Tennessee Valley Authority
Regulatory Submittal for Kingston Fossil Plant

Documents submitted:

Summary of Changes to Ambient Air Monitoring Plan
Site Dust Control and Air Monitoring Plan (Non-Time-Critical Removal Action)

Date Submitted:
07/21/2010

Submitted to whom
Craig Zeller

Concurrence

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Approvals

TVA [signature] Date 7/21/2010

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

July 21, 2010

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

Dear Mr. Zeller:

Please find enclosed the revised Site Dust Control and Air Monitoring Plan. The enclosed plan fulfills the commitment in the Non Time-Critical Removal Action Embayment/Dredge Cell Action Memorandum that the Site Dust Control and Air Monitoring Plan be revised to make it applicable for non time-critical removal activities. Please contact me if you have any questions.

Sincerely,

Stephen H. McCracken
General Manger, Kingston Ash Recovery Project

The *Ambient Air Monitoring Plan for the TVA KIF Fly Ash Release Remediation* (August 2009) was revised May 2010 (Revision 1) to reflect changes in the air monitoring procedures as identified in the table below.

Section	Change
1.Introduction	Added background information and reason for this revision. Deleted section on the response of TVA to EPA's June 2009 audit and replaced with a shorter summary. Added description of air monitoring sampler changes including replacement of fixed filter-based PM2.5 samplers with continuous FEM samplers for PM2.5 and PM10. Mercury was removed as a metal for analysis by EPA Method IO-3.5 as this method is not applicable to the analysis for mercury.
2.Purpose and Objectives	Added statement that this AAMP was developed after completion of a seven-step DQO process (Attachment 1).
3.Scope	Routine handheld mobile sampling for PM10 was discontinued and replaced with fixed-site monitoring for PM2.5 and PM10 using continuous FEM samplers.
4.Sampling Sites	Ten sampling sites was reduced to five and site PS06 was moved and renamed PS13. Figure identifying sampling sites was updated (Figure 1) along with Table 1.
5.Monitoring Equipment	Table 2 showing instrument summary was updated. Low-volume filter-based sampling for PM2.5 and PM10 was stopped, except for one PM2.5 sample at PS07 for 6 months for correlation. Continuous FEM samplers (BAMs) measuring PM2.5 are operated at PS05, 07, 08, 09, and 13. Continuous FEM sampler (TEOM) measuring PM10 is operated at PS09 (TDEC continues TEOM PM10 at PS07). Descriptions of samplers were added.
6.Monitoring Schedules	Schedules were updated by equipment and location.
8.Target Analytical Measurements	Clarified that airborne crystalline silica is monitored. TVA will reevaluate the need for analysis for mercury based on TDEC results. Table 3 was updated to reflect changes in monitoring equipment.
9.Action Levels	Clarified that action levels are 24-hour averages using a midnight-to-midnight time frame.
13.Electronic Data Management and Reporting	Added list of relevant SOPs.
14.References	Added Reference section.
Figure 1	Updated figure.
Attachment 1	Added new attachment of data quality objectives (DQO).

Document No. EPA-AO-006

Kingston Ash Recovery Project
Non-Time-Critical Removal Action

Site Dust Control and Air Monitoring Plan

Prepared by:
Jacobs

for the Tennessee Valley Authority

Revision	Description	Date
00	Approved Plan for the Time-Critical Removal Action	14 August 2009
01	Revised Plan for the Non-Time-Critical Removal Action	7 June 2010

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List of Figures (Attached)

Appendix

List of Acronyms

EPA	U.S. Environmental Protection Agency
HAZWOPER	Hazardous Waste Operations and Emergency Response
TDEC	Tennessee Department of Environment and Conservation
TVA	Tennessee Valley Authority
µg/m3	microgram per cubic meter

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1. BACKGROUND

Control of fugitive dust and comprehensive air quality monitoring are two key elements of the overall response for the Tennessee Valley Authority (TVA) Kingston Ash Recovery Project. This document outlines procedures that are in place now, and additional plans to establish and maintain a strong, effective onsite dust control program. It also includes a perimeter and offsite Ambient Air Monitoring Plan as an attachment, since site perimeter and offsite air quality data is a basic measure of the effectiveness of the dust control effort at the site. Onsite monitoring is conducted through the industrial hygiene program that is outlined in the Site Wide Safety and Health Plan (TVA 2009).

This plan was originally prepared as part of the time-critical removal action and has been revised to make it applicable to non-time-critical removal activities.

During time-critical removal activities, the onsite haul roads and portions of the public roads that are used by construction equipment were sprayed with water multiple times per day. In addition, the paved plant and public roads were cleaned by a wet sweeper/vacuum truck.

Also during time-critical removal activities, TVA applied a dust suppression agent to control fugitive dust on the ash deposits. The dust suppression agent, manufactured by Profile Products LLC under the tradename Flexterra Flexible Growth Medium, is a combination of a cellulosic fibrous material and a non-toxic polymeric binder. Standard hydroseeding equipment was used to apply the dust suppression agent at rates of 1,200 to 3,500 pounds per acre. The dust suppression agent adheres to the surface of the ash; forms a matrix structure on the surface of the ash that reduces dusting; and allows grass seed to germinate and grow up through it. TVA has applied the dust suppression agent to approximately 300 acres. Some of this acreage has required more than one application because the ash was being worked or the ash under the surface sloughed. Dust suppression agent has been applied seven days per week as needed.

2. SITE DUST CONTROL PLAN

2.1 DUST SUPPRESSION ON ROADS

The normal travel areas (public roads, paved in-plant roads) will continue to be sprayed by water trucks and cleaned by sweeper vacuum trucks. The unpaved gravel haul roads will continue to be sprayed with water trucks. These dust suppression methods work well except during extreme cold weather. Figure 1 illustrates the roads that will be routinely watered or swept.

To control fugitive dusting on unpaved haul roads, TVA will engage a contractor to spray a calcium chloride solution on the gravel roads at the site. Calcium chloride attracts moisture, which will help keep the road surface slightly damp, which reduces dusting. Additional dust suppression agents capable of being applied in sub-freezing temperatures are being investigated for use if needed during the winter months.

In accordance with HAZWOPER protocols, exclusion zones and contamination reduction zones have been established at the site. Vehicle traffic out of the exclusion zones will trigger a cleaning procedure that will reduce ash transfer, which will reduce fugitive dusting on roads throughout the facility.

Wheel wash stations are located strategically around the plant where vehicles enter and leave the site. Vehicles that have traveled through exposed ash areas will be routed through the wheel washes before traveling on public roads. If ash is present on the vehicles other than the wheel area, it will be further cleaned at this point. Figure 2 illustrates the locations of the wheel wash locations at the vehicle exit points of the site. As activities change on the site, the locations may change.

Local roads are often used by trucks bringing in rock, clay, or topsoil from offsite quarries or borrow sources. If notable dusting of the roads is noticed, or if a community concern is raised, TVA will contact the quarry and recommend that action be taken.

2.2 DUST SUPPRESSION AND CONTROL IN THE ASH PROCESSING AREA

Rail loading operations will continue in the ash processing area until off-site disposition under time-critical removal activities are completed and may generate dust during the summer months. In addition, ash excavation from the Rim Ditch and Sluice Trench will continue throughout the non-time-critical removal activities. To date, there has been no evidence that indicates dusting is causing exposure to personnel that would be above established action limits. To control potential dusting, fans equipped with water misters will be used to knock down any airborne dust before it leaves the exclusion zone. Additional mobile misters may be positioned in areas that generate dust from work activities. This system will be ready to implement if there are visible dust clouds that are not controlled by other means, or if air sampling data show either that personnel exposure is above health and safety action limits of 25 micrograms per cubic meter (µg/m3) total dust, or that there is the potential for fugitive dust to travel beyond the site boundaries.

2.3 DUST SUPPRESSION DURING CONSTRUCTION

All contractors are responsible for controlling their operations to minimize dust generation. This includes limiting or stopping operations during heavy dusting conditions, management and training procedures that limit employee exposure, and engineered measures that protect equipment operators working in the ash area.

Dust suppression activities in the active construction areas are task-specific. The equipment that operate in the ash excavation, processing, or dry stacking areas (excavators, dump trucks, dozers, etc.) will be equipped with enclosed cabs that are air conditioned, heated and filtered. Inspections of door gaskets, air conditioning units, filters and other devices that seal the cabs will be made to check that they are properly maintained and that the inside cab area is clean from ash buildup. Management and training procedures will be implemented to protect other personnel that work in the area (those that are not in equipment cabs).

Water trucks will be used for dust control wherever access allows because they are cost effective and do a satisfactory job of controlling the dust short-term. Where access to the work area is provided by cutting a road through the ash itself, water alone does not work well; too much added water creates a boggy area. In these areas, gravel will be spread on the road surface, compacted, and wetted-down to control dust.

Applying dust suppression agents in an active ash excavation, processing, or dry stacking area during ongoing excavation activities is generally ineffective because it will only survive a few days before it is destroyed by construction traffic. However, dust suppression agents, such as Flexterra or equivalent, will be applied in areas adjacent to the construction work area to control dust around the site without interfering with ongoing work.

The use of these methods will depend on comparing offsite or perimeter air monitoring results to offsite action levels specified in the air monitoring plan, comparing personnel monitoring to onsite action levels as specified in the Site Wide Health and Safety Plan, as well as visible presence of dust or community concerns.

To control moisture content within the excavated ash, admixtures such as lime or other proprietary moisture conditioning reagents may be used. Any admixture will be evaluated relative to its dust-generation properties and controls engineered into the admixture to limit dust generation. Controls may include increasing admixture pellet size, subsurface injection of the admixture, or additives to bind the admixture and prevent dust generation. Mobile misters may be positioned in any area where dusting is a problem. This system will be ready to implement if there are visible dust clouds that are not controlled by other means, or if air sampling data show either that personnel exposure is above health and safety action limits of 25 µg/m3 total dust, or that there is the potential for fugitive dust to travel beyond the site boundaries.

Silos or batch processing units may be used for storage or mixing of cement or other admixtures with subsurface materials during deep soil mixing operations. These units will be required to maintain positive dust control measures, including seals or pressure control housings to eliminate dust emissions.

2.4 DUST SUPPRESSION ON ASH DEPOSITS

A dust suppression agent such as Flexterra or equivalent has been proven to be the most effective dust control method to date. Grass seed will be added to the dust suppression agent to improve overall dust control and reduce erosion. The grass seed and fertilizer will be mixed with the dust suppression solution and applied using hydroseeding equipment. The dust suppression agent matrix holds the seed in place while it germinates and develops a root structure. Once the root structure is established it is anticipated the grass will grow into the ash and stabilize the ash surface.

As ash stacking activities are completed in a given area, the area will be contoured to reduce the slopes and allow grassing. Exposed ash surfaces will be hydroseeded until final cap and cover are placed.

Alternative materials and methods for dust suppression, as well as alternative grassing or interim cover approaches, will continue to be analyzed to find ways to improve dust control. It is anticipated that this effort will continue for the life of the project.

3. MONITORING

Airborne dust monitoring is ongoing, and has been since the initial incident occurred. Data collected to date, both for ambient air and personnel, consistently show that ambient air standards have not been exceeded and personnel exposure to trace elements in the ash has been far below any established action limits.

Appendix A to this document, *Ambient Air Monitoring Plan For the TVA Kingston Ash Recovery Project*, establishes action levels (Table 4), including visible dust at site boundaries and quantitative values referenced to 75% of the National Ambient Air Quality Standards for airborne particulates at the site perimeter. The site construction manager responsible for dust control will be notified immediately if construction activities cause exceedences of any of these action levels. The construction activity that caused the emission will be ceased until a re-evaluation of dust control measures is completed and additional control measures implemented if needed. Onsite U. S. Environmental Protection Agency (EPA) and Tennessee Department of Environment and Conservation (TDEC) personnel will be notified concurrently of any exceedance of off-site action levels.

An assessment of potential dust generation will be completed before starting new site activity, such as excavation, processing, dry stacking, deep soil mixing, or placement of cap and cover. Appropriate modifications to dust control measures or personnel monitoring will be made based on that assessment. A representative from the onsite environmental or safety and health groups will observe any new activity as it starts up to provide feedback to field personnel and adjust dust control measures as necessary.

Additional information on personnel monitoring is contained in the Site Wide Safety and Health Plan. Selected personnel will be periodically monitored for potential silica exposure. To date, a variety of job responsibilities have been monitored (e.g., equipment operators, laborers, and drivers).

Ambient air monitoring at the Kingston Ash Recovery Project site will include the following components:

- Continuous monitoring will be performed at established fixed locations at the perimeter of the site.
- Continuous meteorological data will be collected to assist in interpreting air sample results.
- Real-time hand held particulate monitoring may be performed at the perimeter of the site or in the local community in response to abnormal or unanticipated events or to public inquiries or complaints.

Additional detailed information on air monitoring is contained in Appendix A.

4. REFERENCE

TVA 2010 (February). *Site Wide Safety and Health Plan for the TVA Kingston Fossil Plant Ash Release Response*, *Revision 4*. Prepared by Jacobs.

FIGURES

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Figure 1: Roads Routinely Watered/Swept

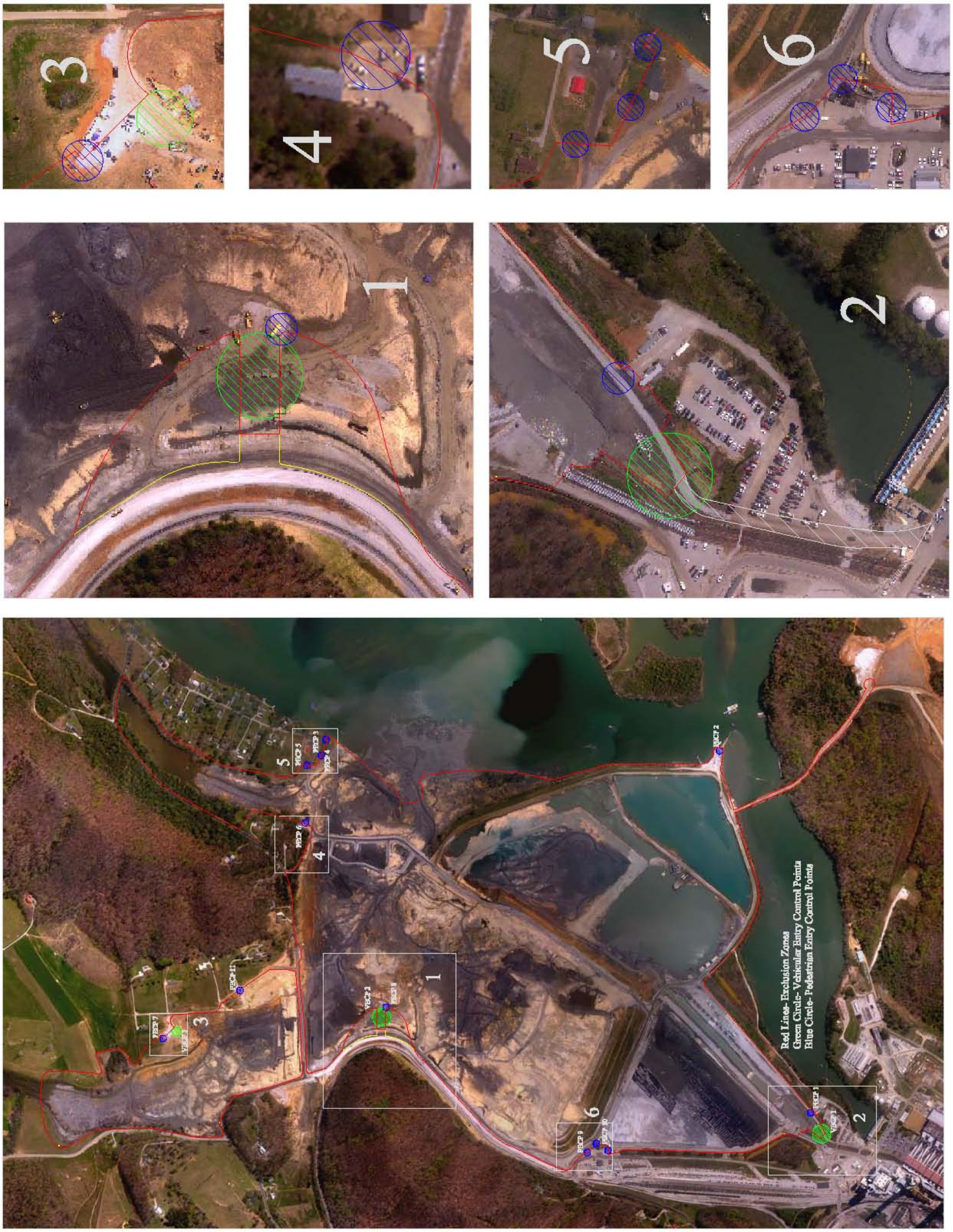

Figure 2: Wheel/Boot Wash Locations

APPENDIX A

Ambient Air Monitoring Plan for the TVA Kingston Ash Recovery Project

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Ambient Air Monitoring Plan For the TVA Kingston Fossil Plant Fly Ash Release Remediation

Revision 2

July 2010
Original Issue—August 2009

1. Introduction

The purpose of this *Ambient Air Monitoring Plan* (hereafter referred to as the "AAMP") is to provide a plan for air monitoring on and around the Tennessee Valley Authority (TVA) Kingston Fossil Plant (KIF) during remediation efforts related to the KIF Fly Ash Release.

On Monday, December 22, 2008, just before 1:00 a.m., a coal fly ash spill occurred at TVA's KIF, allowing a large amount of fly ash to escape into the adjacent waters of the Emory River. Failure of the dredge cell dike caused about 60 acres of ash in the 84-acre containment area to be displaced. At the time of the slide, the area contained about 9.4 million cubic yards (cy) of ash. The dike failure released about 5.4 million cy of coal ash that now covers about 275 acres.

Following emergency response efforts, TVA began recovery actions in accordance with a Commissioner's Order from the state of Tennessee (Case No. OGC 09-0001) issued on January 12, 2009. On May 11, 2009, TVA entered into an Administrative Order and Agreement on Consent (Consent Order) with the U.S. Environmental Protection Agency (EPA) Region 4 to complete the response actions pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, and the National Contingency Plan (NCP). The EPA Consent Order specified several deliverables required under the time-critical sampling activities including a *Site Dust Control and Air Monitoring Plan*. The original *Ambient Air Monitoring Plan* was prepared and included as an attachment to the document *TVA Kingston Fossil Plant Ash Recovery Project, Time-Critical Action Site Dust Control and Air Monitoring Plan* which was signed and approved by EPA on August 14, 2009.

This revised AAMP summarizes the efforts of the TVA and the designated air monitoring contractor to conduct air monitoring for respirable (≤2.5 micron) and inhalable (≤ 10-micron) particulate matter (PM2.5 and PM10) and additional constituents of fly ash. The objective of the monitoring outlined in this AAMP is to provide operational information for site dust-control measures during the remediation efforts by measuring airborne particulates in the adjacent community. **Note**: Federal Reference Methods (FRM), Federal Equivalent Methods (FEM) and the National Ambient Air Quality Standards (NAAQS) alluded to throughout this AAMP are used in the sense that they are Applicable, Relevant, and Appropriate Requirements (ARAR) for this project. These methods, standards, and regulations are used as an ARAR for this source-specific site remediation project only and are not relevant for other regulatory purposes (such as to determine attainment status with regard to the NAAQS). This AAMP documents activities that are adequate to determine the air-quality impacts of the KIF Fly Ash Release. The discussion of air monitoring activities that appear in earlier submittals of the AAMP and the *Quality Assurance Project Plan for the Tennessee Valley Authority Kingston Ash Recovery Project* (TVA-KIF-QAPP) are incidental to this document.

Following an EPA Region 4 onsite audit of the ambient air monitoring data, it was recommended that the fixed-based filter-based PM2.5 samplers be replaced with continuous FEM samplers to acquire real-time data for PM2.5 and PM10. Five BAM 1020 instruments (MetOne Instruments, Inc.) were acquired to satisfy this recommendation, and one existing TEOM (ThermoScientific, Inc.) FEM was reconfigured to measure PM10 from PM2.5. This AAMP incorporates the switch to the use of continuous FEMs and corresponding changes in sample location where the FEMs were sited. Further changes include the addition of data quality objectives (DQO) as Attachment 1 of this document and the elimination of the analyte mercury from the listing of metals to be analyzed by EPA Method IO-3.5 as this method is not applicable to the analysis for mercury.

2. Ambient Air Monitoring Plan Purpose and Objectives

The primary purpose of this AAMP is to describe the rationale and methodology for monitoring to be performed during the remediation of the fly ash release at or near the Kingston (KIF) plant. During the remediation, fly ash may become airborne under certain conditions. The potential for re-suspension of inhalable and respirable fly ash particles by strong winds is the greatest concern. EPA has established NAAQS that define levels of air quality which the Administrator judges are necessary, with an adequate margin of safety, to protect the public health. The air monitoring tasks outlined in this AAMP document the ambient air quality in the vicinity of the release with respect to these NAAQS and may be used to identify any airborne releases of fly ash off site. Dust suppression activities may be modified in the event of an airborne release to prevent recurrences. This AAMP was developed after the completion of a seven-step DQO process provided as Attachment 1.

Principal objectives of the plan are as follows:

- Monitor air quality in the vicinity of fly ash release remediation real time using fixed air monitoring stations and, where and when appropriate, using mobile air monitoring instruments.
- Identify immediate notification steps in the event that real-time particulate levels exceed predetermined action levels so that mitigation steps can be initiated.
- Monitor PM2.5 and PM10 on a time-weighted or 24-hour average basis to provide air sampling data relevant to the NAAQS for particulate matter.
- Document the ambient air sampling protocols, and the frequency and types of analyses that are conducted on the collected samples.
- Specify the target chemical compounds that will be compared to established levels of concern.

3. Scope

3.1. Fixed-Site Monitoring

PM10 and PM2.5 will be monitored at five fixed-monitoring sites at the perimeter of the KIF site using continuous FEM sampling systems. The data are collected for comparison with Action Limits discussed in Section 9 and in the *Time Critical Action Site Dust Control and Air Monitoring Plan* (2009). One FRM filter-based instrument will be operated for a limited time to demonstrate correlation of the network of continuous instruments (see Section 5.1.4). Prior to the ash spill, the Tennessee Department of Environment and Conservation (TDEC) established a PM2.5 monitoring station (PS10) approximately 2.5 miles northwest of KIF at Harriman High School. Data from the Harriman High School monitoring station will be used as an indicator of background levels.

3.2. Real-Time Mobile Monitoring

TVA may conduct event-based real-time mobile monitoring at the site perimeter and in the community in the vicinity of KIF using portable instruments. The mobile instruments may be used as an investigative tool if Action Limits are exceeded and the site is identified as a potential cause of the exceedence.

3.3. Constituents of Potential Concern (COPCs)

COPCs in the airborne dust are arsenic and crystalline silica. The rationale for the selection of these COPCs and associated action levels is discussed in Section 8. The concentrations of these constituents are identified through laboratory analysis of the sample filters collected from the high-volume samplers. High-volume samplers are appropriate for lowering the detection limit sufficiently to measure the COPCs in airborne dust and are used at one site for this purpose. COPCs may be changed as more data become available or upon the request of EPA, TDEC, or other participating agencies.

3.4. Data Evaluation

Data are made available to regulatory agencies and the public as they become available and undergo quality assurance review. Trends of PM10 and PM2.5 are routinely posted on the TVA website, as are results for analyses for COPCs.

4. Sampling Sites

Both mobile- and fixed-sampling strategies are employed in documenting the ambient air quality.

4.1. Fixed-Site Monitoring Locations

The five sampling locations follow EPA siting criteria for ambient particulate monitors to the extent possible. Factors such as proximity to roads, proximity to tree obstructions and vertical distance from nearby horizontal structures were considered. Fixed locations were selected to represent areas closely associated with and proximal to the released fly ash, and at locations between the release and the community. These sites were selected to characterize ambient concentrations of particles and target compounds potentially associated with fly ash at community-based locations near the fly ash. Prevailing wind direction near the plant is strongly influenced by ridge and valley topography oriented along the southwest to northeast axis of the Tennessee River Valley. Two monitoring locations have been established to the north and northeast of the plant, respectively (PS13 and PS07), and one to the southwest (PS09) roughly along this axis so that “upwind” and “downwind” air sampling will exist for most days. In addition, a second pair of sampling sites (PS05 and PS08) is located on a line roughly perpendicular to this orientation (northwest-southeast). A high ridge located just west of KIF will occasionally induce down-slope airflows under stable atmospheric conditions. The sampling sites discussed in this section are listed below in Table 1. The sites are illustrated in Figure 1.

TDEC operates a fixed-monitoring site (former site PS10) in Harriman, Tennessee, located approximately two and a half miles northwest (4.5 km) from KIF. The site is located on the opposite side of the northern ridge bounding the KIF plant site.

As such, it is an appropriate location for a background monitoring site. PS10 was selected to best represent typical upwind air quality conditions nearby, but not impacted by the ash release.

Table 1

Locations of Fixed-Site Air Monitoring

Fixed Site	Street Address	Location Coordinates
PS05	1025 Swan Pond Road, Kingston, Tennessee	Lon: -84.523842, Lat: 35.902641
PS07	199 Lakeshore Drive, Harriman, Tennessee	Lon: -84.504196, Lat: 35.91666
PS08	540 Emory River Road, Harriman, Tennessee	Lon: -84.497139, Lat: 35.907097)
PS09	304 Windswept Lane, Kingston, Tennessee	Lon: -84.51680, Lat:35.889576
PS10	Harriman High School, 1002 North Roane Street, Harriman, Tennessee	Lon: -84.54372, Lat: 35.938695
PS13	Undeveloped lot in the 1600 block on Swan Pond Circle Road, Harriman, Tennessee	Lon: -84.51657, Lat: 35.92550)

4.2. Mobile Real-Time Monitoring Locations

These monitoring locations are selected by air monitoring field sampling personnel, in real-time, to assess the potential presence of PM10 particulates within the adjacent community. These locations focus on the community areas in proximity to the fly ash release area as well as the outlying community areas outside the immediate area of impact. This area generally encompasses a four-mile radius around the site. When used in support of investigations of ambient air quality excursions, meteorological conditions will influence monitoring location selection.

5. Monitoring Equipment

5.1. Fixed-Site Monitoring Equipment

Fixed-site monitoring equipment was selected to measure levels of ash and ash constituents that could become airborne during response and remediation activities. The primary selection criteria were structured such that the data collected by the instruments would be comparable with the applicable NAAQS. Additionally, criteria were evaluated that would allow or provide for ease of use, reliability of operation, the ability to collect analytical data of target chemical compounds, and collection of additional relevant data. Factors such as sampler inlet height, proximity to co-located reference method samplers, and proximity to high-volume particulate samplers have been addressed to the extent possible for the sampling locations selected. EPA and TDEC personnel have conducted an investigation of these sites and have indicated that the monitors are appropriately positioned. The equipment being used and the measurement objectives are listed in Table 2.

Table 2
Fixed-Site Air Monitoring Instrument Summary

Site	Instrument	Measurement Objective
PS05	Met One BAM[1] 1020	PM2.5
PS07	Met One BAM 1020 ThermoElectron TEOM[2] (TDEC) Tisch HiVol Tisch HiVol Tisch HiVol Tisch HiVol SKC 224-PCXR8 BGI PQ200 Meteorological Instruments	PM2.5 PM10 PM10 PM10 (Audit) TSP (Total Suspended Particulate) TSP(Audit) Crystalline silica PM2.5 (Temporary Audit Sampler for Correlation) Weather data
PS08	Met One BAM 1020	PM2.5
PS09	Met One BAM 1020 ThermoElectron TEOM	PM2.5 PM10
PS10	ThermoElectron TEOM (TDEC) Meteorological Instruments	PM2.5 Weather Data
PS13	Met One BAM 1020	PM2.5

[1] BAM = Beta-attenuation mass monitor
[2] TEOM = Tapered Element Oscillating Microbalance

5.1.1 BAM and TEOM Samplers

The MetOne BAMs and the PM10 TEOM monitors are used by the project for real-time assessment of the effectiveness of dust suppression activities at KIF. The data from these instruments are used for notification as discussed in Section 10 below.

5.1.2 High-Volume Samplers

The Tisch high-volume instruments sample at a rate that is greater than one cubic meter per minute for each 24-hour sample collection period. The high-volume samplers are employed primarily to provide the analytical laboratory with the greatest available sample to allow the lowest possible minimum detection level for COPCs. Refer to *PM10 Air Monitoring Using High-Volume Samplers* SOP (TVA-KIF-SOP-52) and *TSP Air Monitoring Using High-Volume Samplers* SOP (TVA-KIF-SOP-53).

5.1.3 Universal Mobile Samplers

The universal mobile SKC samplers sample at a rate of approximately 2.5 liters per meter for each 24-hour sample period. SKC samplers are deployed to collect representative filter samples which are analyzed by the analytical laboratory for crystalline silica. Refer to *Air Monitoring using Universal Mobile Sample Pumps* SOP (TVA-KIF-SOP-54).

5.1.4 Low-Volume Samplers

The low-volume PM2.5 sampler (BGI PQ200) at PS07 is operated to demonstrate the correlation between the FRM and the FEM network and will be discontinued once the correlation is established. At least 60 samples (one-day-in-three sampling schedule) are expected to be collected for the demonstration. TVA, EPA Region 4, and TDEC will agree on the correlation criteria. Refer to *PM2.5 and PM10 Air Monitoring Using Low-Volume Samplers* SOP (TVA-KIF-SOP-55).

5.1.5 Meteorological Instruments

Meteorological instruments log various ambient air parameters during sample collection. Some of the parameters recorded by the meteorological instruments include wind speed and direction, precipitation, ambient temperature, and relative humidity,

5.2. Mobile Monitoring Equipment

Instantaneous measurements of PM10 will be taken using TSI AM510 (or equivalent) portable aerosol monitors. These measure airborne PM10 concentrations in mg/m^3. Data from these instruments is used to investigate the source of visible dust or elevated values as measured at the fixed stations. Refer to *Real-Time Air Monitoring using Portable Aerosol Monitors* SOP (TVA-KIF-SOP-56).

5.3. Operation, Maintenance, and Quality Assurance

Operation, maintenance, data collection, and quality assurance procedures for all monitoring equipment are maintained on site.

6. Monitoring Schedules

6.1. Sampling of Filter-based Instruments

The filter-based instrument monitoring schedule is the same as the 1-in-3 day EPA Ambient Particulate Monitoring Sample-Day Schedule.

6.2. Fixed-Site Real-Time Monitors

With the exception of down time for equipment maintenance and malfunction, PM2.5 monitoring by FEM will be conducted continuously in real time at Stations 05, 07, 08, 09, and 13. TVA's TEOM PM10 monitor will likewise be operated continuously at PS09. TVA will utilize data from the continuous FEMs operated by TDEC; a PM10 TEOM at PS07, and a background PM2.5 at PS10.

6.3. Real-Time Mobile Monitoring

Real-time mobile monitoring may be used to characterize any off-normal operational or weather-related events that result in the potential for off-site dust transport.

7. Performance Evaluation

This monitoring network will participate in the EPA Performance Evaluation Program (PEP). Frequency and type of the EPA PEP audit will be determined by EPA. Fixed-monitoring stations are available for audit by TDEC and EPA. TVA insists that its air monitoring contractor maintain a program of continuous improvement. In addition, TVA maintains a contract with a firm that provides third-party quality assurance services. The entire air monitoring program is routinely reviewed, including sampling, laboratory analytical, and quality assurance activities. A problem resolution and tracking procedure is used to ensure that issues identified during these reviews are promptly addressed. The issues are analyzed for root cause, solutions are identified and implemented, and measures are taken to prevent recurrence. The status of open items is reviewed routinely. Findings identified during audits by regulatory agencies are treated in the same fashion.

8. Target Analytical Measurements

The original AAMP identified a large number of constituents for analysis in addition to particulate air concentrations (PM2.5 and PM10). TVA performed bulk sampling of the ash containment area on December 31, 2008. These samples were analyzed for metals (aluminum, calcium, lithium, selenium, vanadium, antimony, chromium, magnesium, silver, zinc, arsenic, cobalt, manganese, strontium, barium, copper, mercury, thallium, beryllium, iron, molybdenum, tin, cadmium, lead, nickel, and titanium) and BTEX (benzene, toluene, ethyl benzene, and xylene). BTEX were not detected in ash samples. An evaluation and recommendation of the appropriate analytes for this AAMP was performed by Center for Toxicology and Environmental Health, LLC (CTEH). CTEH used the rationale that any metal in ash below a typical background concentration for soil or which is below the EPA residential soil regional screening level (RSL) would not pose an airborne concern. Only the 95% upper control limit (UCL) for arsenic exceeded both the arithmetic mean concentration for background soils and the EPA soil RSL. Although the crystalline silica concentrations of the ash are lower than those of natural soils, material safety data sheets (MSDS) of fly ash products nearly always include crystalline silica as a potential hazard. For this reason, TVA monitors for airborne crystalline silica during remediation of the site.

TVA encourages other agencies participating in the ash recovery to share sampling plans. In most cases, TVA will sample for the same analytes using the same methods in order to provide independent confirmation of the results. As other agencies make changes to their sampling plans, changes may be warranted to the TVA plan. For example, TDEC has begun to analyze a TSP sample collected at Station 07 for aluminum, arsenic, barium, beryllium, cadmium, chromium, lead, manganese, selenium, thallium, vanadium, and mercury. The sample is collected on the one-in-six-day cycle. These metals constitute a broader list of analytes than selected by TVA as discussed above. With the exception of the analysis for mercury, TVA will supplement and confirm the TDEC data by using the similar sample and analysis methods on an alternate (offset 3 days) one-in-six-day cycle. TVA will reevaluate the need for analysis for mercury based on TDEC results. The data from the analysis for the extended list of metals will be evaluated to determine the continuing validity of the COPCs of the core monitoring plan.

8.1. Constituents of Potential Concern (COPCs)

Samples collected at PS07 are analyzed according to Table 3.

Table 3

Summary of Sampling and Analyses Methods

Sample Collection Method	Analyte	Regulatory Guidance	Analysis Method
FRM	$PM_{2.5}$	40 CFR50 Appendix L	Gravimetric*
PM10 High-volume sampler	Arsenic	EPA Method I.O.- 3.5	ICP-MS
TSP High-volume sampler	Aluminum, Arsenic, Barium Beryllium Cadmium, Chromium Lead, Manganese, Selenium, Thallium Vanadium	EPA Method I.O.- 3.5	ICP-MS
Low-volume sampler	PM_4 Crystalline Silica	NIOSH 7500	SKC Aluminum Cyclone
Real-time instantaneous TSI AM510	PM_{10}		Laser Photometer

* Temporary schedule; PM2.5 filter-based sampling will be discontinued after correlation with continuous FEM samplers has been established.

8.2. Laboratory Analyses

Samples collected by fixed instruments are sent offsite for analysis. Procedures for the collection, handling, labeling, shipping, Chain of Custody, and quality control (QC) samples are maintained on site.

Laboratory procedures are found in Appendix E of the *Quality Assurance Project Plan for the TVA Kingston Ash Recovery Project"* (TVA-KIF-QAPP).

9. Action Levels

Action levels for the site were determined using existing standards where possible, or were calculated from risk-based screening levels or other appropriate guidelines. The action levels selected or derived are summarized in the sections below. All action levels are 24-hour averages using a midnight-to-midnight time frame. Table 4 shows the action levels which have been selected for this site. These results will be communicated according to the procedures in Section 10.

Table 4

Action Levels

Analyte	Off-Site Specific Action Levels	Source
Airborne Dust	Visible Dust	TDEC Chapter 1200-3-8
Particulate PM2.5 (24-hour average)	26 µg/m^3 (24 hour)	NAAQS[1]
Particulate PM10 (24-hour average)	112 µg/m^3	NAAQS[1]
Arsenic (24-hour average)	20 ng/m^3	ATSDR, 2007
Crystalline Silica (24-hour average)	10 µg/m^3	ACGIH TLV Divided by 420

[1] The action levels listed are based on 75% of the NAAQS levels to provide an additional margin of safety.

9.1. Action Level Rationale: Airborne Dust

Action levels for PM2.5 and PM10 reflect 75% of the 24-hour concentration standards as set forth by the 40 CFR part 50 NAAQS criteria. The Action levels are relevant to the NAAQS, but are not utilized for the purpose of determination of compliance with the NAAQS. Action levels for visible dust are also established to remain in compliance with the regulatory limit for visible dust emissions at the boundaries of the site.

9.2. Action Level Rationale: Arsenic

A site-specific action level for arsenic was established using background concentrations reported by the Agency for Toxic Substances and Disease Registry (ATSDR, 2007). As reported by Schroeder et al. (1987; as cited in ATSDR, 2007), the range of background arsenic air concentrations in rural areas was 1 to 28 ng/m^3. EPA has also estimated arsenic concentrations in the U.S. as part of its Assessment System for Population Exposure Nationwide (ASPEN) (Rosenbaum et al. 1999 as cited in ATSDR, 2007). Using 1990 data to estimate total emissions of arsenic in the conterminous 48 states, excluding road dust or windblown dust from construction or agricultural tilling, the 25th percentile median, and 75th percentile arsenic concentration were estimated by EPA to be 9, 20, and 30 ng/m^3, respectively. These estimated levels are close to the range reported for rural areas by Schroeder et al. The median estimate for background air concentrations for arsenic (20 ng/m^3) is used as the action level for arsenic.

9.3. Action Level Rationale: Crystalline Silica

A value of 10 µg/m^3 was established for crystalline silica based on the EPA-developed air quality target level derived for the deconstruction of the 130 Liberty Street Deutsche Bank building in Manhattan (http://www.renewnyc.

com/plan_des_dev/ 130liberty/air_monitoring_ reference.asp; accessed February 24, 2009). The EPA value is based on respirable crystalline silica.

10. Exceedence Notification

Real-time or filter-based measurements equal to or above the action levels will indicate the need for an evaluation of the data generated by the network and other data sources to determine the cause of the elevated values. The TVA KIF environmental staff, in coordination with on-site EPA and TDEC personnel, will determine if there is a reasonable potential that fugitive emissions from ash recovery operations are impacting air quality beyond the perimeter of the exclusion zone. The TVA Air Lead may direct the collection of additional data using mobile PM10 monitoring instruments. If it is determined that fugitive emissions from the ash recovery operations are a probable cause of the action level exceedence(s), the Construction Manager for Dust and Erosion Control will be immediately notified and will implement prompt measures to mitigate the source.

The TVA Project Manager, EPA On-Scene Coordinator, and TDEC On-Site Representative will be contacted in person, by phone, or by email when data indicates an exceedence of action levels for PM2.5, PM10, arsenic, or crystalline silica as a 24-hour average. Further notifications to TVA and regulatory agency personnel will be made as directed by these individuals. Every effort will be made to make these notifications within one work day of verification of the analytical results. An event that requires immediate further investigation will result in immediate notification to EPA and TDEC on-site personnel.

11. Meteorological Monitoring

Meteorology monitoring will be conducted at PS07 and PS10. Wind speed, direction, and temperature will be measured; additional meteorological parameters may be measured as well. Calibration and maintenance of meteorological monitoring equipment will be performed in accordance with procedures maintained on site.

12. Quality Assurance / Quality Control

Air monitoring activities will conform to the *Quality Assurance Project Plan for the TVA Kingston Ash Recovery Project* (TVA-KIF-QAPP) and follow the specific quality assurance (QA) and QC frequency listed in the applicable sampling standard operating procedures (SOPs) (see list of SOPs in Reference section).

13. Electronic Data Management and Reporting

Data, including photographic data, will be managed according to the appropriate *Data Management Plan* (TVA-KIF-DMP-001). All air monitoring data collected will be provided to the appropriate database administrator, for inclusion as identified in the *Data Management Plan* (TVA-KIF-DMP-001), *Field Data Submittal to Data Management System* SOP (TVA-KIF-SOP-23), *Air Data Transfer to EQuIS™ and AQS Databases* SOP (TVA-KIF-SOP-45), and *Air Instrumentation Monitoring* SOP (TVA-KIF-SOP-60). As relevant QA/QC activities are completed, TVA is committed to provide data to EPA's data system (AQS) as identified in TVA-KIF-SOP-45. TVA understands that the data uploaded to AQS are non-regulatory and not intended for use in determining compliance with the NAAQS.

14. References

TVA, *Air Monitoring Using Universal Mobile Sample Pumps* SOP (TVA-KIF-SOP-54), 2010.

TVA, *$PM_{2.5}$ and PM_{10} Air Monitoring Using Low-Volume Sampler* SOP (TVA-KIF-SOP-55), 2010.

TVA, *PM_{10} Air Monitoring Using High-Volume Sampler* SOP (TVA-KIF-SOP-52), 2010.

TVA, *Data Management Plan for the Tennessee Valley Authority Kingston Ash Recovery Project* (TVA-KIF-DMP-001), September 11, 2009.

TVA, *Air Data Transfer to EQuIS™ and AQS Databases* SOP (TVA-KIF-SOP-45), 2010.

TVA, *Field Data Submittal to Data Management System* SOP (TVA-KIF-SOP-23), 2010.

TVA, *Management and Implementation of EQuIS™-Based Chain of Custody* SOP (TVA-KIF-SOP-18), 2010.

TVA, *Photograph Management for the TVA Kingston Fossil Plant Ash Recovery Project* SOP (TVA-KIF-SOP-26), 2009.

TVA, *Quality Assurance Project Plan for the Tennessee Valley Authority Kingston Ash Recovery Project* (TVA-KIF-QAPP), December 18, 2009.

TVA, *Real-Time Air Monitoring Using Portable Aerosol Monitors* SOP (TVA-KIF-SOP-56), 2010.

TVA, *Real-time Air Monitoring Instrumentation* SOP (TVA-KIF-SOP-60), 2010.

TVA, *TSP Air Monitoring Using High-Volume Sampler* SOP (TVA-KIF-SOP-53), 2010.

TVA, *TVA Kingston Fossil Plant Ash Recovery Project Time-Critical Action Site Dust Control and Air Monitoring Plan*, August 2009.

U.S. EPA. 40 C.F.R. Part 50, *National Ambient Air Quality Standards for Particulate Matter*, 2006.

U.S. EPA. *Quality Assurance Guidance Document 2.12, – Monitoring PM2.5 in Ambient Air Using Designated Reference or Class I Equivalent Methods*, November, 1998.

Figure 1

Fixed-Site Air Monitoring Stations

ATTACHMENT 1

Data Quality Objectives (DQO) for Ambient Air Monitoring

Data Quality Objectives (DQO) for Ambient Air Monitoring

The DQO Process is a series of logical steps that guides managers or staff to a plan for the resource-effective acquisition of environmental data. It is both flexible and iterative, and applies to both decision-making (such as compliance/non-compliance with a standard) and estimation (such as ascertaining the mean concentration level of a contaminant). The DQO Process is used to establish performance and acceptance criteria, which serve as the basis for designing a plan for collecting data of sufficient quality and quantity to support the goals of the study. Use of the DQO Process leads to efficient and effective expenditure of resources; consensus on the type, quality, and quantity of data needed to meet the project goal; and the full documentation of actions taken during the development of the project (EPA 2006).

Step 1. State the Problem. Define the problem that necessitates the study.

On Monday, December 22, 2008, just before 1 a.m., a coal fly ash spill occurred at TVA's KIF, allowing a large amount of fly ash to escape into the adjacent waters of the Emory River. Failure of the dredge cell dike caused about 60 acres of ash in the 84-acre containment area to be displaced. At the time of the slide, the area contained about 9.4 million cubic yards (cy) of ash. The dike failure released about 5.4 million cy of coal ash that now covers about 275 acres.

Fly ash filled the Swan Pond Embayment on the north side of the KIF property adjacent to the failed dredge cell. A dike (Dike #2) has been constructed in the eastern portion of the Swan Pond Embayment to contain the fly ash to the west of the dike until a non-time critical removal action plan is developed, approved by the regulators, and implemented.

As a result of the ash slide there are large areas of fly ash at the Kingston site exposed to weathering and wind. Fly ash can produce persistent air-borne dust once it dries on the surface of aboveground placements. During the remediation, fly ash may become airborne under certain conditions. The re-suspension of inhalable and respirable fly ash particles by strong winds is the greatest concern. Long-term exposure to fly ash may pose an unacceptable risk to receptors in the vicinity of KIF.

Step 2. Identify the Goal of the Study. State how environmental data will be used in meeting objectives and solving the problem, identify study questions, define alternative outcomes.

The primary objectives of Ambient Air Monitoring include the following:

- Monitor air quality in the vicinity of fly ash remediation in real-time using fixed air monitoring.

  Study Question 1: Are the site dust control measures effective at preventing off-site releases of airborne fly ash particles?

- Identify immediate notification steps in the event that real-time particulate levels exceed predetermined action levels so that mitigation can be initiated. No study questions are associated with this goal.
- Monitor PM10 and PM2.5 on a continuous or 24-hour average basis to provide air sampling data relevant to the NAAQS for particulate matter.

Study Question 2: What are the time-weighted or 24-hour average concentrations of PM10 and PM2.5 in ambient air in the vicinity of KIF?

- Monitor airborne arsenic and crystalline silica on a time-weighted or 24-hour average basis to provide air sampling data relevant to risk based screening levels.

Study Question 3: What are the time-weighted or 24-hour average concentrations of arsenic and crystalline silica in ambient air in the vicinity of KIF?

- Document the ambient air sampling protocols and the frequency and types of analyses that are conducted on the collected samples. No study questions are associated with this goal.

Step 3. Identify Information Inputs. Identify data and information needed to answer study questions.

Information and data needed include the following:

- Collect data from instrumentation that provides an immediate indication of the presence of airborne PM10 and PM2.5 outside of the perimeter of the site.
- Collect data from filter-based 24-hour samples analyzed in the laboratory for PM2.5, and metals.
- Use real-time monitoring to investigate if visible dust identified at the exclusion zone boundary exceeds TDEC fugitive emission limits or the average of the real-time PM10 or PM2.5 values in the previous 24 hours exceed 75% of the NAAQS of either particulate species.

Step 4. Define the Boundaries of the Study. Specify the target population and characteristics of interest, define spatial and temporal limits, scale of inference.

- PM10 and PM2.5 will be monitored at five fixed-monitoring sites at the perimeter of the KIF site using sampling systems. Therefore, the spatial boundary of the study for the continuous monitoring locations is the perimeter of KIF. The temporal boundary of the study is the on-going monitoring until completion of the remedial activities associated with the ash spill, but may be reevaluated as inputs are analyzed;
- The measurement and analytical populations of interest are the average concentrations of PM10, PM2.5, arsenic, and crystalline silica;
- The human receptor populations of interest are local residential receptors in the vicinity of KIF.

Step 5. Develop the Analytic Approach. Define the parameter of interest, specify the type of inference, and develop the logic for drawing conclusions from findings.

- Specify appropriate population parameters for making decisions or estimates. TVA performed bulk sampling of the ash containment area on December 31, 2008. These samples were analyzed for metals (aluminum, calcium, lithium, selenium, vanadium, antimony, chromium, magnesium, silver, zinc, arsenic, cobalt, manganese, strontium, barium, copper, mercury, thallium, beryllium, iron, molybdenum, tin, cadmium, lead, nickel, and titanium) and BTEX. BTEX were not detected in ash samples. Evaluation and recommendation of the appropriate analytes for this AAMP were performed by CTEH. CTEH used the rationale that any metal in ash below a typical background concentration for soil or which is below a EPA residential soil regional screening level (RSL) would not pose an airborne concern. Only the 95% UCL for arsenic exceeded both the arithmetic mean concentration for background soils and the EPA soil RSL. Although the crystalline silica concentrations of the ash are lower than those of natural soils, material safety data sheets (MSDS) of fly ash products nearly always include crystalline silica as a potential hazard. Action levels for the site were determined using existing standards where possible or were calculated from risk-based screening levels or other appropriate guidelines. Available screening levels for protection of human health are based on chronic exposures; therefore, the analytical parameter of interest is the average concentration of any ash-related constituent compared to the NAAQS for PM10, PM2.5, and risk-based screening levels or guideline values.

- For decision problems, choose a workable Action Level and generate an "If … then … else" decision rule. Action levels for this project are 75% of the NAAQS for PM10 and PM2.5 and risk-based screening levels or guideline values for arsenic and crystalline silica.

The decision rule for air is "If the average concentration of any ash-related constituent exceeds its respective action level, then evaluation of the need for corrective actions to reduce the particulate emissions, else continue monitoring."

Step 6. Specify Performance or Acceptance Criteria. Specify the decision rule as a statistical hypothesis test (null hypothesis to be rejected in favor of a specified alternative hypothesis), examine consequences of making incorrect decisions from the test, and place acceptable limits on the likelihood of making decision errors.

- The null hypothesis for air is: The average concentration of an ash-related constituent is less than or equal to its respective action level. The alternative hypothesis for air is: The average concentration of an ash-related constituent is greater than or equal to its respective action level.
- Specify probability limits for false rejection and false acceptance decision errors. The probability limit for a false rejection decision is 20%. The probability limit for a false acceptance decision is 5%. This means we accept a 20% chance that we will say the average concentration of ash-related constituents are unacceptable when they are acceptable and a 5% chance that we will say the average concentration of ash-related constituents are acceptable when they are unacceptable.

Step 7. Develop the Plan for Obtaining Data. Select the resource-effective sampling and analysis plan that meets the performance criteria.