal Combustion Residues from Electric Utilities Using Multi-Pollutant Control Technology – Leaching and Characterization Data (EPA-600/R-09/151) Dec 2009, <http://www.epa.gov/nrmrl/pubs/600r09151/600r09151.html>. Laboratory leach test eluate concentrations for 5.4 ≤ pH ≤ 12.4 and at “own pH” from evaluation of 34 fly ash samples. See Table 13 at 183.

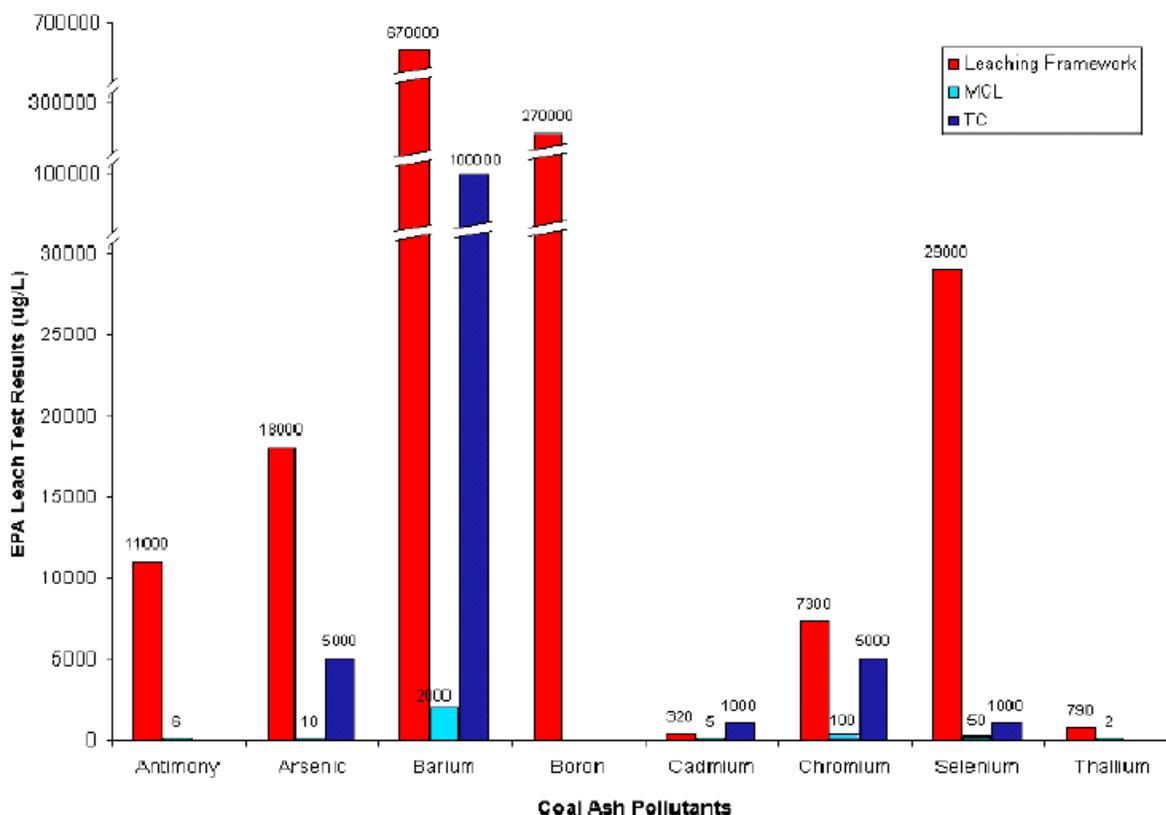
Updated 3/19/2010

It is also clear that the leachate resulting from the new test is considerably more toxic when compared to federal drinking water standards (maximum contaminant levels (“MCLs”)) and hazardous waste concentration limits. The graph below compares both MCLs and toxicity characteristics (“TCs”) to the EPA’s new leaching values for coal ash as documented in its December 2009 report. The toxicity characteristic determines at what concentration level a solid waste becomes a hazardous waste.⁴ This graph indicates the magnitude by which coal ash leachate often exceeds federal drinking water standards and the toxicity characteristic. For example, the highest leaching level for arsenic found by the EPA using the new testing method was 18,000 parts per billion (ppb). This level is 1800 times the federal drinking water standard and over 3 times the level that defines a hazardous waste. Similarly, the highest leaching level for selenium found by the EPA using the new testing method was 29,000 ppb. This level is 580 times the drinking water standard and 29 times the hazardous waste toxicity characteristic level.

⁴ See 40 C.F.R. § 261.44. The toxicity characteristic identifies wastes likely to leach concentrations of contaminants that may be harmful to human health or the environment.

Comparison of EPA Leach Test Results for Coal Ash¹ to Maximum Contaminant Levels (MCLs) and Toxicity Characteristic (TC) Levels

(Concentrations reflect highest level of contaminants documented by 1999 and 2009 EPA reports)



¹ U.S. EPA, Characterization of Coal Combustion Residues from Electric Utilities Using Multi-Pollutant Control Technology – Leaching and Characterization Data (EPA-600/R-09/151) Dec 2009, <http://www.epa.gov/nrmrl/pubs/600r09151/600r09151.html>. Laboratory leach test eluate concentrations for 5.4 ≤ pH ≤ 12.4 and at “own pH” from evaluation of 34 fly ash samples. See Table 13 at 183.

Updated 3/19/2010

In sum, the growing body of data generated by EPA’s Office of Research and Development definitively shows that CCW, when tested using a more accurate leach test, produces leachate containing heavy metals at concentrations harmful to human health and the environment. According to the EPA, TCLP data alone, relied upon by TVA in this EE/CA, are no longer accurate measurements of coal ash toxicity. Therefore, given the availability of new testing protocols that would predict more accurately the extent of leaching from the Kingston ash, it is necessary that TVA conduct such testing. According to the TCLP leach data in the EE/CA, the Kingston ash does not exhibit the characteristic of toxicity for any of the metals tested.⁵ Yet until the ash is tested with the new leaching protocol, one cannot conclude that the CCW does not leach at levels equivalent to a hazardous waste. TVA tested 68 samples of ash.⁶ These samples should be re-tested before any decision is made regarding its on-site or off-site disposal.

⁵ *Id.* at p. 11.

⁶ *Id.* at p. 10.

In addition, in numerous places throughout the EE/CA, TVA relies on the TCLP data to justify a limited consideration of remedial alternatives. For example, because TVA relies on the “fact” (as supported by TCLP testing) that “contaminants are typically bound to the ash,”

TVA concludes that “the reduction of infiltration offered by clay caps is appropriate at the site.”⁷ Therefore, “a clay cap option is carried forward in this EE/CA as a representative type of containment system for use in developing alternatives.”⁸ Other alternatives are also short-circuited by reliance on the TCLP results for the Kingston ash. In Table 3-1 of the EE/CA, “Identification and Screening of Technologies,” TVA states “results of TCLP tests show fly ash has low leachability (below regulatory limits) therefore immobilization/stabilization was considered unnecessary.”⁹ The EE/CA is flawed because TVA never developed alternatives evaluating treatment technologies because they prematurely and without adequate scientific basis determined that they were unnecessary. These conclusions are unwarranted and must be reconsidered after testing the coal ash using the EPA’s more accurate leach test.

⁷ *Id.* at p. 27.

⁸ *Id.*

⁹ *Id.* at 28.

TVA Response: Metals in the ash do not leach readily under site-specific conditions. Several lines of evidence support this conclusion. First, groundwater quality does not exceed drinking water standards after more than 50 years of the ash being in contact with groundwater. This overall evidence integrates site-specific geochemical, hydrostratigraphic, and leaching characteristics to demonstrate that ash does not leach readily. Second, an EPA Science Panel review of potential selenium issues after the ash spill concluded that most metals are not readily leaching off the ash particles spilled into the river, based on available surface water monitoring data. Third, the U.S. Army Engineer Research and Development Center (ERDC) tested samples of ash taken from the Dredge Cell, Emory River, and Stilling Pond using sequential extraction procedures designed to remove metals from the ash with increasingly more “aggressive” solvents. This previous extended leaching work conducted by the ERDC used site water agitated with air and nitrogen, and demonstrated that metal leaching at circumneutral pH values closely mimics site conditions. Results of that study also demonstrated that site-specific metals (such as arsenic and selenium) would not easily become mobile in normal aqueous environments, that is, they do not readily leach from the ash. A copy of that report may be found at the following website: <ftp://erdccftp.erdcc.usace.army.mil/pub/el/Steevens/ERDC%20TVA%20fly%20ash%20Final%20Draft%2010-09-09.pdf>. Fourth, results of Toxicity Characteristic Leaching Procedure (TCLP) testing of ash samples for waste characterization purposes have shown that the TCLP leachate does not exceed threshold limits and that the ash is not a hazardous waste. This provides secondary evidence that the ash does not readily leach metals.

The new EPA leach tests, specifically Proposed Methods 1313 through 1316, are alternate leaching procedures developed in EPA research studies that could theoretically result in greater leaching of metals. These alternate procedures are under development and have not yet been formally adopted. The alternate procedures are being developed specifically to characterize the impact of leaching under a range of plausible field conditions for various disposal or secondary uses. The new leaching procedures are intended to evaluate all kinds of waste materials, not just coal ash, for disposal or re-use under a wide variety of plausible conditions. The particular response of the material to those leaching procedures is to be evaluated relative to the environmental conditions expected for the particular disposal or re-use under consideration. These tests subject the ash to harsh conditions that are not representative of site-specific pH and redox conditions observed or managed at the TVA Kingston site. TVA’s proposed action addresses the site-specific field conditions encountered and the conditions which are expected to be encountered in the future at the Kingston site. Plausible conditions noted in the comment above, such as acid mine drainage, secondary uses of the material, codisposal with other waste products (pyrites or

high-sulfur coal rejects) aren't applicable to the site-specific conditions observed with the retrieved ash or managed under closure of the Dredge Cell.

It should be noted that future sampling and analysis plans for characterization of the river system include additional sampling of ash and groundwater to determine geochemical conditions and leaching characteristics for modeling fate and transport of metals and radionuclides to the river. These tests will include soil leaching column tests and sequential extraction procedures. TVA will be assessing the geochemical conditions and conducting additional leach/column tests based on recommendations from EPA's National Risk Management Research Laboratory (Groundwater and Ecosystem Restoration Division) in Ada, Oklahoma.

II. Further Investigate the Environmental Risks, Including CCW Leachate Treatment, at Arrowhead Landfill in Alabama and Chestnut Ridge Landfill in Tennessee.

This EE/CA does not examine the current CCW disposal problems at the Arrowhead landfill, or the likelihood that other EPA-approved landfills, such as the Chestnut Ridge landfill, may experience similar problems with CCW disposal. TVA's current CCW disposal site in Perry County, Alabama has been widely criticized and continues to be controversial due to financial problems, environmental issues, and environmental justice concerns.¹⁰ Although the Chestnut Ridge Landfill is only being considered for 760,000 cubic yards of CCW from the Berkshire Slough (North Embayment), both landfills should be examined to determine compliance with CERCLA offsite disposal regulations and whether the disposal of ash is currently threatening health and the environment.¹¹

¹⁰ Shaila Dewan, *Clash in Alabama Over Landfill's Plans to Take Tennessee Coal Ash*, NEW YORK TIMES (Aug 30, 2009); Scott Barker, *Landfill owner files for Chapter 11: TVA, contractor say action won't stop coal ash spill shipments*, THE KNOXVILLE NEWS-SENTINEL (Jan. 28, 2010); AP Alert (Alabama), *Lawsuit planned over landfill's coal ash shipments*, ASSOCIATED PRESS (Feb. 5, 2010); Bill Poovey, *Plant in Alabama stops taking coal ash drainage*, ASSOCIATED PRESS (Feb. 6, 2010).

¹¹ TVA EE/CA, *supra* note 1 at 29.

Of special concern is the ability of each landfill to treat CCW leachate. TVA should investigate whether wastewater treatment plants ("WWTP") in Alabama and in the Knoxville area are equipped to remove metals and other CCW constituents from CCW wastewaters before committing to dispose of CCW at these landfills. CCW leachate should be collected at each landfill and treated, most likely by a local WWTP. However, in Perry County, the local WWTP had problems treating CCW leachate, and the company charged with transporting leachate for treatment has stopped accepting it.¹² TVA should address these problems before shipping CCW offsite, and ensure that similar problems will not arise at the Tennessee landfill.

¹² Ben Raines, *Mobile firm rejects waste*, PRESS-REGISTER (Mobile, AL) (Feb. 6, 2010 (Liquid Environmental Solutions in Mobile announced that it would no longer accept shipments of waste liquids from the Perry County landfill).

TVA Response: Please note that Alternatives 1 and 2 do not require disposal at any specific landfill; the Arrowhead and Chestnut Ridge Landfills were used as representative disposal options, however other permitted landfills could be used. If the decision were to be made to dispose of the retrieved ash offsite, the facility or landfill selected would have to comply with RCRA Subtitle D permitting requirements for operation and disposal of industrial wastes. These requirements include the use of a synthetic liner, leachate collection system, groundwater monitoring, financial assurance, and closure and post-closure care as provided in Section XVII of the AOC. In addition, prior to any offsite shipment, TVA would obtain

EPA's determination that the proposed receiving facility is operating in compliance with the requirements of 40 C.F.R. § 300.440, as well as appropriate health and safety standards.

III. Investigate the Full Scope of Environmental Risks at the Arrowhead Landfill in Uniontown, Alabama.

The EE/CA must ensure safe off-site disposal of the TVA ash in permitted, composite-lined landfills only after ensuring that such landfills are operating in a manner that protects the long-term health and environment of the host communities. Both Alternative 1 and Alternative 2 require the off-site disposal of substantial quantities of coal ash at the Arrowhead Landfill in Uniontown, Alabama.

Alternative 1 requires the off-site disposal of approximately 2.8 million cubic yards of coal ash, and Alternative 2 requires the disposal of approximately 6.8 million cubic yards of ash. If options to truck portions of this waste to a subtitle D landfill in Tennessee are chosen, these totals would be reduced slightly.

Wholly absent from the EE/CA, however, is any analysis of the impact to public health and the environment of disposing of these prodigious quantities of coal ash in the Arrowhead Landfill. For the past year, trainloads of TVA ash have been arriving daily in Uniontown, Alabama at the rate of approximately 10,000 tons per day. Yet, to date, no comprehensive analyses of the impacts to groundwater, surface water or air quality have been undertaken. Neither the Alabama Department of Environmental Management (ADEM) nor the EPA has required the collection of data sufficient to quantify such impacts. TVA appears not to have looked into the nature of the many citizen complaints of degradation of air and water near the landfill,¹³ the notices of intent to sue sent to the owners of the landfill,¹⁴ the outstanding notice letter pertaining to violations of the federal Clean Water Act involving landfill leachate,¹⁵ the outstanding notice letters sent to the operators of the landfill on behalf of 155 residents of Uniontown for violations of the federal Clean Air and Solid Waste Disposal Acts,¹⁶ and a Petition to Rescind the EPA determination that the Arrowhead Landfill is acceptable for the receipt of CERCLA waste.¹⁷ This is wholly unacceptable. In the absence of data and analysis in the EE/CA, it is inappropriate to designate Arrowhead Landfill as the recipient of additional waste shipments of this magnitude before such an investigation is completed.

¹³ See, for example, the Complaint regarding off-site discharge of contaminated water at Arrowhead Landfill Perry County Associates, LLC, SWDF Permit No. 53-03, filed with ADEM and the US EPA by David A. Ludder, Esq., dated December 17, 2009, available at <http://www.enviro-lawyer.com/News-LawOfficeNews.html>.

¹⁴ See Notice of Intent to File Suit for Violation of Criteria for Municipal Solid Waste Landfills under the Solid Waste Disposal Act and Notice of Intent to File Suit for Violation of State Implementation Plan for Alabama under the Clean Air Act to Perry County Associates, LLC, Inc. by David A. Ludder, Esq. on behalf of residents of Uniontown, AL, dated December 7, 2010, available at <http://www.enviro-lawyer.com/News-LawOfficeNews.html>.

¹⁵ See Notice of Intent to File Suit under the Clean Water Act sent to the Demopolis Wastewater Treatment Plant and Collection System by David A. Ludder, Esq. on behalf of Conservation Alabama Foundation, dated February 9, 2010, available at <http://www.enviro-lawyer.com/News-LawOfficeNews.html>.

¹⁶ See Notice of Intent to File Suit for Violation of Criteria for Municipal Solid Waste Landfills under the Solid Waste Disposal Act and Notice of Intent to File Suit for Violation of State Implementation Plan for Alabama under the Clean Air Act to Phillips and Jordan, Inc by David A.

Ludder, Esq. on behalf of 155 residents of Uniontown, AL, dated February 2, 2010, available at <http://www.enviro-lawyer.com/News-LawOfficeNews.html>, attached as Appendices D and E.

¹⁷ See Petition to Rescind Determination that the Perry County Associates, LLC Landfill is Acceptable for the Receipt of CERCLA Waste filed by David A. Ludder, Esq. on behalf of Uniontown residents, dated February 15, 2010, available at <http://www.enviro-lawyer.com/News-LawOfficeNews.html>.

TVA Response: Please note that Alternatives 1 and 2 do not require disposal at any specific landfill; the Arrowhead and Chestnut Ridge Landfills were used as representative disposal options, however other permitted landfills could be used. If the decision were to be made to dispose of the retrieved ash offsite, the facility or landfill selected would have to comply with RCRA Subtitle D permitting requirements for operation and disposal of industrial wastes. These requirements include the use of a synthetic liner, leachate collection system, groundwater monitoring, financial assurance, and closure and post-closure care as provided in Section XVII of the AOC. In addition, prior to any offsite shipment, TVA would obtain EPA's determination that the proposed receiving facility is operating in compliance with the requirements of 40 C.F.R. § 300.440, as well as appropriate health and safety standards..

IV. Site Characterization of the Arrowhead Landfill Is Needed to Determine Current and Potential Impacts on Groundwater.

In order to ensure that disposal of coal ash in the Arrowhead Landfill is not currently degrading groundwater and does not have the potential in the future to degrade area groundwater, a geologic and hydrologic study of the site must be completed. This study should include an analysis of the site's hydrology, including determining whether voids beneath the landfill could facilitate off-site migration of contaminants, determination of the direction of groundwater flow and rate of flow, and determination of background groundwater quality. In addition, a study of current and potential uses of groundwater in the area must be completed, including an analysis of the location of groundwater wells, their depth, and their use.

While the EPA recently conducted an analysis of the available groundwater data collected from semi-annual monitoring by the landfill operators, this analysis is insufficient to determine present and future impacts to groundwater.¹⁸ The analysis is inadequate because of the landfill owner/operator's failure to determine background quality of the groundwater, the limited number of groundwater wells, the location of existing wells, the condition and construction of groundwater wells, the limited sampling parameters of the current program, and the infrequency of the monitoring period.

¹⁸ See Letter from G. Alan Farmer, Director, RCRA Division, EPA Region 4 to Lisa Evans, Earthjustice and Reverend James R. Murdock, Concerned Citizens of Perry County, Review of Groundwater Monitoring Data for the Perry County Associates Landfill near Uniontown, Alabama, dated March 22, 2010.

Specifically, inadequacy of the current groundwater monitoring regime includes the characterization of baseline water quality by only four sampling events over a period of 42 days. Pursuant to the RCRA regulations, Part 265 Interim Status regulations for hazardous waste landfills, four background measurements are required during the first year of monitoring by quarterly sampling.¹⁹ It is highly questionable whether baseline water quality could be determined by the very limited sampling conducted by the Arrowhead Landfill operators. Further, the sampling parameters required by the landfill permit do not include primary constituents of concern for coal ash, including boron, sulfate, manganese and molybdenum.²⁰ Without the quarterly monitoring of such common CCW contaminants, it is unlikely that accurate and timely detection of contaminant migration can be ascertained.

Third, the extremely high pH reported in groundwater wells suggests a problem with the construction and installation of the wells. Lastly, conducting only semi-annual monitoring is not sufficient to produce a database that can accurately characterize groundwater impacts.

¹⁹ See 40 C.F.R. § 265.92(c)(1).

²⁰ See Hensel, Bruce, Kenneth L Ladwig, and Karen V. Summers. Remediation of Groundwater at Coal Combustion Product Management Facilities: Driving Issues and Future Trends, 2009 World of Coal Ash Conference Abstract, dated May 2009, available at www.flyash.info/2009/a134-hensel2009abs.pdf.

TVA Response: Please note that Alternatives 1 and 2 do not require disposal at any specific landfill; the Arrowhead and Chestnut Ridge Landfills were used as representative disposal options, however other permitted landfills could be used. If the decision were to be made to dispose of the retrieved ash offsite, the facility or landfill selected would have to comply with RCRA Subtitle D permitting requirements for operation and disposal of industrial wastes. These requirements include the use of a synthetic liner, leachate collection system, groundwater monitoring, financial assurance, and closure and post-closure care as provided in Section XVII of the AOC. In addition, prior to any offsite shipment, TVA would obtain EPA's determination that the proposed receiving facility is operating in compliance with the requirements of 40 C.F.R. § 300.440, as well as appropriate health and safety standards.

V. Investigation of Impacts on Air Quality Is Needed at the Arrowhead Landfill.

In view of the persistent complaints of Uniontown residents of noxious odors emanating from the Arrowhead Landfill²¹ and the threats posed by fugitive dust when coal ash becomes airborne, TVA must examine whether the disposal of the Kingston coal ash at the Arrowhead landfill is adversely affecting air quality. To date, adequate air monitoring and control measures are not in place to quantify or prevent adverse impacts.

²¹ See Notice of Intent to Sue, *supra* at note 15.

The threat to human health from inhalation of the Kingston coal ash was examined by scientists from Duke's Nicholas School of the Environment, Duke's Pratt School of Engineering, the Duke Comprehensive Cancer Center, and the Georgia Institute of Technology.²² The peer-reviewed study that resulted from their analysis found a "high probability of atmospheric resuspension of fine fly ash particulates, which are enriched in toxic metals and radioactivity, [that] could have a severe health impact on local communities and workers."²³

²² See Ruhl, L. Vengosh, A, Dwyer, G. Hsu-Kim, H, Deonarine, A, Bergin, M., Kravchenko, J. Survey of the Potential Environmental and Health Impacts in the Immediate Aftermath of the Coal Ash Spill in Kingston, Tennessee. *Environ.Sci.Technol.* 2009, 43(22), 6326–6333.

²³ *Id.* at 6331.

Scientists analyzed the TVA coal ash currently being disposed at the Arrowhead Landfill, and their analysis revealed that the Kingston ash contains high levels of toxic metals and radioactivity, including 75 parts per million of arsenic, 150 parts per billion of mercury, and 8 picocuries per gram of total radium. According to the study, the high concentrations of trace metals and radioactivity in the bulk ash "are expected to magnify, as fine fractions of fly ash (which may be resuspended and deposited in the human respiratory system) are typically 4-10 times enriched in metals relative to the bulk ash and the coarse size fraction."²⁴ In addition, the study notes that the "toxic metal content in coal ash, the sizes of fly ash particulates, and the ionizing radiation (IR) exposure (both incorporated and external) may act synergistically or, less frequent, antagonistically, affecting human health directly (predominantly through inhalation of contaminated air)."²⁵

²⁴ *Id.*

²⁵ *Id.*

The study also notes that coal ash is a Group I human carcinogen associated with increased risks of skin, lung, and bladder cancers. Arsenic and radium exposures in humans are associated with increased risks of skin, lung, liver, leukemia, breast, bladder, and bone cancers for exposure predominantly due to chronic ingestion or chronic inhalation, with the dose-response curve dependent on location, sources, and population susceptibility and/or tolerance.²⁶ The study states that coal ash particulates:

affect lung epithelial and red blood cells in animal studies and human in vitro models, causing inflammation, changing the sensitivity of epithelia, altering immunological mechanisms and lymphocyte blastogenesis, and increasing the risk of cardiopulmonary disease (e.g., pulmonary vasculitis/hypertension). Individuals with pre-existing chronic obstructive pulmonary disease, lung infection, or asthma are more susceptible to the coal ash affliction. Several epidemiological studies have proved the significant health hazards (such as enhanced risk for adverse cardiovascular events) of fine-particulate air pollution for individuals with type II diabetes mellitus and people with genetic and/or disease-related susceptibility to vascular dysfunction, who are a large part of the population.²⁷

²⁶ *Id.*

²⁷ *Id.*

Lastly, in addition to the threats posed by inhalation of trace metals such as arsenic and lead, the study also identifies risk from inhalation of radium in the Kingston ash:

Radium-226 and 228Ra, which are the main sources of low-dose IR exposure in coal ash, can remain in the human lung for several months after their inhalation, gradually entering the blood circulation and depositing in bones and teeth with this portion remaining for the lifetime of the individual. When inhaled, the radionuclides can affect the respiratory system even without the presence of the other coal ash components. Thus, the airborne particles containing radioactive elements inhaled by cleanup workers of the nuclear accident at the Chernobyl nuclear power plant caused bronchial mucosa lesions, in some cases preneoplastic, with an increased susceptibility to the invasion of microorganisms in bronchial mucosa. Consequently, the combined radioactivity of coal ash at the TVA spill, together with other enriched trace metals such as Ni, Pb, and As, may increase the overall health impact in exposed populations, depending on duration of exposure, and particularly for susceptible groups of the population.²⁸

²⁸ *Id.*

Nothing in the current permit at the Arrowhead Landfill requires the owner or operator of the landfill to take any specific precautions to eliminate the threat of airborne ash. While the permit does require placement of “daily cover,” the permit specifically allows the use of coal ash as an “alternative daily cover material” to cover the TVA ash.²⁹ In view of the absence of any specific permit conditions requiring control of fugitive dust, the allowance of coal ash as a daily cover creates a further potential for injury.

²⁹ See Section III.H.2. of the Permit Modification for the Arrowhead Landfill, dated July 20, 2009, available at <http://www.arrowheadlandfill.com/Solid%20Waste%20Permit.pdf>.

Current air monitoring at the landfill, obtained by a Freedom of Information Act Request, reveals that the Arrowhead Landfill operators are only conducting PM 10 monitoring. This has produced a data set that is inadequate to determine potential human health impacts to residents near the landfill. Because a significant portion of the TVA coal ash contains particles smaller than PM 10, monitoring for PM 2.5 (respirable particles) is essential. TVA

has acknowledged that such enhanced air quality monitoring is necessary to determine potential health threats from the coal ash, and TVA currently conducts PM 2.5 monitoring at the Kingston spill site.

The EE/CA must resolve this lack of relevant data concerning both fugitive dust and noxious odors prior to approval of the Arrowhead Landfill as the designated off-site disposal site for millions more tons of toxic waste.

TVA Response: Please note that Alternatives 1 and 2 do not require disposal at any specific landfill; the Arrowhead and Chestnut Ridge Landfills were used as representative disposal options, however other permitted landfills could be used. If the decision were to be made to dispose of the retrieved ash offsite, the facility or landfill selected would have to comply with RCRA Subtitle D permitting requirements for operation and disposal of industrial wastes. These requirements include the use of a synthetic liner, leachate collection system, groundwater monitoring, financial assurance, and closure and post-closure care as provided in Section XVII of the AOC. In addition, prior to any offsite shipment, TVA would obtain EPA's determination that the proposed receiving facility is operating in compliance with the requirements of 40 C.F.R. § 300.440, as well as appropriate health and safety standards.

VI. Investigation of Impacts to Surface Water Quality from the Arrowhead Landfill.

There have been numerous reports of the discharge of coal ash-laden water to surface waters near the Arrowhead Landfill.³⁰ These discharges have been brought to the attention of ADEM and the EPA, but no investigation into the effect of these discharges has occurred. Samples taken by concerned citizens reveal arsenic levels in ditches that flow close to residential properties at levels far above federal drinking water standards. One sample revealed an arsenic level of 0.840 mg/L in the surface water—84 times the maximum contaminant level for arsenic. These discharges appear to flow from various sources, including the washing of trucks and train cars at unloading stations, uncontrolled runoff, and uncontrolled leachate. In view of the proximity of residences to the landfill, an investigation of area ditches and streams is needed as well as an evaluation of the sufficiency of the control of runoff and leachate at the landfill.

³⁰ See, e.g., Complaint of David A. Ludder, *supra* at fn. 12.

TVA Response: Please note that Alternatives 1 and 2 do not require disposal at any specific landfill; the Arrowhead and Chestnut Ridge Landfills were used as representative disposal options, however other permitted landfills could be used. If the decision were to be made to dispose of the retrieved ash offsite, the facility or landfill selected would have to comply with RCRA Subtitle D permitting requirements for operation and disposal of industrial wastes. These requirements include the use of a synthetic liner, leachate collection system, groundwater monitoring, financial assurance, and closure and post-closure care as provided in Section XVII of the AOC. In addition, prior to any offsite shipment, TVA would obtain EPA's determination that the proposed receiving facility is operating in compliance with the requirements of 40 C.F.R. § 300.440, as well as appropriate health and safety standards.

VII. The EE/CA Must Address Environmental Justice Concerns Pertaining to Off-Site Disposal.

It is clear from the EE/CA that important environmental justice (“EJ”) concerns have once again been omitted in the consideration of off-site disposal options for the toxic coal ash from the TVA Kingston plant. These concerns should be addressed in an environmental justice assessment under Executive Order 12898, Federal Actions to Address

Environmental Justice in Minority Populations and Low-Income Populations, signed by President William J. Clinton in 1994.³¹

³¹ William J. Clinton, Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, available at http://www.epa.gov/compliance/resources/policies/ej/exec_order_12898.pdf (accessed April 4, 2010).

Executive Order 12898 is “designed to focus the attention of federal agencies on the human health and environmental conditions in minority communities and low-income communities. It requires federal agencies to adopt strategies to address environmental justice concerns within the context of agency operations.”³² In December 1997, the President’s Council on Environmental Quality (CEQ) issued environmental justice guidance for integrating EJ into the National Policy Act.³³ And in April 1998, the EPA adopted the Final Guidance For Incorporating Environmental Justice Concerns in EPA’s NEPA Compliance Analyses.

³² U.S. EPA, *Final Guidance For Incorporating Environmental Justice Concerns in EPA’s NEPA Compliance Analyses*. Washington, DC: EPA, April 1998.

³³ President’s Council on Environmental Quality, *Environmental Justice Guidance Under the National Environmental Policy Act*, December 10, 1997.

The first gross omission of environmental justice concerns by TVA and EPA was made when the agencies failed to conduct an EJ assessment or EJ analysis prior to the July 2, 2009 determination to dispose of the coal ash from the TVA spill at the Arrowhead Landfill in Perry County, Alabama, located approximately 330 miles from the spill site. An environmental justice red flag should have been raised immediately based on the following:

(1) TVA’s plan called for shipping toxic coal ash by railcar from the mostly white east Tennessee Roane County (95.2 percent white and 13.9 percent of its residents living in poverty) to the Arrowhead Landfill located in the heart of the mostly black and poor Perry County (69 percent African-American with more than 32 percent of its residents living in poverty), in the heart of the Alabama “blackbelt.”³⁴

³⁴ U.S. EPA Press Release, EP:A Approves Plan for Disposal of Coal Ash from TVA Kingston Site at the Arrowhead Landfill in Perry County, Alabama, available at <http://yosemite.epa.gov/opa/admpress.nsf/2ac652c59703a4738525735900400c2c/02ec745d4bba7547852575e700476a8f!OpenDocument>, July 2, 2009 (accessed April 4, 2010).

(2) The nature of the waste spilled—coal combustion waste—was under review by the EPA for redesignation as a hazardous waste.

(3) The large volume of coal ash involved—up to 6.8 million tons.

(4) The long, sordid history of disparate waste facility siting and discriminatory disposal of toxic waste in minority communities, as documented in the 2007 Toxic Wastes and Race at Twenty report and numerous other studies.³⁵

³⁵ Robert D. Bullard, Paul Mohai, Robin Saha, and Beverly Wright, *Toxic Wastes and Race at Twenty*. Cleveland, OH: United Church of Christ, March 2007.

(5) The legacy of unequal protection and discriminatory waste “dumping in Dixie” -- practices and policies that target black communities for toxic waste disposal from cleanups in white communities.³⁶ A case in point is the 1978 cleanup of PCB-contaminated soil in mostly white areas in North Carolina and the decision by EPA Region 4 and the State of North Carolina to dispose of the toxic waste in mostly black and poor Warren County in 1982—giving rise to the modern EJ movement. By 1993, the Warren County disposal facility was failing with 13 feet of water trapped in the landfill.³⁷ The PCB landfill became the most recognized environmental justice symbol in the county. Despite the stigma, Warren County also became a symbol of triumph. After 21 years of living with the 142-acre toxic waste dump, in 2003, the

threats to the community were officially recognized and state and federal sources spent \$18 million to detoxify or neutralize contaminated soil stored at the Warren County PCB landfill.³⁶

³⁶ Robert D. Bullard, *Dumping in Dixie: Race, Class and Environmental Quality*. Boulder: Westview Press, 2000.

³⁷ Exchange Project, *Real People, Real Stories: Afton, NC (Warren County)*. Chapel Hill: Department of Health and Health Education, University of North Carolina at Chapel Hill, September, 2006, available at <http://www.exchangeproject.unc.edu/documents/pdf/real-people/Aquadale%20long%20story%2007-0426%20for%20web.pdf> (accessed April 4, 2010).

³⁸ Wade Rawlins, "Dump's Days Fade," *The News & Observer*, November 11, 2003, p. 1.

- (6) EPA Region 4 and the State of Tennessee have a history of discriminatory decisions allowing toxic wastes from industrial spills and accidents to be cleaned up in white communities and disposed of in black communities. The Dickson County case is yet another example where EPA Region 4 and the State of Tennessee sanctioned the removal of toxic waste from white communities (Dickson County is only 4.5 percent black) to be transported to and disposed in a black community, in the Dickson County Landfill, located in the heart of Dickson's predominately black Eno Road community.³⁹

³⁹ See Tetra Tech EM Inc., *Dickson County Landfill Reassessment Report*. Prepared for the U.S. EPA (September 18, 2003), pp. 16-17, available at http://www.epa.gov/region4/foiapgs/readingroom/dickson_co_landfill/Sept2003.pdf (accessed April 4, 2010); Robert D. Bullard, Paul Mohai, Robin Saha, and Beverly Wright, "Toxic Wastes and Race at Twenty: Why Race Still Matters After All of These Years," *Lewis & Clark Environmental Law Journal* 38 (2): 2008; Robert D. Bullard and Beverly Wright, "Disastrous Response to Natural and Man-Made Disasters: An Environmental Justice Analysis Twenty-Five Years After Warren County," *UCLA Journal of Law and Environmental Policy* 26: 2008.

Clearly, an environmental justice analysis should have been conducted between December 22, 2008 (the date of the spill) and July 2, 2009 (the date of the EPA's determination of the suitability of the Arrowhead Landfill)—a period of more than six months. The EJ implications became problematic when the EPA/TVA's preferred site involved shipping toxic waste along a 330-mile corridor by rail from East Tennessee to the heart of the Alabama Blackbelt in Perry County. An EJ analysis using geographic information system (GIS) mapping to assess the racial and income implications along the route at alternative off-site waste disposal facilities could easily have been accomplished. Now the EPA/TVA is about to embark on the largest off-site removal of hazardous substances ever conducted under Superfund. Yet documents retrieved under several Freedom of Information Act requests show that no EJ analysis has been conducted to date. It has now been more than 15 months since the Kingston coal ash spill. A second decision to dispose of coal ash at the Arrowhead Landfill will compound the first decision. And clearly, EPA and TVA have not adequately addressed environmental justice impacts of the initial decision. At the very least, EPA Region 4 and TVA should have been actively investigating the current problems at the Arrowhead Landfill, holding public meetings and soliciting comments from the affected community.

TVA must now analyze the environmental justice impacts of its decision to dispose of the Kingston coal ash in Perry County. TVA should prepare a supplemental EE/CA that identifies alternative offsite disposal sites and analyzes the environmental justice impacts, if any, at these sites. The revised EE/CA should demonstrate the commitment to provide equal protection and equal enforcement of the law when it comes to the black residents of Perry County, Alabama. Such an EJ analysis should assess the public health,

socioeconomic, and equity implications of disposing up to 6.8 million tons of ash in the low-income and minority community of Uniontown. In addition, TVA and/or the EPA should promptly make funds available to the Uniontown community, as they have to the Citizens Action Group (“CAG”) in Harriman, Tennessee, to enable the community to participate meaningfully in the decision making process. This non-time critical removal action presents TVA and EPA Region 4 with the opportunity, not realized to date, to integrate environmental justice into its decisionmaking.⁴⁰ Executive Order 12898 requires no less. Failures over the years have exposed too many low-income and minority communities like Warren County, North Carolina and Perry County, Alabama to unnecessary elevated environmental health risks.⁴¹ TVA and EPA should not move forward with the decision for off-site disposal until an EJ analysis is completed and the Uniontown community is brought meaningfully into the decision-making process.

⁴⁰ Robert D. Bullard, "Unequal Environmental Protection: Incorporating Environmental Justice in Decision Making," Pp. 237-266 in Adam M. Finkel and Dominic Golding, eds., *Worst Things First? The Debate over Risk-Based National Environmental Priorities*. Washington, DC: Resources for the Future, 1994. See also, Robert D. Bullard, "Assuring Environmental Justice for All." Pp. 187-212 in Tavis Smiley, *Covenant with Black America*. Chicago: Third World Press, 2006; Robert D. Bullard, *The Quest for Environmental Justice: Human Rights and the Politics of Pollution*. San Francisco: Sierra Club Books, 2005.

⁴¹ Robert D. Bullard, "Need for EPA Inspector General Investigation of Region 4 Treatment of Black Communities," Dissident Voice, September 14, 2009, found at <http://dissidentvoice.org/2009/09/need-for-epainspector-general-investigation-of-region-4-treatment-of-black-communities> (accessed on April 4, 2010).

TVA Response: TVA agrees that environmental justice impacts should be evaluated during the selection of alternative offsite disposal sites. Such analysis should assess the public health, socioeconomic, and equity implications of disposing ash in low-income, minority communities. Please note that Alternatives 1 and 2 do not require disposal at any specific landfill; the Arrowhead and Chestnut Ridge Landfills were used as representative disposal options, however other permitted landfills could be used. If the decision were to be made to dispose of the retrieved ash offsite, TVA would evaluate alternative disposal locations and include environmental justice evaluations in the selection.

VIII. TVA Should Not Construct Dikes Around the Failed Dredge Cell or Elsewhere at Kingston Using Coal Ash.

The EE/CA states that, “under each of the three alternatives, the conceptual dike would be constructed using dewatered ash, compacted in thin lifts.”⁴² There is no discussion in the EE/CA concerning the potential problems involving construction using coal ash. Use of ash for construction of the dike, however, ensures continued contact between CCW and water and presents perpetual source for leaching of contaminants. Further, there is no evidence in the EE/CA that demonstrates that ash is a stable material for long-term waste containment. In contrast, the engineers who studied the root cause of the Kingston failure found that soft foundation soils and dike construction from ash contributed to the dredge cell failure.⁴³ Because coal ash, particularly the Kingston coal ash, has not proven to be a stable material for long-term waste containment, TVA should not use CCW to construct a new dike around the failed dredge cell or anywhere else at the Kingston site.

⁴² TVA EE/CA, *supra* note 1 at xi.

⁴³ TVA OIG Report, Review of the Kingston Fossil Plant Ash Spill Root Cause Study (July 23, 2009).

TVA Response: TVA will not construct dikes around the failed Dredge Cell or elsewhere using ash. For clarification, please note that the EE/CA states (paragraph 1 on page xi) that

the perimeter dikes would be constructed using compacted soil, not ash, placed on a crushed rock working platform, which would be further reinforced with soil/cement columns (paragraph 3 on page xi). The EE/CA further states (paragraph 2 on page xi) that the conceptual cell fill would be constructed by dry stacking using dewatered ash, compacted in thin lifts. Therefore, the dikes (perimeter berms) would be constructed of soil on a stabilized foundation; the fill inside the cell would be dry-stacked ash.

IX. TVA Should Revise Closure Plans for the Failed Dredge Cell and Ash Pond.

A. TVA Must Consider Using a Synthetic Cap for the Dredge Cell and Ash Pond

The closure plans for both the dredge cell and ash pond appear inadequate. First, TVA should install a synthetic cover at closure. As discussed above, TVA should be using new EPA leach tests instead of the TCLP, and preparing closure plans that are protective of the environment over the longterm, taking into consideration the full leaching potential of the coal ash. TVA's current proposal in the EE/CA only requires a soil cover over the dredge cell and only 2 feet of clay and 1 foot of topsoil over the area.⁴⁴ The same plan has been proposed for the ash pond, including closure with a cover of 2 feet of clay and 1 foot of topsoil, seeding, and mulching.⁴⁵ TVA should install a synthetic cap on both the dredge cell and ash pond or show that the clay and soil covers proposed in the EE/CA provides equivalent or better protection from water infiltration.

⁴⁴ TVA EE/CA, *supra* note 1 at 38-39.

⁴⁵ TVA EE/CA, *supra* note 1 at 38-39.

TVA Response: For clarification, please note that the EE/CA presents the revised closure plan for the failed Dredge Cell and Ash Pond. Closure will be in accordance with Tennessee Solid Waste Rule 1200-1-7. Please note further that the EE/CA has used a compacted clay cover as a representative closure option. However, the EE/CA states (Section 3.1, page 27) that other low-permeability caps, such as a composite clay liner system may be used. The EE/CA further states, in evaluating each of the three alternatives in Section 4, that an alternate final cover system may be used provided that it provides equivalent or superior performance in minimizing infiltration. TVA will evaluate a synthetic cover during that final design.

Please also see response to comment "I". Future sampling and analysis plans for characterization of the river system include additional sampling of ash and groundwater to determine geochemical conditions and leaching characteristics for modeling fate and transport of metals and radionuclides to the river. These tests will include soil leaching column tests and sequential extraction procedures.

B. TVA Must Commit to Long-term Monitoring After Closure of the Failed Dredge Cell and Ash Pond

TVA's current monitoring plan should be extended to ensure long-term protection of the environment. TVA should commit to a 30-year, post-closure monitoring plan. The proposed monitoring plan allows TVA to reduce monitoring "once stable conditions are confirmed for four quarters," to a semi-annual basis, and then cease monitoring altogether. Since CCW remains in the dredge cell in contact with groundwater, and groundwater underneath the cell and water from the cell flow into surface water, TVA should commit to monitoring the failed dredge cell for a minimum of 30 years to ensure safety and environmental health. Termination of monitoring should be permitted only after a study is completed of all monitoring data, including consideration of adverse impacts on all receiving surface water bodies.

TVA Response: Post-closure monitoring will be performed in accordance with TDEC rule 1200-1-7-.04(d), which requires that post-closure care be continued for 30 years after the date of final completion of closure of the disposal facility.

X. Investigate the Environmental Risk and Sufficiency of Permit Conditions at the Chestnut Ridge Landfill in Anderson County, Tennessee.

The EE/CA does not provide sufficient information on the adequacy of the Chestnut Ridge Landfill in Anderson County, Tennessee to accept Kingston coal ash. The EE/CA identified this landfill, 50 miles from the Kingston site, as a potential recipient of approximately 760,000 cubic yards of ash. The EE/CA states that it is “approved by the EPA to handle CERCLA waste,” but provides no specific information regarding its capability to safely handle the disposal of coal ash.⁴⁶ Questions regarding the adequacy of the landfill’s groundwater and air monitoring programs are not addressed. If, for example, the Chestnut Ridge Landfill is a state-permitted subtitle D landfill, this, alone, does not guarantee that an adequate groundwater monitoring program is in place. Tennessee regulations pertaining to subtitle D landfills do not require monitoring for common coal contaminants such as boron, manganese, molybdenum and sulfate.⁴⁷ Nothing in the EE/CA indicates that there is any air monitoring at the landfill, nor is there information regarding the community in which the landfill is located. The EE/CA should provide supplemental information to fill these gaps and, in particular, should provide documentation that compliance and monitoring programs are sufficient to address the potential health and environmental threats posed by disposal of large quantities of coal ash.

⁴⁶ TV EE/CA *supra* note 1 at 35.

⁴⁷ See Tenn. Comp. R. & Regs. 1200-1-7-.04.

TVA Response: Please note that Alternatives 1 and 2 do not require disposal at any specific landfill; the Arrowhead and Chestnut Ridge Landfills were used as representative disposal options, however other permitted landfills could be used. If the decision were to be made to dispose of the retrieved ash offsite, the facility or landfill selected would have to comply with RCRA Subtitle D permitting requirements for operation and disposal of industrial wastes. These requirements include the use of a synthetic liner, leachate collection system, groundwater monitoring, financial assurance, and closure and post-closure care as provided in Section XVII of the AOC. In addition, prior to any offsite shipment, TVA would obtain EPA’s determination that the proposed receiving facility is operating in compliance with the requirements of 40 C.F.R. § 300.440, as well as appropriate health and safety standards.

XI. Conclusion

For the foregoing reasons, we urge TVA to correct the significant deficiencies in the EE/CA that require additional investigation and clarification, and choose an action plan that removes as much CCW as possible from the dredge cell and the embayment and minimizes long-term reliance on the failed dredge cell as a waste containment unit.

TVA Response: TVA appreciates receiving your comment recommending that as much ash as possible be removed from the Dredge Cell and the embayment, so as to minimize long-term reliance on the failed Dredge Cell as a waste containment unit. TVA will take your recommendation under consideration during selection of the preferred removal action.

ATTACHMENT C
Applicable or Relevant and Appropriate Requirements (ARARs)

APPENDIX C
Potential ARARs and TBC Guidance for Non-Time-Critical CERCLA Response Actions for the 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)

**Potential ARARs and TBC Guidance for Non-Time-Critical CERCLA Response Actions for the 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)
	Stream or other waterbody flows shall support the fish and aquatic life criteria.		TDEC 1200-4-3-.03(3)(o)

**Potential ARARs and TBC Guidance for Non-Time-Critical CERCLA Response Actions for the Kingston Fly Ash Recovery Project,
Roane County, Tennessee**
(continued)

Media/Resource/Action	Requirement	Prerequisite	Citation
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)
Restoration of on-site soils	The concentration of radium-226 in land averaged over any area of 100 square meters shall not exceed the background level by more than 5pCi/g, averaged over the first 15 cm of soil below the surface and 15pCi/g averaged over 15cm thick layers of soil more than 15cm below the surface.	Presence of radium in on-site soils – relevant and appropriate	40 CFR 192.12(a)(1) and (2)

**Potential ARARs and TBC Guidance for Non-Time-Critical CERCLA Response Actions for the Kingston Fly Ash Recovery Project,
Roane County, Tennessee**
(continued)

Media/Resource/Action	Requirement	Prerequisite	Citation
Location-specific ARARs			
<i>Floodplains</i>			
Presence of floodplain	An evaluation shall consider (1) the effect of the proposed action on natural and beneficial floodplain values and (2) alternatives that would eliminate or minimize such effects. The initiating office shall determine if there is no practicable alternative to siting in a floodplain. If a determination of no practicable alternative is made, all practical measures to minimize impacts on the floodplain shall be implemented. If at any time prior to commencement of the action it is determined that there is a practicable alternative that will avoid affecting floodplains, the proposed action shall not proceed.	Federal actions that involve potential impacts to, or take place within, floodplains — to be considered	Tennessee Valley Authority Instruction, Section IX, Environmental Review: Procedures for Compliance with the National Environmental Policy Act, April 28, 1983, which incorporates E011988, Section 2(a)(2) requirements.
<i>Aquatic resources</i>			
Waters of the State as defined in TCA 69-3-103(33)	Must comply with the substantive requirements of the Aquatic Resources Alteration Permit (ARAP) Individual Permit; § 401 Water Quality Certification; or General Permit.	Action potentially altering the physical, chemical, radiological, biological, or bacteriological properties of any Waters of the State, including wetlands. These activities include, but are not limited to: the discharge of dredge or fill material, dredging, stream channel modifications, water withdrawals, wetlands alterations including drainage, and other construction activities which result in the alteration of the waters of the State — applicable	TDEC 1200-4-7
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 USC 661 <i>et seq.</i>)

**Potential ARARs and TBC Guidance for Non-Time-Critical CERCLA Response Actions for the Kingston Fly Ash Recovery Project,
Roane County, Tennessee**
(continued)

Media/Resource/Action	Requirement	Prerequisite	Citation
Location encompassing aquatic ecosystem as defined in 40 <i>CFR</i> 230.3(c)	No discharge of dredged or fill material into an aquatic ecosystem is permitted if there is a practicable alternative that would have less adverse impact.	Action that involves discharge of dredged or fill material into waters of the U.S., including jurisdictional wetlands — applicable	40 CFR 230.10(a)
	No discharge of dredged or fill material shall be permitted unless appropriate and practicable steps in accordance with 40 CFR 230.70 <i>et seq.</i> are taken that will minimize potential adverse impacts of the discharge on the aquatic ecosystem.		40 CFR 230.10(d)
	Must comply with the substantive requirements of the NWP 38 General Conditions, as appropriate, any regional or case-specific conditions recommended by the Corps District Engineer, after consultation.	On-site CERCLA action conducted by Federal agency that involves the discharge of dredged or fill material into waters of the United States, including jurisdictional wetlands – relevant and appropriate	Nation Wide Permit (38) <u>Cleanup of Hazardous and Toxic Waste</u> 33 CFR 323.3(b)
Wetlands			
Presence of wetlands	An evaluation shall consider (1) the effect of the proposed action on natural and beneficial wetland values and (2) alternatives that would eliminate or minimize such effects. The initiating office shall determine if there is no practicable alternative to constructing in a wetland. If a determination of no practicable alternative is made, all practical measures to minimize impacts on the wetland shall be implemented. If at any time prior to commencement of the action it is determined that there is a practicable alternative that will avoid affecting wetlands, the proposed action shall not proceed.	Federal actions that involve potential impacts to, or take place within, wetlands — to be considered	Tennessee Valley Authority Instruction, Section IX, Environmental Review: Procedures for Compliance with the National Environmental Policy Act, April 28, 1983, which incorporates E011990, Section 2(a) requirements.

**Potential ARARs and TBC Guidance for Non-Time-Critical CERCLA Response Actions for the Kingston Fly Ash Recovery Project,
Roane County, Tennessee**
(continued)

Media/Resource/Action	Requirement	Prerequisite	Citation
<i>Endangered, threatened, or rare species</i>			
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 TWRCPP 94-16 and 94-17) — applicable	TCA 70-8-104(c)
	May not knowingly destroy the habitat of such wildlife species.		TWRCPP 94-16(II)(1)(a) and TWRCPP 94-17(II) (to be considered 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 TWRCPP 94-16(II)(1)(c) (to be considered guidance)
Presence of Tennessee-listed endangered or rare plant species as listed in TDEC 0400-6-2-.04	It is a violation for any person other than the landowner, lessee, or other person entitled to possession (or the manager, in the case of publicly owned land) or a person with the written permission of the landowner (or manager) to knowingly uproot, dig, take, remove, damage or destroy, possess or otherwise disturb for any purposes any endangered species.	Action impacting rare plant species including but not limited to federally listed endangered species — relevant and appropriate	TCA 70-8-309(a) TWRCPP 94-16(II)(1)(a) TWRCPP 94-17(II) (to be considered 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)
Action-specific ARARs			
<i>Site preparation, construction, and excavation activities</i>			
Activities causing fugitive dust emissions	Shall take reasonable precautions to prevent particulate matter from becoming airborne. Reasonable precautions shall include, but are not limited to, the following:	Fugitive emissions from land-disturbing activities (e.g., excavation, construction) — applicable	TDEC 1200-3-8-.01(1)

**Potential ARARs and TBC Guidance for Non-Time-Critical CERCLA Response Actions for the Kingston Fly Ash Recovery Project,
Roane County, Tennessee**
(continued)

Media/Resource/Action	Requirement	Prerequisite	Citation
	<ul style="list-style-type: none"> Use, where possible, of water or chemicals for control of dust and in demolition of existing buildings or structures, construction operations, grading of roads, or the clearing of land; and 		TDEC 1200-3-8-.01(1)(a)
	<ul style="list-style-type: none"> Application of asphalt, oil, water, or suitable chemicals on dirt roads, materials stock piles, and other surfaces which can create airborne dusts. 		TDEC 1200-3-8-.01(1)(b)
	Shall not cause or allow fugitive dust to be emitted in such a manner to exceed 5 minutes/hour or 20 minutes/day beyond property boundary lines on which emission originates.		TDEC 1200-3-8-.01(2)
	Operator must take dust control measures as necessary to prevent dust from creating a nuisance or safety hazard to adjacent landowners or to persons engaged in supervising, operating, and using the site. The use of any oils or other chemicals (other than water) for dust suppression must be approved in writing beforehand.	Emissions from coal ash fill area- relevant and appropriate	TDEC 1200-1-7-.02(1)(c)(1)(ii)(XI)
Activities causing storm water runoff (e.g., clearing, grading, excavation)	Implement good construction management techniques (including sediment and erosion controls, vegetative controls, and structural controls) in accordance with the substantive requirements of <i>General Permit No. TNR10-0000, Appendix F</i> to ensure water discharge:	Storm water runoff discharges from land disturbed by construction activity— disturbance of ≥1 acre total — applicable	TCA 69-3-108(j) TDEC 1200-4-10-.03(2)(a)
	<ul style="list-style-type: none"> Does not violate water quality criteria as stated in TDEC 1200-4-3-.03, including but not limited to prevention of discharges that cause a condition in which visible solids, bottom deposits, or turbidity impairs the usefulness of water of the state for any of the uses designated for that water body by TDEC 1200-4-4, and Does not violate other conditions detailed in <i>General Permit No. TNR10-0000</i>. 	Stormwater discharges from construction activities — to be considered	<i>General Permit No. TNR10-0000</i> Section 4.3.2(a)
	<ul style="list-style-type: none"> Does not contain distinctly visible floating scum, oil, or other matter. 		<i>General Permit No. TNR10-0000</i> Section 4.3.2(b)

**Potential ARARs and TBC Guidance for Non-Time-Critical CERCLA Response Actions for the Kingston Fly Ash Recovery Project,
Roane County, Tennessee**
(continued)

Media/Resource/Action	Requirement	Prerequisite	Citation
	<ul style="list-style-type: none"> Results in no materials in concentrations sufficient to be hazardous or otherwise detrimental to humans, livestock, wildlife, plant life, or fish and aquatic life in the receiving stream. 		<i>General Permit No. TNR10-0000</i> Section 4.3.2(d)
General duty to mitigate for discharge of wastewater from treatment system	Take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of effluent standards which has a reasonable likelihood of adversely affecting human health or the environment.	Discharge of pollutants to surface waters— applicable	40 CFR §122.41(d)
Operation and maintenance of treatment system	<ul style="list-style-type: none"> Properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used to achieve compliance with the effluent standards. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. 	Discharge of pollutants to surface waters— applicable	40 CFR §122.41(e)
Technology-based treatment requirements for wastewater discharge	<ul style="list-style-type: none"> For industrial discharges with applicable federal effluent guidelines, technology-based effluent limitations and standards in accordance with those guidelines shall be applied. 	Discharge of pollutants to surface waters from other than a POTW— applicable	T.C.A. 1200-04-05-.09 (1)(b)(1)
Monitoring requirements for treatment system discharges	In addition to 40 CFR §122.48 and to assure compliance with effluent limitations, one must monitor, as provided in subsections (i) thru (iv) of 122.44(i)(1).	Discharge of pollutants to surface waters— applicable	40 CFR §122.44(i)(1)
	All effluent limitations, standards and prohibitions shall be established for each outfall or discharge point, except as provided under section 122.44(k)		40 CFR §122.45(a)
	All effluent limitations, standards and prohibitions, including those necessary to achieve water quality standards, shall unless impracticable be stated as: <ul style="list-style-type: none"> Maximum daily and average monthly discharge limitations for all discharges 	Continuous discharge of pollutants to surface waters— applicable	40 CFR §122.45(d)(1)

**Potential ARARs and TBC Guidance for Non-Time-Critical CERCLA Response Actions for the Kingston Fly Ash Recovery Project,
Roane County, Tennessee**
(continued)

Media/Resource/Action	Requirement	Prerequisite	Citation
<i>Monitoring Well Installation, Operation, and Abandonment</i>			
Installation, operation, or abandonment of monitoring wells	Must comply with the substantive requirements of TDEC 1200-4-9.	Construction of monitoring wells- relevant and appropriate	TDEC 1200-4-9
<i>Closure/capping with waste in place</i>			
Disposal of solid waste in on-site landfill and closure of landfill	If a waste is determined to be a solid waste and is disposed of on-site in a solid waste landfill, the landfill must be managed in accordance with state regulations at TDEC 1200-1-7, including the applicable closure and post-closure care state regulations at TDEC 1200-1-7-.04(8)	On-site disposal of solid waste in landfill and closure of landfill – applicable	TDEC 1200-1-7-.04(8)
General performance standards	The facility must be located, designed, constructed, operated, maintained, closed, and cared for after closure in such a manner as to minimize to the extent practicable:	Operation and closure of a solid waste disposal facility- relevant and appropriate	TDEC 1200-1-7-.04(2)(a)
	<ul style="list-style-type: none"> • The potential for releases of solid wastes, solid waste constituents, or other potentially harmful materials to the environment except in a manner authorized by state and local air pollution control, water pollution control, and/or waste management control agencies; and 		TDEC 1200-1-7-.04(2)(a)(3)
	<ul style="list-style-type: none"> • The exposure of the public to potential health and safety hazards through uncontrolled or unauthorized public access. 		TDEC 1200-1-7-.04(2)(a)(4)
Run-on/runoff and erosion control during closure	Operator must design, construct, operate, and maintain a run-on control system capable of preventing flow onto the active portion of the facility for all flow up to and including peak discharge from a 24-hour, 25-year storm.	Operation and closure of a solid waste disposal facility- relevant and appropriate	TDEC 1200-1-7-.04(2)(i)(1)
	Operator must design, construct, operate, and maintain a run-off management system to collect and control at least the peak flow volume resulting from a 24-hour, 25-year storm.		TDEC 1200-1-7-.04(2)(i)(2)

**Potential ARARs and TBC Guidance for Non-Time-Critical CERCLA Response Actions for the Kingston Fly Ash Recovery Project,
Roane County, Tennessee**
(continued)

Media/Resource/Action	Requirement	Prerequisite	Citation
	Holding facilities (e.g., sediment basins) associated with run-on and run-off control systems must be designed to detain at least the water volume resulting from a 24-hour, 25-year storm and to divert through emergency spillways at least the peak flow resulting from a 24-hour, 100-year storm.		TDEC 1200-1-7-.04(2)(i)(3)
	Collection and holding facilities associated with run-on and run-off control systems must be emptied or otherwise managed expeditiously after storms to maintain design capacity of the system.		TDEC 1200-1-7-.04(2)(i)(4)
Landfill closure performance standard	Must close the unit in a manner that: <ul style="list-style-type: none"> Minimizes the need for further maintenance; and 	Closure of a solid waste disposal facility- applicable	TDEC 1200-1-7-.04(8)(a)(1)(i)
	<ul style="list-style-type: none"> Controls, minimizes, or eliminates to the extent necessary to prevent threats to public health and the environment, post-closure escape of solid waste, solid waste constituents, leachate, contaminated rainfall, or waste decomposition products to ground or surface waters or to the atmosphere. 		TDEC 1200-1-7-.04(8)(a)(1)(ii)
	Must care for a disposal facility or disposal facility parcel for the period of time after closure, specified in TDEC 1200-1-7-.04(8)(d), in a manner that assures that the performance objectives of TDEC 1200-1-7-.04(8)(a)(1) are continuously met.		TDEC 1200-1-7-.04(8)(a)(2)
	Must complete closure activities including grading and establishing vegetative cover in the shortest practicable time after any fill areas or any portion of the fill areas have achieved final grade.		TDEC 1200-1-7-.04(8)(c)(2)
Landfill cover performance standard	Facility must be designed, constructed, operated, and maintained such that the final cover includes a cap which will:	Operation and closure of a solid waste disposal facility- relevant and appropriate	TDEC 1200-1-7-.04(4)(a)(6)
	<ul style="list-style-type: none"> Provide long-term minimization of migration of liquids through the closed facility; 		TDEC 1200-1-7-.04(4)(a)(6)(i)

**Potential ARARs and TBC Guidance for Non-Time-Critical CERCLA Response Actions for the Kingston Fly Ash Recovery Project,
Roane County, Tennessee**
(continued)

Media/Resource/Action	Requirement	Prerequisite	Citation
	<ul style="list-style-type: none"> Function with minimum maintenance; 		TDEC 1200-1-7-.04(4)(a)(6)(ii)
	<ul style="list-style-type: none"> Promote drainage; 		TDEC 1200-1-7-.04(4)(a)(6)(iii)
	<ul style="list-style-type: none"> Accommodate settling and subsidence so that the cap's integrity is maintained; and 		TDEC 1200-1-7-.04(4)(a)(6)(iv)
	<ul style="list-style-type: none"> Meet the closure requirements of paragraph TDEC 1200-1-7-.04(8) 		TDEC 1200-1-7-.04(4)(a)(6)(v)
Landfill cover design and construction	<p>A compacted final cover material (e.g., soil) shall be placed on the disposal facility in the shortest practicable time, after achieving final grade of any fill area.</p>	Closure of a solid waste disposal facility- applicable	TDEC 1200-1-7-.04(8)(c)(3)
	<p>The final depth of final cover system shall be at least 36 inches of soil of which a minimum of 12 inches shall be for the support of vegetative cover.</p> <p>The design of the final cover system shall be a design which includes a compacted soil layer of at least 24 inches and has a permeability no greater than 1×10^{-7} cm/sec. This design shall be supported by use of the HELP model or other equivalent model approved by TDEC and EPA.</p> <p>An alternate final cover system may be used provided that it is demonstrated to the satisfaction of TDEC and EPA that the final cover system provides equivalent or superior performance to the minimum performance standard in this subpart.</p>		TDEC 1200-1-7-.04(8)(c)(3)(i)
	<p>With approval of TDEC and EPA, any other low permeability layer construction techniques or materials may be used to provide the final cover, provided that it provides equivalent or superior performance to the requirements of this part.</p>		TDEC 1200-1-7-.04(8)(c)(3)(iii)
Run-on/runoff control systems for landfill cover	The final surface of the disposal facility or disposal facility parcel shall be graded and/or provide with drainage facilities in a manner that:	Closure of a solid waste disposal facility- applicable	TDEC 1200-1-7-.04(8)(c)(4)

**Potential ARARs and TBC Guidance for Non-Time-Critical CERCLA Response Actions for the Kingston Fly Ash Recovery Project,
Roane County, Tennessee**
(continued)

Media/Resource/Action	Requirement	Prerequisite	Citation
	<ul style="list-style-type: none"> Minimizes precipitation run-on from adjacent areas onto the disposal facility; 		TDEC 1200-1-7-.04(8)(c)(4)(i)
	<ul style="list-style-type: none"> Minimizes erosion of cover material (e.g., no steep slopes); 		TDEC 1200-1-7-.04(8)(c)(4)(ii)
	<ul style="list-style-type: none"> Optimizes drainage of precipitation falling on the disposal facility (e.g., prevent pooling); and 		TDEC 1200-1-7-.04(8)(c)(4)(iii)
	<ul style="list-style-type: none"> Provides a surface drainage system which is consistent with the surrounding area and in no way adversely affects proper drainage from these adjacent lands. 		TDEC 1200-1-7-.04(8)(c)(4)(iv)
	<p>In addition to the drainage and grading requirements and vegetative cover requirements, the operator shall take other measures as may be necessary to minimize and control erosion and sedimentation (e.g., soil stabilization, sediment ponds) at the site.</p>		TDEC 1200-1-7-.04(8)(c)(6)
	<p>In order to minimize erosion, as soon as practicable after final grading, the operator shall take steps as necessary to establish a protective vegetative cover of acceptable grasses over the disturbed areas of the site. These steps shall include seeding, mulching, and necessary fertilization at a minimum, and may include additional activities such as sodding of steeper slopes and drainage ways if necessary.</p>	<p>Closure of a solid waste disposal facility with final cover that includes vegetative layer-applicable</p>	TDEC 1200-1-7-.04(8)(c)(5)
Groundwater protection and monitoring standards	Perform monitoring in compliance with TDEC 1200-1-7-.04(7). Note that substantive aspects of regulations addressed through existing permit.	Installation of monitoring wells- relevant and appropriate	TDEC 1200-1-7-.04(7)
General post-closure care for closed landfill	<p>Owner or operator must: Maintain the approved final contours and drainage system of the site such that the objectives of TDEC Rule 1200-1-7-.04(8)(c)(4) are continuously met;</p>	<p>Closure of a solid waste disposal facility-applicable</p>	TDEC 1200-1-7-.04(8)(e)(1)
	<p>Ensure that a healthy vegetative cover is established and maintained over the site; and</p>		TDEC 1200-1-7-.04(8)(e)(2)

**Potential ARARs and TBC Guidance for Non-Time-Critical CERCLA Response Actions for the Kingston Fly Ash Recovery Project,
Roane County, Tennessee**
(continued)

Media/Resource/Action	Requirement	Prerequisite	Citation
	Maintain the drainage facilities, sediment ponds, and other erosion/sedimentation control measures (if such are present at the landfill), at least until the vegetative cover is established sufficiently to render such maintenance unnecessary.		TDEC 1200-1-7-.04(8)(e)(3)
	Maintain and monitor the ground and/or surface water monitoring system. The monitoring system and sampling and analysis program established in the permit shall be continued during the post-closure care period, unless the permit is modified to establish a different system or program. Note that substantive aspects of regulations addressed through existing permit.		TDEC 1200-1-7-.04(8)(e)(6)
Post-closure notices for closed landfill	Must ensure that within 90 days of final closure of the facility and prior to sale or lease of the property on which facility is located, there is recorded, in accordance with State law, a notation on the deed to the property - or on some other instrument which is normally examined during a title search - that will in perpetuity notify any person conducting a title search that the land has been used as a disposal facility and its use is restricted.	Closure of a Class II solid waste disposal facility- applicable	TDEC 1200-1-7-.04(8)(f)
<i>Waste characterization, storage, and disposal</i>			
Characterization of solid waste (all primary and secondary wastes)	Must determine if waste is hazardous or is excluded under 40 CFR 261.4; and	Generation of solid waste as defined in 40 CFR 261.2 — applicable	40 <i>CFR</i> 262.11(a) TDEC 1200-1-11-.03(1)(b)(1)
	Must determine if waste is listed under 40 CFR Part 261; or		40 <i>CFR</i> 262.11(b) TDEC 1200-1-11-.03(1)(b)(2)
	Must characterize waste by using prescribed testing methods or applying generator knowledge based on information regarding material or processes used. If waste is determined to be hazardous, it must be managed in accordance with appropriate sections of 40 CFR 260–272.		40 <i>CFR</i> 262.11(c) TDEC 1200-1-11-.03(1)(b)(3)

**Potential ARARs and TBC Guidance for Non-Time-Critical CERCLA Response Actions for the Kingston Fly Ash Recovery Project,
Roane County, Tennessee**
(continued)

Media/Resource/Action	Requirement	Prerequisite	Citation
Disposal of solid waste in on-site landfill	May receive for disposal only those solid wastes it is allowed to manage under the terms of its permit (i.e., those which meet its WAC) or “special wastes” as approved in writing by the TDEC Commissioner.	Disposal of solid waste in a class I, II, III, IV disposal facility regulated by TDEC — relevant and appropriate	TDEC 1200-1-7-.04(2)(k)(1)
Temporary storage of remediation waste in staging piles (excavated soils)	An accumulation of solid, non-flowing remediation waste defined in 40 CFR 260.10 not in a containment building may be temporarily stored, including mixing, sizing, blending or other similar physical operations intended to prepare the wastes for subsequent management or treatment, at a facility if used only during remedial operations provided that the staging pile will:	Accumulation of remediation waste on site as defined in 40 CFR 260.10 — relevant and appropriate	40 CFR 264.554(a)(1)
	<ul style="list-style-type: none"> • Facilitate a reliable, effective and protective remedy; 		40 CFR 264.554(d)(1)(i)
	<ul style="list-style-type: none"> • Prevent or minimize releases of hazardous wastes and constituents into the environment and minimize or adequately control cross-media transfer as necessary to protect human health and the environment (e.g. use of liners, covers, run-off/run-on controls); 		40 CFR 264.554(d)(1)(ii)
Closure of staging piles of remediation waste located in previously contaminated area	Must be closed within 180 days after the operating term by removing or decontaminating all remediation waste, contaminated containment system components, and structures and equipment contaminated with waste and leachate.	Storage of remediation waste in staging pile in previously contaminated area — relevant and appropriate	40 CFR 264.554(j)
Closure of staging piles of remediation waste located in an uncontaminated area	Must be closed within 180 days after the operating term according to 40 CFR 264.258(a) and 264.111 or 265.258(a) and 265.111.	Storage of remediation waste in staging pile in uncontaminated area — relevant and appropriate	40 CFR 264.554(k)
On-site storage of used oil	Used oil shall not be stored in a unit other than a tank or container.	Generation and storage of used oil — applicable	40 CFR 279.22(a) TDEC 1200-1-11-.11(3)(c)1
	Containers and aboveground tanks used to store used oil must be:		40 CFR 279.22(b) TDEC 1200-1-11-.11(3)(c)2

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Media/Resource/Action	Requirement	Prerequisite	Citation
	<ul style="list-style-type: none"> • In good condition (no severe rusting, apparent structural defects or deterioration); and 		40 CFR 279.22(b)(1) TDEC 1200-1-11-.11(3)(c)2(i)
	<ul style="list-style-type: none"> • Not leaking (no visible leaks). 		40 CFR 279.22(b)(2) TDEC 1200-1-11-.11(3)(c)2(ii)
	Containers and aboveground tanks used to store used oil and fill pipes used to transfer used oil into USTs must be labeled or marked clearly with the words “Used Oil”.		40 CFR 279.22(c)(1) and (2) TDEC 1200-1-11-.11(3)(c)3(i) and (ii)
Disposal of RCRA hazardous waste in a land-based unit	May be land disposed if it meets the requirements in the table “Treatment Standards for Hazardous Waste” at 40 CFR 268.40 before land disposal.	Land disposal, as defined in 40 CFR 268.2, of restricted RCRA waste - applicable	40 CFR 268.40(a)
	All underlying hazardous constituents [as defined in 40 CFR 268.2(i)] must meet the Universal Treatment Standards, found in 40 CFR 268.48 Table UTS prior to land disposal	Land disposal of restricted RCRA characteristic wastes (D001-D043) that are not managed in a wastewater treatment system that is regulated under the CWA, that is CWA equivalent, or that is injected into a Class I nonhazardous injection well- applicable	40 CFR 268.40(e)
Disposal of RCRA- <i>hazardous waste soil</i> in a land-based unit	Must be treated according to the alternative treatment standards of 40 CFR 268.49(c) <u>or</u> according to the UTSs specified in 40 CFR 268.48 applicable to the listed and/or characteristic waste contaminating the soil prior to land disposal	Land disposal, as defined in 40 CFR 268.2, of restricted hazardous soils- applicable	40 CFR 268.49(b)

**Potential ARARs and TBC Guidance for Non-Time-Critical CERCLA Response Actions for the Kingston Fly Ash Recovery Project,
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Media/Resource/Action	Requirement	Prerequisite	Citation
<i>Transportation</i>			
Transportation of hazardous materials	Shall be subject to and must comply with all applicable provisions of the HMTA and HMR at 49 CFR 171-180.	Any person who, under contract with a department or agency of the federal government, transports “in commerce,” or causes to be transported or shipped, a hazardous material — applicable	49 CFR 171.1(c)
Transportation of hazardous waste <i>off-site</i>	Must comply with the generator requirements of 40 CFR 262.20–23 for manifesting, Sect. 262.30 for packaging, Sect. 262.31 for labeling, Sect. 262.32 for marking, Sect. 262.33 for placarding, Sect. 262.40, 262.41(a) for record keeping requirements, and Sect. 262.12 to obtain EPA ID number	Preparation and initiation of shipment of hazardous waste off-site - applicable	40 CFR 262.10(h);
<i>Dam Safety</i>			
Operation and maintenance of a dam.	Requirements for alteration, maintenance and operation of a dam.	Tennessee substantive dam safety standards — to be considered	TDEC 1200-5-7

CFR = *Code of Federal Regulations*
TBC = to be considered
TCA = *Tennessee Code Annotated*
USC = *United States Code*
WAC = waste acceptance criteria