Tennessee Valley Authority
Regulatory Submittal for Kingston Fossil Plant

Documents submitted:
Revised Site Wide Safety and Health Plan (January 2013)

Date Submitted:
01/17/2013

Submitted to whom
Craig Zeller

Concurrence

Received	Not Applicable	TVA
☒	☐	Kathryn Nash
☒	☐	Tom Heffernan
☐	☐	_____
☐	☐	_____
☐	☐	_____

Received	Not Applicable	Jacobs
☒	☐	Jack Howard
☒	☐	Tom Bock
☐	☐	_____
☐	☐	_____
☐	☐	_____

Approvals

TVA Kathryn Nash Date 1/17/13

EPA _____ Date 01/24/13

cc:

- ☒ Anda Ray, TVA
- ☒ Jonathon Burr, TDEC
- ☒ Brenda Brickhouse, TVA
- ☒ Brian Fowler, TVA
- ☒ Craig Zeller, EPA
- ☒ Dennis Yankee, TVA
- ☒ Kathryn Nash, TVA
- ☒ Cynthia Anderson, TVA
- ☒ EDM
- ☒ Jodie Birdwell, Jacobs
- ☒ Jonathon Burr, Jacobs
- ☒ Jack Howard, Jacobs
- ☒ Michelle Cagley, TVA
- ☒ Greg Signer, TVA
- ☒ KIF Incident Document Control
- ☒ Amanda Miolen, EPA
- ☒ Robert Pullen, Jacobs
- ☒ Document Control, Jacobs (Terry Crabtree-Hagemann

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

January 17, 2013

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 Wide Safety and Health Plan for the Tennessee Valley Authority at the Kingston Fossil Plant in Roane County, Tennessee. This plan meets the requirements of Section XIII, paragraph 35, of the Administrative Order and Agreement on Consent. Please contact me if you have any questions.

Sincerely,

Kathryn Nash

Kathryn Nash
General Manager
Kingston Ash Recovery

Enclosures

Revision 06

SITE WIDE SAFETY AND HEALTH PLAN

FOR THE

TVA KINGSTON FOSSIL PLANT

ASH RELEASE RESPONSE

Prepared for:

Tennessee Valley Authority

Prepared by:

Jacobs
125 Broadway Ave
Oak Ridge, TN 37830

January 2013

TABLE OF CONTENTS

LIST OF TABLES

LIST OF APPENDICES

LIST OF ACRONYMS

ACGIH	American Conference of Governmental Industrial Hygienists
AED	Automated External Defibrillator
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
BBP	Bloodborne Pathogen
bpm	beat per minute
CAS#	Chemical Abstract Service Number
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
CM	Construction Manager
CPR	Cardiopulmonary Resuscitation
CRZ	Contamination Reduction Zone
cy	cubic yard
dBA	Decibels A Weighted
ECP	Electrical Control Building
EMS	Emergency Medical Services
EPA	U.S. Environmental Protection Agency
ERP	Emergency Response Plan
ESH	Environmental, Safety, and Health (Reference HSE)
EZ	Exclusion Zone
GFCI	Ground Fault Circuit Interrupter
GM	General Manager
HAZCOM	Hazard Communication
HAZWOPER	Hazardous Waste Operations and Emergency Response
HSE	Health, Safety, and Environmental
HSEP	Health Safety and Environmental Procedure
Jacobs	Jacobs Engineering Group Inc.
JSA	Job Safety Analysis
KIF	Kingston Fossil Plant
LIHT	Lead Industrial Hygiene Technologist
LO/TO	Lock Out / Tag Out
MSDS	Material Safety Data Sheet
NIOSH	National Institute of Occupational Safety and Health
NWS	National Weather Service
OSHA	Occupational Safety and Health Administration/Act
PEL	Permissible Exposure Limit
PFD	Personal Floatation Device
PHSM	Project Health and Safety Manager

PM	Program Manager
PPE	Personal Protective Equipment
PWS	Perimeter Wall Stabilization
REL	Recommended Exposure Limit
SOR	Safety Observation Report
SSHO	Site Safety and Health Officer
SWSHP	Site Wide Safety and Health Plan
SZ	Support Zone
TDEC	Tennessee Department of Environment and Conservation
TLV	Threshold Limit Value
TVA	Tennessee Valley Authority
TWA	Time Weighted Average
USCG	United States Coast Guard
WBGT	Wet Bulb Globe Thermometer
WEP	Water Extraction Point

APPROVALS

By their signature, the undersigned hereby certify that this Site Wide Safety and Health Plan has been reviewed and approved for use at TVA's Kingston Ash Recovery Project in Kingston, Tennessee.

Craig Zeller
Remedial Project Manager
EPA

1/24/13
Date

Kathryn Nash
General Manager
TVA

1-17-13
Date

Thomas K. Heffernan
TVA Senior Manager
Safety FGD&C

1-17-13
Date

Jack Howard
Program Manager
Jacobs

01-17-2013
Date

Tom Bock
Safety and Health Manager
Jacobs

1-17-13
Date

SUMMARY OF CHANGES FROM REVISION 05 TO REVISION 06

Section	Changes
Global	Changed header from August 2010, Revision 05 to January 2013, Revision 06
	Changed term “deep soil mixing” to “slurry wall construction”
	Removed Appendix E, Activity Hazard Analysis, and all references related to it
	Removed Appendix J, Response to EPA Comments, and all references related to it
	All instances of “Activity Hazard Analysis” were changed to “Work Package”
	Removed references to railroad, rail equipment, and rail transport of ash offsite
	Changed task-specific “procedures” to “Work Instructions”
Title Page	Changed Revision 05 to Revision 06
	Changed date from August 2010 to January 2013
Approvals Page	Changed TVA General Manager from Steve McCracken to Kathryn Nash
	Removed Program Manager signature block
	Changed TVA Safety Senior Manager from Charles Profit to Thomas K. Heffernan
	Changed Jacobs Safety and Health Manager from Danny Whitaker-Sheppard to Tom Bock
Section 1.2, Activities	Changed text from to: The components that are covered by this SWSHP are 1) ~~dredging of ash from rivers and auxiliary water bodies; 2)~~ ash processing which will include drying and volume reduction by movement of ash / windrow management, loading of processed ash for transfer to ~~disposal~~ stacking areas; 3) support activities which will include dust control, water management, environmental sampling and site maintenance; 4) dike construction; 5) recovery activities which will include cenosphere collection, debris removal, and community outreach ~~and dock reconstruction~~; and 6) cell closure activities including ~~deep soil mixing~~ Perimeter Wall Stabilization (PWS) construction, ash hauling, ash stacking, and capping.
Section 1.2.1, Dredging	Removed section in its entirety
Section 1.2.2, Ash Processing and Load-Out	Removed section in its entirety

Section	Changes
Section 1.3, Summary of Major Hazards	Modified bullet 4 from "Working around heavy equipment railroad and rail equipment used for materials handling, transfer and movement;" to "Working around heavy equipment;"
	Removed bullet 6, "Dredging operations;"
Section 1.6, Subcontractor Adherence Policy, first paragraph	Removed paragraph in its entirety
Section 3.4, Comprehensive Environmental Response, Compensation, and Liability Act Order, fourth bullet	Removed all sub-bullets
Section 4.1, Task Hazard Analysis	Modified text as follows: General task hazard analysis for activities ~~expected to occur~~ onsite have been developed and are included in ~~Appendix E~~ work packages specific to the work to be completed. The process for developing ~~Activity Hazard Analyses (AHA) and~~ Work Packages and JSAs are further discussed in Section 7.0 of this document. The hazard analyses included in this document are generic in nature and reflect the potential hazards of the site as outlined in this section. However, they must be further developed by task supervisors to address the specific conditions, hazards and those controls expected to be used for their crews.
Section 4.3, Site-Specific Procedures	Removed reference to the Project Management Plan
	Removed bullets identifying work activities
Section 4.4.1.1, Slips, Trips, and Same Level Falls, second paragraph, third sentence	Modified text as follows: "Steel-toe shoes (sneaker or loafer type) will not be worn in the field."
Section 4.4.2, Confined Space Entry, first paragraph, second sentence	Modified text as follows: On occasion, entry into vessel holds or mix tanks for inspection or repair work is required.
Section 4.4.2, Confined Space Entry, last paragraph	Removed paragraph
Section 4.4.3.1, Heat Stress Monitoring, second paragraph	Modified text as follows: Consideration must be given for those workers in areas of increased thermal loading ~~such as working inside rail cars, working on top of black railcar liners~~ and working in extra levels of PPE such as Tyvek.

Section	Changes
Section 4.4.5, Noise, last paragraph, first sentence	Modified text as follows: In some work environments, ~~such as dredge engine rooms~~, dual hearing protection may be warranted.
Section 4.4.6, Work On or Around Water, first three paragraphs	Modified text as follows: A significant amount of the work on this project will be conducted on or around water. Hazards associated with working around water are unique and are to be included in ~~AHAs~~ Work Packages. In addition, prior to performing work on the water in boats outside of ~~the immediate dredge areas~~ site boundaries, a Float Plan (Form 057) in Appendix D must be submitted, tracked and maintained by a dedicated individual on shore. In preparing the ~~AHAs~~ Work Packages, consideration will be given to the elements ~~of Jacobs HSEP 15.3, Work Over Water or Adjacent to Water~~ listed in Appendix H Marine Operations Requirement. U.S. Army Corps of Engineers Safety and Health Requirements Manual EM 385-1-1, Sections 19 and 30, and any applicable TVA requirements or U.S. Coast Guard (USCG) regulations. ~~For more extensive information on working on or around water, refer to the Marine Operations Requirements (Appendix H).~~ Unless otherwise posted, Personal Flotation Devices (PFD) will be required when working within 6 feet of the edge of water. If exceptions to this requirement are necessary, they must be established ~~on the task specific AHA~~ in the Work Package with concurrence from the SSHO. A complete list of Marine Emergency and Rescue Equipment can be found in Appendix F-5, Marine Emergency Equipment.
Section 4.4.7, Utility Clearance, second paragraph	Modified text as follows: Before the execution of any intrusive activities (or any type of marine activity), the TVA process for obtaining an excavation permit and utility clearance must be completed. Depending on the location of the excavation, a Kingston Ash Recovery Project permit may be developed (reference site-specific ~~Standard Operating Procedure~~ Work Instruction WI-CON-010*, Excavation and Trenching*. If a plant permit is required, complete an Excavation Permit found in Appendix D along with the following steps per *TVA Safety Procedure 804, Excavations and Trenching*:

Section	Changes
Section 4.4.7.2, Overhead Utilities, second bullet	Modified text as follows: For lines rated ~~over~~ between 50,000-200,000 volts, minimum clearance between the lines and any equipment part shall be ~~10~~ 15 feet ~~plus 0.4 inches for each 1,000 volts over 500,000 colts, or twice the length of ther line insulator, but never less than 10 feet.~~ A detailed listing of clearances can be found in Appendix J of T*VA Safety Procedure 802 Requirements for the Safe Operation of Cranes*.
Section 4.4.8, Pinch Points / Cutting Edges, first paragraph	Modified text as follows: Pinch points / cutting edges are a potential hazard in many areas of the work site such as in operating hand tools, vehicle doors, ~~and transporting debris and materials~~ operating drill rigs, collecting samples, performing equipment maintenance, etc. Pinch points or cutting edges are to be identified on the task-specific JSA and reviewed during tailgate meetings. Work gloves are to be worn by personnel with exposure to pinch points. Cut resistant gloves are to be worn by personnel with exposure to cutting edges.
Section 4.4.9, Low Illumination, second paragraph	Removed paragraph in its entirety
Section 4.4.10, Vehicles and Heavy Equipment Safety, first paragraph, third paragraph	Added “scrapers, road graders, and tractors” to the heavy equipment list
Section 4.4.11, Rail Activities	Removed section in its entirety
Section 4.4.11, Crane Activity, first paragraph	Modified text as follows: All crane activities will comply with *TVA Safety Procedure 802, Safe Operations of Cranes* including crane operator certification meeting TVA requirements. All rigging activities must comply with *TVA Safety Procedures 721, Rigging,-721-A, TVA Rigging Manual* including qualification of riggers and *721-B Rigging Equipment*.
Section 4.4.11, Crane Activity, second paragraph	Modified text as follows: For repetitive lifts ~~such as those occurring during debris removal in the river~~ a single plan can be completed which must establish the basic parameters allowed for that activity.
Section 4.4.12, Aerial Lifts, first paragraph	Removed last sentence: “Due to the unusual terrain encountered onsite, additional site specific guidance is included in the *Kingston Ash Recovery Project, Project Management Plan*.”

Section	Changes
Section 4.4.17, Fire / Explosion, third paragraph, last sentence	Changed “Jacobs, safety personnel...” to “Site safety, safety personnel...”
Section 4.4.18, Eye, Face, and Hand, first paragraph	Added “chainsaws” to PPE list for face shields or welding helmet list
Section 4.5. Chemical Hazards, second paragraph	Added “Process related chemicals such as high calcium lime, bentonite, slag cement, and Portland cement pose a hazard to a reduced percentage of site personnel due to the location of usage.”
Section 4.6.4, Spiders, first paragraph	Modified text as follows: In East Tennessee, spiders of potential concern are the brown recluse and black widow. Spiders may hide in clothing and PPE. Clothing should be inspected prior to donning. If personnel sustain a spider bite they are to go to site medical for evaluation, and report the bite to the SSHO. Information on these two spiders follows.
Section 4.6.4, Spiders, last paragraph, last sentence	Modified text as follows: “The spiders are nonaggressive and bite only in self-defense, ~~such as when someone accidently sits on them~~.”
Section 5.0, Health Hazard Monitoring, last paragraph	Deleted section in its entirety
Section 5.1.1. Integrated Air Sampling, second paragraph	Modified text as follows: When integrated monitoring is performed, a statistically significant sample of workers per the direction of the PHSM and recommended NIOSH sample methods will be selected for exposure monitoring. ~~Nearby areas or employees may be monitored if it is suspected a dispersed impact of the contaminants of concern however, these personnel will not count towards the statistical significance of the task workers monitored.~~ Refer to Appendix K for full details of the Industrial Hygiene Monitoring Plan.
Section 5.2.3, Data Review	Modified text as follows: The PHSM or Certified Industrial Hygienist (CIH) designee (IH Lead Technologist) will interpret monitoring data with peer review by another CIH as necessary. Personnel exposure results will be tabulated and ~~posted at the site~~ issued to individuals sampled, as soon as possible after results are received. Monitoring and sampling data, along with all sample documentation will be periodically reviewed by the PHSM.

Section	Changes
Section 5.4, Cold Stress Monitoring	Modified text as follows: Cold stress monitoring will be conducted in accordance with ~~Jacobs *HSEP 11.4, Cold Stress Control*~~. TVA requirements. Considerations will include ambient temperature, wind speed, type of work being performed and thermal warming effects. Warming breaks may be implemented based upon these considerations.
Section 7.0, Work Package Development	Changed title from to: "7.0 Activity Hazard Analysis" to "7.0 Work Package Development"
	Modified text as follows: The Work Package is a systematic way of planning work and identifying the potential health and safety hazards associated with the work~~,~~ and the methods to avoid, control and mitigate those hazards. Work Packages will be used to train work crews in identifying and controlling hazards prior to beginning a task.
Section 7.1, Work Package Components	Changed title from: "Task Specific Activity Hazard Analysis" to "Work Package Components"
	Modified text as follows: Task-specific work packages will be reviewed and approved by the SSHO or their designee and the appropriate operations manager/team lead. The Work Package, at a minimum, shall include the following: 1. Cover sheet 2. Two Minute Rule card 3. JSA 4. Pre-Job Briefing Checklist 5. Step Text for work instructions, including acceptance criteria as required. 6. Permits/Inspections/Hold Order Boundaries 7. Post-Job Review Checklist ~~Based on the scope of work, AHAs have been developed for the tasks expected to be performed onsite and are located in Appendix E. Additional AHAs will be developed as needed.~~ ~~The AHA is used as an initial hazard analysis, guide for the development of JSAs, planning, training, and auditing tool and is usually completed by a HSE professional. The JSA is a task specific planning tool and is completed by the craft lead on or just prior to the actual day of activity."~~

Section	Changes
Section 7.2, Job Safety Analysis Development from Work Package	Changed title from "Job Safety Analysis Development from the Activity Hazard Analysis" to "Job Safety Analysis Development from the Work Package"
	Modified text as follows: The superintendent or foreman as well as the work crew participate in developing the JSA as a collective effort. A JSA is a key component of the work package, tying the step text to the hazards of the work and the controls to prevent incident. Section 4 of this plan identifies many site hazards and general controls to be used to protect workers and can be utilized during development of the JSA.
	Removed second paragraph and bullets in their entirety
Section 7.3, New Phases of Work	Removed section in its entirety
Section 8.0, Work Zones, Site Control, and Personal Hygiene, second paragraph, third sentence	Modified text as follows: The notification and approval process can be conducted verbally or via e-transmission, but is to be followed up with the Work Zone Classification Change Notice (Form 085) found in Appendix D within 48 hours. ~~Changes that last more than 2 weeks will require a modification to the SWSHP.~~
Section 8.5, Waste Collection and Disposal, first paragraph	Removed reference to the "Rim Ditch"
Section 10.0, Emergency Response Plan, sixth paragraph	Modified text as follows: If either localized or site-wide evacuation is required, affected personnel are to report to their designated assembly areas at trailer city or at Berkshire house as soon as possible so all personnel can be accounted for. ~~Designated assembly areas are identified on Figure FIII - Emergency Assembly Areas, located in Appendix F.~~
Section 10.2, Medical Emergencies	Changed "SOP-HSE-019" to "WI, HSE-012, Site-Specific Automated External Defibrillator (ARD) Program"
Section 10.2.1, Emergency Medical Service Site Access and Initial Response, first paragraph	Modified text as follows: Primary Emergency Medical Service (EMS) access to the site will be via the ~~construction~~ North Sector entrance (Trailer City) located on Swan Pond Road. Those personnel calling 911 during an emergency must send a runner to this entrance to escort EMS to the victim's location. In addition, arrangements must be made to meet the onsite paramedic at ~~Personnel Entry Control Point #9 (near the rail spur crossing~~) Trailer City EZ entry control point and transport them to the victim's location. If the injury...steps are as follows:

Section	Changes
Section 10.2.2, On-Water Medical Response	Removed bullets identifying specific figures after the first paragraph
Section 10.3, Hazardous Material / Environmental Release, first paragraph	Modified text as follows: For hazardous materials and environmental release, the KIF ERP will be followed. ~~Designated shelters are identified on Figure FV - Emergency Chemical Shelters located in Appendix F.~~ If shelter in place is required, individuals will mobilize to site trailers and houses with established escape respirators and goggles, close all windows and doors, turn off all HVAC equipment and wait for further instruction.
Section 10.6.1, Shelter Locations at the North End of the Project Site	Modified text as follows: "To MAXIMIZE the available parking space BLOCKING cars in is PREFERRED. Exiting the parking area will be coordinated after the event. Appendix F for emergency access locations. The emergency shelter located at the north end of the site is located at:"
	Removed 119 Lakeshore Drive, 145 Lakeshore Drive, and 179 Lakeshore Drive from the bullet list
Section 11.2, Site-Specific Training/Orientation, first paragraph	Modified text as follows: Prior to commencement of field activities, all personnel assigned to the project will have completed site-specific training that will address ~~the contents of applicable AHAs~~all applicable site hazards. Training will also ~~including the activities, procedures, monitoring, and equipment used in the site operations. Site-specific training will also~~ include activities, procedures, monitoring, and equipment used in the site operations, site and facility layout, locations of EZs, CRZs, potential hazards, risks associated with identified hazardous substances at the site, hazard communication as necessary, PPE, incident reporting, emergency response actions, and available emergency services. ~~Each individual attending the training will be issued the Kingston Ash Recovery Project Site Wide Safety and Health Plan Booklet for quick reference of site rules.~~
Section 1.2.2, Railroad Safety	Section removed in its entirety
Section 11.3, First Aid and Cardiopulmonary Resuscitation, first paragraph, first sentence	Added "...American Red Cross (or other TVA-Approved curriculum..."
Section 12.0, Hazard Communication, fourth paragraph	Removed paragraph in its entirety
Section 14.0, Meetings, second paragraph	Removed reference to Jacobs

Section	Changes
Section 14.2, Daily Site Safety and Health Staff Meetings	Changed title from "Weekly Site Safety and Health Staff Meetings" to "Daily Site Safety and Health Staff Meetings"
	Modified text as follows: All designated contractor SSHO representatives must attend a ~~weekly~~daily telecom meeting chaired by the Jacobs Assistant Site Safety Officer or designee. The meeting will review program status, air monitoring results, upcoming activities, lessons learned and other topics deemed relevant by the group.
Section 14.3, Progress Meetings	Removed section in its entirety
Section 15.2, Weekly Safety Reports	Removed section in its entirety
Section 15.2 (formerly 15.3)	Modified text as follows: All personal monitoring results, laboratory reports, calculations and air sampling data sheets are part of an employee exposure record. These records will be maintained ~~by the contractor HSM~~ in the onsite Document Control office during site work. At the end of the project they will be maintained according the 29 CFR 1910.120 and TVA procedures.
Table 15-1, Notification	Updated contract information to reflect current conditions
Section 15.3.3, Incident Reports, second paragraph	Modified text as follows: All incidents categorized as first aid or worse (including near misses) will be entered into the TVA Problem Evaluation Report system by the Jacobs Methods and Process Coordinator. ~~In the event the incident results in a recordable injury or is likely to evolve into a recordable injury, the Task Managed Contractor Preliminary / Incident Report (TVA 20260) found in Appendix D must be completed and sent by the TVA Ash Recovery Program Manager within 24 hours via the email distribution identified at the bottom of the form.~~
Section 15.3.4, Management of Potential Injuries or Illnesses, second paragraph, last bullet	Modified text as follows: • Status Reporting to ~~Jacobs~~ TVA – Contractors shall keep the ~~Jacobs SSHO~~ TVA Safety Officer informed of case management status, progress, and issues for the duration of any evaluation or treatment provided. The contractor shall provide updated information to the ~~Jacobs SSHO~~ TVA Safety Officer regarding injury or illness status within 24 hours of each visit or change in status regarding recordability, restricted duty, or lost time.

Section	Changes
Section 15.3.5, OSHA Form 300, second paragraph	Removed paragraph in its entirety
Section 15.4, Health and Safety Logbooks, first paragraph	Modified text as follows: "All contractors and subcontractors shall complete and maintain logbooks in the field to document health and safety-related events as they occur during the day or utilize the SOR database for documentation of daily observations. ..."
Section 15.7, Inspections and Structured Field Visits	Modified text as follows: Regular inspections of active fieldwork areas shall be conducted to identify and correct potential worksite hazards as outlined below. ~~The Jacobs equipment inspection forms may be used and may be modified as desired to reflect task- or site-specific health and safety issues.~~ Administrative operations such as offices and storage areas have less frequent inspection requirements as the working conditions, and work practices in these areas are not expected to change as rapidly as active field work areas. The trailer and storage areas will be inspected on a monthly basis (fire extinguishers and First Aid kits) and on a quarterly basis ~~in accordance with Jacobs *HSEP 6.9, Warehouse Safety*~~ drills will be conducted to test emergency response preparedness.
Section 15.7.1 Daily Inspections (Health and Safety Supervisor or Designee), last sentence	Added "...or in the SOR database."
Section 15.7.2, Monthly Inspections (Site Supervisor)	Changed title from "Weekly Inspections (Site Supervision)" to "Monthly Inspections (Site Supervision)"
	Changed weekly inspections to monthly
	Removed reference to Jacobs.
Section 15.7.3, Safety Coaching Visits, second paragraph	Added "...checklist found in Appendix D or utilize the SOR process."
Section 15.7.5, Equipment Inspections	Removed reference to Jacobs and a floating plant
Section 15.7.6, Corrective Action, first paragraph	Modified text as follows: Corrective actions shall be implemented in a timely manner and tracked through completion within the SOR database or the TVA Problem Evaluation Report database. ~~Findings for weekly, monthly, or quarterly site inspections not completed or verified by the next scheduled inspection shall be reentered on the subsequent inspection form (with the date of the original~~

Section	Changes
	~~inspection added at the end of the corrective action). Corrective actions should be carried forward on each subsequent inspection until the corrective action is completed or verified. The notation 'F' (for carried forward) shall be made in the Date corrected column of the site inspection form whenever a finding is carried forward to a subsequent inspection.~~
Appendix A, Applicable Programs, Procedures, and Guidelines	Removed applicable TVA Safety and Jacobs HSE procedures and added Site Guidance Documents (HSE-xx)
Appendix D, Forms	Added Drill Rig Inspection (Form 129)
	Removed Task Managed Contractor Preliminary Incident / Injury Report (TVA 20260)
	Added TVA Take Two Card
Appendix E, Activity Hazard Analysis	Removed appendix in its entirety
Appendix F, Emergency Response and Contingency Plan	Reformatted sections and updated figures to reflect current conditions
Appendix I, Figures	Updated figures to reflect current conditions
Appendix J, Response to EPA Comments	Removed appendix in its entirety
Appendix K, Industrial Hygiene Monitoring Plan	Added Attachment 2: Kingston Ash Recovery Site Industrial Hygiene Monitoring White Paper

1.0 INTRODUCTION

1.1 BACKGROUND

This Site Wide Safety and Health Plan (SWSHP) addresses the safety and health management and practices for the Tennessee Valley Authority's (TVA) Kingston Fossil Plant Ash Release Response Project.

This revision as well as subsequent revisions of this SWSHP incorporates the specific requirements of 29 Code of Federal Regulations (CFR) 1910.120; Hazardous Waste Operations and Emergency Response (HAZWOPER). Plans written prior to this revision were not required to address the HAZWOPER requirements; however they were adequately protective of employee safety and health. The major changes in this and future revisions primarily address terminology, work zones, worker training and medical monitoring requirements as required by HAZWOPER.

This SWSHP addresses the identified hazards and presents procedures to be followed by site personnel to protect their health and safety. Activities performed under this SWSHP will comply with applicable sections of Occupational Safety and Health Administration (OSHA) Regulations 29 Code Parts 1910 and 1926, U.S. Army Corps of Engineers EM385 and the TVA Safety Program. Appendix A contains a list of programs, procedures, and guidelines that will be applicable on this project; electronic formats, which can be found on the TVA Intranet, ensures currency and consistency of these documents, and are available for examination by project participants if requested.

The SWSHP will be revised periodically as determined by the project team and changes will be communicated to all holders of controlled copies of the SWSHP.

1.2 ACTIVITIES

The components that are covered by this SWSHP are: 1) ash processing which will include drying and volume reduction by movement of ash / windrow management, loading of processed ash for transfer to stacking areas; 2) support activities which will include dust control, water management, environmental sampling, and site maintenance; 3) dike construction; 4) recovery activities which will include cenosphere collection, debris removal, and community outreach; and 5) cell closure activities including Perimeter Wall Stabilization (PWS) construction, ash hauling, ash stacking, and capping.

1.2.1 Infrastructure and Support Activities

The site facilities, grounds and common use equipment will be constructed and maintained as necessary. Dust control is implemented continuously onsite using water trucks and hydro-seed trucks spraying Flexterra®. The ash will also be re-contoured to limit the chance for dust generation and erosion. Water management includes controlling the flow of surface runoff through the slide area and managing water in the windrow areas. Site maintenance involves site facilities, roads and ancillary facilities. Environmental sampling activities will occur on and off site involving air, water, soil, flora and fauna. These activities occasionally occur on the Emory and Clinch Rivers.

1.2.2 Dike Construction

Dike areas will be reconstructed or strengthened as required onsite. This will primarily involve the placement of materials around existing dike areas.

1.2.3 Recovery Activities

Numerous activities will be conducted on and off the TVA property in areas impacted by the slide. This includes debris removal from rivers, cenosphere collection, and private dock repair / reconstruction. In addition, a portion of the Community Outreach Program will involves activities to respond to complaints and concerns from local residents as well as area enhancements to the surrounding community.

1.2.4 Cell Closure Activities

Activities will include performing PWS construction to create a stable foundation for perimeter containment of the land filled ash, ash hauling from areas outside of the planned cell footprint, construction of a working platform, ash stacking to construct the cell, and final capping/closure, including installation of instrumentation for future monitoring.

1.3 SUMMARY OF MAJOR HAZARDS

These activities present the following major hazards.

- Chemical hazards associated with handling fly ash;
- Physical hazards associated with working on or near water;
- Physical hazards associated with working on fly ash;
- Working around heavy equipment;
- Operation of watercraft and associated hazards of the marine environment;
- Crane operations;
- Diving operations; and
- Exposure to temperature extremes.

1.4 BEYOND ZERO

Beyond Zero® Performance describes a site approach and establishes expectations for both safety and project execution. We will achieve this level of performance excellence through teamwork and partnering with our client, site contractors and through the participation of every person on this project.

All site personnel are entitled to a safe working environment, individually and collectively; we are responsible for our own safety and that of our fellow employees.

We believe the following:

- All incidents are preventable through proper planning, tasking, and execution of plans as written.

- Any goal less than Zero Incident Performance is unacceptable and sends the message that incidents cannot be prevented.
- Active participation by all personnel is required to achieve Beyond Zero Performance. This includes all site personnel working collectively.
- If any incident does occur, it must be reported and investigated to identify root causes, take corrective actions, and communicate the lessons learned.

Various Beyond Zero® initiatives will be developed and rolled out with support and approval of key site management.

1.5 INITIAL SITE SPECIFIC ORIENTATION

Initial site specific orientation will be conducted per the requirements of 29 CFR 1910.120 (b) (4) (iii). All personnel being provided access to the site to perform work in restricted areas such as Exclusion Zones (EZ) and / or Contamination Reduction Zones (CRZ) will complete a pre-entry orientation. The orientation will address the anticipated site hazards associated with assigned tasks as well as work methodologies and control measures used to mitigate those hazards. If conditions or procedures change, briefings will be repeated as necessary.

Those workers in offices and Support Zones (SZ) who do not enter controlled areas will be required to attend a site specific health and safety orientation before being allowed unescorted site access. The orientation will focus on the general site layout, locations of restricted / controlled areas, emergency procedures and Environmental, Safety and Health (ESH) program elements.

1.6 SUBCONTRACTOR ADHERENCE POLICY

By attending site orientation, being trained on the specifics of this plan and in writing agreeing to comply with its requirements, all personnel affirm their belief in and commitment to the Zero Incident Process. The site safety and health professionals will continually evaluate planning and project execution to ensure that safety is embedded in the work process.

All contractors onsite will be required to comply with the requirements of this SWSHP.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

Project Organization and Responsibilities for each position are enumerated in the Project Management Plan.

TVA is responsible for establishing the goals, policies and requirements for the Kingston Ash Recovery Project Site.

The Construction Manager (CM), in association with the TVA, is responsible for ensuring that those goals, policies, and procedures are made known to all site personnel and are executed.

It is the responsibility of each contractor to ensure that their personnel and subcontractors are made aware of the goals, policies and procedures and that those goals, policies, and procedures are acted upon accordingly.

It is the responsibility of each individual to:

- Report all injuries immediately.
- Comply with applicable safety standards.
- Follow established site and employer safety and health work rules.
- Wear prescribed Personal Protective Equipment (PPE) (hard hats, high visibility vests, safety glasses, hard toed foot wear and gloves as appropriate).
- Promptly report hazards (to either your supervisor or submit a Safety Observation Report [SOR]).
- Participate in the daily pre-task planning.
- Participate in required training.

3.0 SITE HISTORY AND PROJECT DESCRIPTION

This section provides background information for TVA's Kingston Fossil Plant (KIF) and the Emory River.

3.1 LOCATION

The KIF is located on the Emory River arm of Watts Bar Reservoir, which feeds into the Clinch River. The Emory River borders the KIF to the east. The Emory River rises on the Cumberland Plateau in Morgan County, Tennessee and crosses into Roane County near Harriman, Tennessee. Flow on the Emory River in the vicinity of KIF is not controlled upstream by flood control or navigation structures, but the river elevation is controlled by Watts Bar Dam located downstream of KIF.

3.2 BACKGROUND AND SITE DESCRIPTION

On Monday, December 22, 2008, just before 1:00 a.m., a coal fly ash release occurred at the KIF, allowing a large amount of fly ash to escape into the adjacent waters of the Emory River and surrounding land.

Ash, a by-product of a coal-fired power plant, is stored in containment areas. 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 300 acres and affected about 40 area homes.

Fly ash filled the Swan Pond Embayment on the north side of the KIF property adjacent to the failed dredge cell. A dike was constructed in the eastern portion of the Swan Pond Embayment to contain that fly ash while a response action plan is developed by TVA and approved by the Tennessee Department of Environment and Conservation (TDEC) and the U.S. Environmental Protection Agency (EPA). Fly ash to the west (formerly upstream) of the Swan Pond dike is contained from further migration toward the Emory River by the dike. Fly ash also entered the channel and overbank areas of the riverine section of the Emory River. TVA is recovering the material outside of the Swan Pond Embayment by use of dredging operations.

3.3 SITE CHARACTERIZATION DATA

The fly ash that was released to the Emory River originates from the coal burned in boilers for power production at KIF. The coal, in its natural state, contains various metals that can be retained with the ash after burning. The ash itself is primarily composed of fine silica particles very similar to sand. Trace amounts of arsenic, selenium, cadmium, boron, thallium, and other metals which occur naturally in the coal remain in the ash after coal combustion. These metals are typically bound to the ash.

3.4 COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT ORDER

On May 11, 2009 an order was implemented to apply the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) to the response and cleanup actions associated with this program. As such, requirements related to 29 CFR 1910.120, also known as HAZWOPER, will be followed. Health and safety procedures prior to

this order did not specifically incorporate the requirements of HAZWOPER but were found to be adequately protective of worker safety and health. Key changes in this document associated with this order relate primarily to terminology, site control and training requirements which include:

- Training to be conducted per the general requirements of 29 CFR 1910.120 and the specific requirements of 29 CFR 1910.120, sections (e)(3), (e)(4), (e)(5), (e)(6), (e)(8);
- Implementation of a documented supervised field experience duration for all site workers, per the requirements of 20 CFR 1910.120(e)(3)(i) and (ii) typically a 24 hour work period;
- Establishing fencing, barricades and signage around the perimeter of the site stating, “Environmental Clean-up in Progress, Do Not Enter, No Trespassing”;
- Application of 0.050 mg/m^3 as an 8 hour Time Weighted Average (TWA) occupational exposure limit and 0.025 mg/m^3 as the 8 hour TWA action level for crystalline silica (respirable fraction);
- Increased focus on personal hygiene which includes the deployment of hand washing stations, boot cleaning locations and other decontamination activities as warranted, minimizing the dispersion of fly ash to personal vehicles, worker residences and support / office areas.

4.0 POTENTIAL HAZARDS OF THE SITE

This section presents an assessment of the overall physical, chemical and biological hazards that may be encountered during the execution of this project. It is expected that these hazards and task specific controls used to minimize their risk will be established in task specific Job Safety Analyses (JSA) which are required for all site tasks.

4.1 TASK HAZARD ANALYSIS

General task hazard analysis for activities onsite have been developed and are included in work packages specific to the work to be completed. The process for developing Work Packages and JSAs are further discussed in Section 7.0 of this document. The hazard analyses included in this document are generic in nature and reflect the potential hazards of the site as outlined in this section. However, they must be further developed by task supervisors to address the specific conditions, hazards and those controls expected to be used for their crews.

4.2 ZERO TOLERANCE ISSUES

It should be noted that TVA has the following issues which are considered to be immediately dangerous to life and are “Zero Tolerance”. Per the Zero Tolerance policy, violation will result in a 90 day termination for the first offense with more severe disciplinary action for repeat offenses. These are further discussed within this document where applicable and shall be addressed as appropriate for the task on all JSAs:

- Working at heights greater than 4 feet without proper protective systems or personal fall arrest devices.
- Failure to wear required respiratory protection.
- Employees under the influence of drugs or alcohol.
- Fighting.
- Entering confined spaces without proper permitting, training and equipment.
- Failure to comply fully with hot work permits.
- Riding equipment not designed for transporting employees.
- Unsafe operation of motorized equipment.
- Not properly locking out / tagging out (LO/TO) equipment per *TVA Safety Procedure 615, Lock-out/Tag-out* prior to removing machine guarding or entering areas of operation.
- Failure to wear a life vest when working over, adjacent to (within 6 feet), or in the water.
- Entering a regulated area (asbestos, lead, arsenic, radiation) without authorization.
- Entering unprotected excavations or entering excavations without adequate review and approval of a competent person.

4.3 SITE-SPECIFIC PROCEDURES

Numerous site-specific Work Instructions have been developed to assist Project Managers (PM), CMs, Superintendents, and Foremen in the ESH aspects of work planning. They do not repeat the specific requirements already established in the associated TVA Safety Procedures;

however, they do detail the methods to be used on this site in applying those requirements. These Work Instructions address responsibilities and basic planning steps and can be found in Appendix A.

4.4 PHYSICAL HAZARDS

An evaluation of physical hazards common to the site has been included in this section. This information should be used as a guide in developing JSAs.

4.4.1 Slips, Trips, and Falls

The site includes significant areas of uneven ground, rip-rap, river banks and difficult walking / working surfaces. Considering slips, trips and falls are the most common cause of injury on this type of work site, considerable planning and care must be taken to minimize the likelihood of injury.

4.4.1.1 Slips, Trips, and Same Level Falls

Whenever possible, walking surfaces will be designated and maintained to provide as level as possible of a walking surface. If areas are to be used repeatedly for foot traffic such as access ways to boat ramps, docks, or storage areas, it will be required to designate and maintain proper access to these locations. Special consideration must be given to walkways:

- Used by personnel carrying equipment and materials
- Used routinely for river or boat access
- Used by visitors and office personnel
- Intended to provide emergency egress from high hazard areas
- Routinely used by personnel working night shifts
- Around process equipment and stationary moving machinery
- Where water build-up could create ice in the winter months

In addition to proper walkways, proper field footwear is essential to minimize risk to slips and trips. All field personnel are required to wear steel-toe work boots with adequate ankle support. Steel-toe shoes (sneaker or loafer type) will not be worn in the field. Office personnel are encouraged to wear footwear that will provide adequate traction on the dirt walkways and wooden stairs in and around the field trailers.

4.4.1.2 Falls from Elevation

Falls from elevation can be mitigated a number of ways including; avoidance, process change, engineered fall protection systems such as standard railings or personal fall arrest systems. All of these approaches require significant advanced planning and coordination with the Project Health and Safety Manager (PHSM) and Site Safety and Health Officer (SSHO). Details of how fall prevention will be implemented must be thoroughly established and all impacted personnel properly instructed prior to the activity taking place.

TVA maintains a Zero Tolerance policy on anyone violating fall prevention / protection requirements. This includes working outside of engineered systems, working at heights greater

than 4 feet without personal fall arrest systems or improperly implementing established procedures. Requirements for implementing fall protection systems will be consistent with *TVA Safety Procedure 305, Fall Protection Systems*.

4.4.2 Confined Space Entry

Routine operations do not require entry into permit required confined spaces. On occasion, entry into vessel holds or mix tanks for inspection or repair work is required. These spaces are typically considered permit required confined spaces.

Prior to entering any space with all of the following characteristics, an evaluation must be performed by the contractor SSHO with concurrence by the PHSM as to whether or not permit required confined space procedures are required:

- A space that is large enough and so configured that an employee can bodily enter and perform assigned work;
- Has limited or restricted means for entry or exit; and
- Is not designed for continuous employee occupancy.

If it is determined that the space meets characteristics of permit required confined spaces, *TVA Safety Procedure 801, Confined Space Entry* must be followed. Basic requirements include worker training, clearance procedures, adequate staffing, means for prompt rescue and appropriate SSHO support.

4.4.3 Heat Stress

Heat stress is a significant potential hazard during summer months at the site. A heat stress prevention program will be implemented when ambient temperatures exceed 70°F for personnel wearing impermeable clothing and for other personnel when the Wet Bulb Globe Temperature (WBGT) index exceeds values established in *TVA Safety Procedure 806, Heat Stress.*

4.4.3.1 Heat Stress Monitoring

Monitoring will consist of either ambient, personal dosimetry or personal physiological techniques. Discussion of these various approaches are established in Section 5.3 of this plan.

Consideration must be given for those workers in areas of increased thermal loading and working in extra levels of PPE such as Tyvek.

If conditions warrant, a work rest regimen will be implemented to decrease the risk of personnel developing heat related conditions. Work rest cycles vary based on the results of ambient or personal monitoring, the type of work being performed and the acclimatization level of workers as prescribed in *TVA Safety Procedure 806, Heat Stress*.

4.4.3.2 Heat Stress Conditions

Any individual exhibiting signs of heat stress conditions must be provided appropriate treatment immediately.

The following is a brief description of common heat related ailments and their treatment:

Heat Fatigue – Symptoms of heat fatigue include impaired performance of skilled, sensorimotor, mental, or vigilance jobs. There is no treatment for heat fatigue except to remove the stress and insure adequate hydration before a more serious heat-related condition develops. It may be necessary in some cases of heat fatigue to remove the worker from strenuous activity for the entire day since symptoms may return more rapidly and with increased severity when heat exposure continues.

Heat Exhaustion – Symptoms include headache, nausea, vertigo, and weakness. This condition responds readily to prompt treatment such as cooling and rehydration. Workers suffering from heat exhaustion should be removed from the hot environment and provided fluids and adequate rest. Any worker suffering from signs of heat exhaustion must be removed from strenuous work activity for the day.

Heat Stroke – Heat stroke is a MEDICAL EMERGENCY. It occurs when the body's system of temperature regulation fails and body temperature rises to critical levels. The primary signs and symptoms of heat stroke are confusion and irrational behavior, loss of consciousness, convulsions, hot, dry skin and an abnormally high temperature.

Any worker exhibiting heat stroke symptoms should be immediately removed from their protective clothing without regard to chemical decontamination. Medical emergency responders must be called and the worker cooled to the extent possible until emergency response personnel arrive. Workers having suffered this ailment must have medical clearance from a physician prior to returning to work.

4.4.4 Cold Stress

During the colder months of the year, workers may be exposed to the hazards of working in cold environments. Potential hazards in cold environments include frostbite, trench foot or immersion foot, hypothermia, as well as slippery walking surfaces, brittle equipment, poor judgment and unauthorized procedural changes. The effects of low temperatures are further exacerbated by the proximity of the river. Discussion of cold stress monitoring is provided in Section 5.4 of this plan.

Adequate plans and procedures must be established to minimize the impact of these potential hazards, including adequate emergency accommodations for workers on water. Protection of workers from cold stress will include additional clothing, warm up periods, etc.

4.4.5 Noise

Noise is a potential hazard associated with the operation of heavy equipment, power tools, pumps and generators. Suspected high noise operations will be evaluated to determine if protective measures are warranted.

Worker monitoring for noise exposure is established in section 5 of this document.

Workers with 8-hour TWA exposures exceeding 85 decibels A weighted (dBA) will be included in a Hearing Conservation Program as required by 29 CFR 1910.95 and 1926.52. This is considered the action level for noise exposure. The Permissible Exposure Limit (PEL) for noise in an 8-hour work day is 90 dBA.

For those personnel routinely working 12-hour work days, the action level is 82 dBA, the PEL is 87 dBA.

In some work environments, dual hearing protection may be warranted. An evaluation should be made of the adequacy of hearing protection in these locations. This evaluation must follow the procedure established in 29 CFR 1910.95, Appendix B and *TVA Safety Procedure 310, Hearing Conservation Program*. Use of double hearing protection is required at sound levels >96 dBA.

4.4.6 Work On or Around Water

A significant amount of the work on this project will be conducted on or around water. Hazards associated with working around water are unique and are to be included in Work Packages. In addition, prior to performing work on the water in boats outside of site boundaries, a Float Plan (Form 057) in Appendix D must be submitted, tracked and maintained by a dedicated individual on shore.

In preparing the Work Packages, consideration will be given to the elements listed in Appendix H Marine Operations Requirements., U.S. Army Corps of Engineers Safety and Health Requirements Manual EM 385-1-1, Sections 19 and 30, and any applicable TVA requirements or U.S. Coast Guard (USCG) regulations.

Unless otherwise posted, Personal Flotation Devices (PFD) will be required when working within 6 feet of the edge of water. If exceptions to this requirement are necessary, they must be established in the Work Package with concurrence from the SSHO. A complete list of Marine Emergency and Rescue Equipment can be found in Appendix F.

All groups engaged in diving operations shall, as a minimum, meet the requirements of 29 CFR 1910 Subpart T Commercial Diving Operations and *TVA Safety Procedure 814, Underwater Diving*. This includes but is not limited to training requirements and the creation of a Dive Plan.

In the event that navigation changes are required in the river, they must be coordinated through the USCG, Nashville.

4.4.7 Utility Clearance

4.4.7.1 Underground Utilities / Excavation Clearance and Permitting

Whenever intrusive activities are conducted, whether land or water based, the threat of contact with underground utilities exists, including electrical, gas, sewage, etc.

Before the execution of any intrusive activities (or any type of marine activity), the TVA process for obtaining an excavation permit and utility clearance must be completed. Depending on the location of the excavation, a Kingston Ash Recovery Project permit may be developed (reference site-specific Work Instruction WI-CON-010*, Excavation and Trenching*. If a plant permit is required, complete an Excavation Permit found in Appendix D along with the following steps per *TVA Safety Procedure 804, Excavations and Trenching*:

- A plant specific administrative cover page with Parts A & B. Part A includes a plant specific sequential number (Plant/EXC/yr/number; e.g. ALF-EXC-0501) and the appropriate reviews for permit approval. Approvals are based on the subject matter expert's safety assessment

within their area of expertise of the proposed excavation. Part B includes approvals for completion and final closure of the permit.

- A description of the work to be performed.
- Exact location of the excavation and the embedded systems such as piping, electrical conduit, etc., that are to be located and marked.
- The hold order numbers on systems that have to be de-energized because they are located in or near the excavation.
- Any drawings or sketches needed to locate these embedded systems.

The utility clearance agency will be notified and the utility companies will mark existing utilities. In some instances this may include TVA in-house utility locator service or Tennessee On-Call or both. The clearance reference number will be recorded and kept current.

In the event underground work is required to be performed in the area of known utilities, non-mechanical means must be used to positively identify the location of these utilities prior to heavy equipment being used. A spotter should be positioned to assist the equipment operator avoid utilities during all excavation activities in these areas.

Prior to any workers entering excavations, a designated competent person must perform an excavation inspection and document the review on an Excavation and Trenching Permit (Form 041 or TVA 29205), found in Appendix D. All excavations in which workers must enter have to meet the basic requirements for sloping, shoring or shielding found in 29 CFR 1926, Subpart P; *TVA Safety Procedure 804, Excavations and Trenching*.

4.4.7.2 Overhead Utilities

Adequate clearance must be established and maintained for all overhead utilities. These include utilities crossing waterways in and around the site. Prior to conducting work in areas where overhead utilities exist, it is essential that a field inspection be conducted to verify adequate distances will be maintained for all equipment intended to be used in that location. As a minimum, 10 feet of clearance will be maintained between equipment and overhead utilities.

Clearance distances increase as voltage increase:

- For lines rated 50,000 volts or below, minimum clearance between the lines and any equipment part shall be 10 feet.
- For lines rated between 50,000-200,000 volts, minimum clearance between the lines and any equipment part shall be 15 feet. A detailed listing of clearances can be found in Appendix J of T*VA Safety Procedure 802 Requirements for the Safe Operation of Cranes*.
- A minimum of 10 feet of clearance must be maintained from low voltage conductors such as phone, cable, and similar conductors.

4.4.8 Pinch Points / Cutting Edges

Pinch points / cutting edges are a potential hazard in many areas of the work site such as in operating hand tools, vehicle doors, operating drill rigs, collecting samples, performing equipment maintenance, etc. Pinch points / cutting edges are to be identified on the task-specific JSA and reviewed during tailgate meetings. Work gloves are to be worn by personnel

with exposure to pinch points. Cut resistant gloves are to be worn by personnel with exposure to cutting edges.

When activities require the removal of any machine guarding over and around pinch points, it is necessary to implement the LO/TO procedures to prevent inadvertent start up. These must be as stringent as *TVA Safety Procedure 615, Lock-out/Tag-out*.

4.4.9 Low Illumination

Low illumination from diminishing daylight or nightfall due to work schedules is a hazard that may affect all site operations. Lighting requirements onsite are divided into two categories as follows:

- Lighting for Safety – This is defined as the minimum illumination level required for site personnel to safely navigate the site. This accounts for uneven terrain, access points to docks, boats and barges and various grade changes. The requirement for this site is 5 foot-candles. If general illumination levels are less than 5 foot-candles, personal supplemental lighting will be required. Personal supplemental lighting may be from flashlights, headlamps, temporary lighting stands or equivalent sources.
- Task Lighting – Addresses the lighting requirements for personnel to effectively and safely perform their assigned tasks. Supplemental lighting may be required for task illumination and should include overhead or pole mounted sources to avoid shadows being cast on work surfaces / work areas. Due to the significant variety of tasks onsite the following ranges are provided as a guide:
    - Excavation activity, bulk material handling, dredging: 5 foot-candles
    - Construction activity, maintenance, repair: 10 foot-candles
    - Office related work: ≥30 foot-candles

4.4.10 Vehicles and Heavy Equipment Safety

Requirements of *TVA Safety Procedure 711, Heavy Equipment Operations* must be met in regard to all heavy equipment operations. This includes meeting the requirement that an S5 physical or equivalent is provided to all heavy equipment operators. The nature of the work will result in vehicle traffic around the site in the form of heavy equipment such as excavators, backhoes, bulldozers, front end loaders, dump trucks, scrapers, road graders, tractors, and field vehicles. Vehicles will also be entering and exiting the site on a regular basis to / from the surface roads.

Onsite controls will include wearing of American National Standards Institute (ANSI) Class 2 (or greater) high-visibility vests when working at any location on the site outside of the immediate office area. Upon initial site mobilization, vehicle and pedestrian traffic patterns onsite will be established and properly communicated to the work crews and equipment operators. Traffic control persons will be identified and used as necessary at any of the intersections of the site and public roads.

Swing radius around heavy equipment must be controlled to prevent workers inadvertently walking into the swing path of equipment. In some instances this may require barricades, cones or caution tape to be utilized. All personnel must establish eye contact and acknowledgement from equipment operators prior to entering the swing radius of operating equipment. When

operators are required to interact or talk with ground personnel they must ground their equipment (buckets, etc.) and disengage the controls in order to prevent inadvertent movement.

Under no circumstances are equipment or motor vehicle operators to talk on cell phones while moving / operating equipment. Seat belts are required for operators and any passengers. Site speed limits must be observed.

4.4.11 Crane Activity

All crane activities will comply with *TVA Safety Procedure 802, Safe Operations of Cranes* including crane operator certification meeting TVA requirements. All rigging activities must comply with *TVA Safety Procedures 721, Rigging, 721-A, TVA Rigging Manual* including qualification of riggers and *721-B Rigging Equipment*.

All crane usage onsite requires a Lift Plan, the basic Lift Plan and Pre-Lift Checklist (Form 074) can be found in Appendix D. For routine lifts, Figures 1 and 3 of the Lift Plan must be completed prior to the lift.

For repetitive lifts,, a single plan can be completed which must establish the basic parameters allowed for that activity.

For those lifts meeting one or more of the criteria below, the lift will be considered a high hazard lift. High hazard lifts require completion and approvals of the High Hazard Lift Permit, Figure 2 of the Lift Plan found in Appendix D.

The following parameters define a high hazard lift:

- All lifts over 50 tons.
- When the load exceeds 85% of the cranes capacity, as shown on applicable crane manufacturer's load capacity charts for the configuration to be used.
- Planned engineered lifts when the capacity of an overhead crane is to be exceeded.
- When rigging, attachments, or methods are employed that are not covered in OSHA, the American Society of Mechanical Engineers (ASME), or Rigging Handbook requirements.
- When operating on an inherently hazardous location or under severe weather or emergency conditions.
- When operating with specific operational limits due to abnormal conditions existing with equipment, load, rigging, or facilities.
- Any lift whose failure could damage a high-value, long-procurement item(s) or significantly impact plant operations, shutdown, or equipment availability as determined by site management / superintendent, plant manager, or equivalent level of management.
- Any lift, in which the crane working clearances to adjacent equipment or electrical power lines are within plus 10% of minimum clearances specified in the ASME standard for the respective crane, excluding approved hot-line work.
- Any lift utilizing more than one crane or more than one hook.
- Any lift of humans with platforms attached to a load line.

- Any lift of material / equipment over humans (under special / unique conditions requiring such lifts) or lifts over active work areas, office buildings, public roadways or public transportation systems, e.g., light rail system, expressways, etc.
- Lifts involving non-rigid (flexible) objects such as tank shells.
- Lifts in confined or tight work areas.
- Other activities that should be considered for classification by the Program Manager as a critical lift would include:
    - Lifts over water including crane set up on barges, docks, etc.
    - Lifts made on rubber
    - Lifts of highly valuable or hazardous material
    - When replacement time for damaged load exceeds two months
    - Lifts using more than 200 feet of boom

4.4.12 Electrical Hazards

Electrical generators and associated equipment used onsite must be properly positioned, set up, and maintained. Since the grounding of most portable generators is accomplished through the equipment frame being in contact with the ground, all generators must be set up on the ground or a means of adequate grounding established and tested. For vehicle mounted generators, the frame must be bonded to the vehicle frame per *TVA Safety Procedure 1011, Portable and Vehicle Mounted Generators*.

All outlets onsite will require Ground Fault Circuit Interrupters (GFCI) which should be checked for proper operation prior to each use. All permanently installed outlets or any portable sources onsite longer than a month with GFCI protection are to be tested and documented on a monthly basis.

Properly rated extension cords with three prong plugs are required and must not display any signs of physical damage such as broken or cut insulation. Cords will not be placed where they may be run over by vehicles or create trip hazards. *TVA Safety Procedure 1004, Extension Cords and Attachments,* addresses extension cords and attachments including color marking for routine inspections unless ground continuity monitors are used.

Appropriate LO / TO methods must be employed per *TVA Safety Procedure 615, Lock-out/Tag-out* when working on electrical equipment or when deficiencies in existing electrical equipment have been identified. Work on energized electrical equipment will not be performed on this site without proper review and coordination from the responsible CM and contractor safety personnel. Reference and review of requirements found in *TVA Safety Procedure 302, Electric Arc Flash Protection*, and *TVA Safety Procedure 1022, Arc Flash Hazard Calculation* and Required Protection must be made prior to any personnel working on energized electrical equipment.

All work on electrical equipment must be performed by a properly trained and licensed electrician.

4.4.13 Pressurized Systems

Various pressurized systems exist onsite and include pipelines, hydraulic hoses and pneumatic control lines. Basic hazard controls must be implemented for routine use of these systems including whip checks, pins for twist lock fittings, warning signs and worker awareness.

Prior to disassembling any components of a pressurized system, residual or stored energy must be properly bled off. Once this is accomplished, LO / TO controls will be implemented to prevent inadvertent start-up of the equipment during maintenance activities. Under no circumstances are adjustments such as bolt tightening to be made on a pressurized system.

During disassembly, maintenance, and start-up activities, control of the “line of fire” must be established to prevent any workers from entering in or standing in areas where a component failure would result in impact to personnel.

4.4.14 Aerial Lifts

Various types of aerial lifts may be utilized on this site. All devices used and the methods of use must meet the requirements of 29 CFR 1926.453 Aerial Lifts and the intent of *TVA Safety Procedure 702, Aerial Lifts* and manufacturer recommendations. In addition, all lifts used onsite must comply with the requirements of ANSI A92.2-1969; lifts manufactured prior to 1973 will not be used on this site unless they have been appropriately modified per manufacturer requirements to comply with the associated ANSI standard.

All personnel utilizing aerial lifts must be trained per manufacturer requirements and be deemed competent to operate the specific devices prior to beginning tasks involving their use. This competent person designation must be in writing and accompany evidence of aerial lift training. These documents must be maintained onsite and be readily available for review.

4.4.15 Moving Machinery / Equipment

Numerous pieces of machinery and equipment will be utilized on this site. Proper precautions and controls must be implemented to prevent inadvertent contact to rotating components such as belt drives, chains, sprockets, pulleys, etc.

All manufacturer guards must be clearly identified and remain in place while equipment is in routine operation. During periods of maintenance or repair, LO / TO must be implemented to prevent inadvertent equipment start-up. Only authorized persons will remove machine guarding for maintenance and repair activities.

During JSA review, all rotating equipment and machinery must be identified to all impacted personnel. In addition, the types of guards in use and the location of all emergency stops must be covered with the work crew supporting the activity.

4.4.16 Overhead Hazards

The nature of site activities inherently creates the potential for overhead hazards to exist in most work areas. These hazards are frequently changing scope and location. As such, it is required that all field personnel utilize hard hats while in any work areas outside of the trailer complex. Existing and anticipated overhead hazards should be identified during the pre-task planning process and Work Package review.

Overhead work activities such as crane work, work from scaffolding, work from elevated platforms and ladders must be clearly identified to those on the ground. This may require the use of danger tape in the ground area impacted by overhead activities. In areas of high foot traffic, physical barricades may be necessary.

4.4.17 Fire / Explosion

Fire and explosion prevention includes proper housekeeping, proper storage of flammable / combustible materials, use of the hot work permit system, worker training and other controls essential to risk mitigation.

It is also essential that fire extinguishers are strategically placed throughout the site as required. In general, extinguishers should be available:

- In all pieces of heavy equipment
- On all boats, barges, dredges and other floating work platforms
- In all trailers
- In all site vehicles
- At all refueling areas
- In all areas where gas or diesel powered equipment is in use

Special conditions apply to refueling activities such as means for proper grounding and bonding, use of proper refueling equipment, worker training and spill control. In the event fixed refueling facilities will be utilized, it is required that pre-use inspections are conducted. Site requirements are further established in *TVA Safety Procedure 906, Combustible and Flammable Liquids*. Initial and subsequent quarterly inspections will be performed on all refueling areas onsite by Site safety, safety personnel from operating contractors and TVA Environmental.

Hot work on this site is defined as open flame, welding, or spark generating activity. For all hot work onsite, a Hot Work Permit found in Appendix D, must be issued by a site health and safety professional or their designee.

4.4.18 Eye, Face, and Hand

Numerous sources of eye, face, and hand injuries exist on the site. All personnel in the field will utilize ANSI Z87 approved safety glasses with side shields as a basic component of PPE. When using cut-off wheels, handheld grinders, wire wheels, chainsaws, welding equipment and oxy-fuel torches, protection such as face shields or welding helmets shall be worn in addition to safety glasses.

Hand injuries can be prevented a number of ways including using the right tool for the job, maintaining handheld equipment in good working order, maintaining tool guards, using the right type of gloves, keeping hands away from pinch points and keeping hands from between stationary objects and moving equipment.

4.4.19 Fly Ash Hazards

When the moisture content of fly ash is low, it can be a stable walking surface. As moisture content increases, movement of individuals and equipment can cause the ash to become unstable and allow the individual or equipment to sink in the material. Several controls are used to protect workers from this hazard.

If there is no work related reason to access an area of ash, then don't. If access is required, use the buddy system or take a means of communication such as a phone or radio. If possible, carry a shovel, rake, etc. to be used for balance, weight distribution, and probing for soft spots.

If activities result in being stuck in the fly ash, don't struggle. Stay calm and call for help immediately. Distribute body weight by sitting to prevent further sinking. Wait for coworkers to retrieve recovery boards stationed around the site to provide a stable platform to work from to assist in freeing the individual from the fly ash.

4.5 CHEMICAL HAZARDS

An evaluation of chemical hazards common to the site has been included in this section. This information should be used as a guide in developing JSAs.

Chemical hazards found onsite include constituents of fly-ash; chemicals used in equipment such as fuel, oil, hydraulic fluids, water treatment chemicals such as flocculating agents used in the dredging operations and acetic acid for pH control, and process chemicals associated with routine plant operations such as ammonia gas. Process related chemicals such as high calcium lime, bentonite, slag cement, and Portland cement pose a hazard to a reduced percentage of site personnel due to the location of usage.

All listed exposure limits are based on TWA for an 8-hour work shift and 40-hour work week. In instances when work shifts extend beyond these parameters, consideration will be given to adjust the exposure limit accordingly. Such adjustments must take into consideration the extended exposure time and the decreased recovery time associated with longer work shifts. Initially, the Brief and Scala model will be used to implement adjustments to exposure limits for extended work shifts. This model assumes a linear adjustment and does not take into account the specific body burden and toxicology associated with specific chemicals. It is generally considered to be the most conservative model in use.

As an initial guideline, adjustments will be based on Table 4-1

Table 4-1
Chemical Hazard Exposure Limits

Shift	Percentage of Original Exposure Limit to be Used
5 days by 10 Hours (50)	70%
5 days by 12 Hours (60)	50%
6 days by 12 Hours (72)	42%

4.5.1 Properties of Fly Ash Components

Fly ash from coal combustion is the principal material processed and handled during the project. Fly ash is comprised of the following:

- Crystalline silica (3 to 7%)
- Amorphous silica (33 to 57%)
- Aluminum oxide (18 to 31%)
- Iron oxide (5 to 25%)
- Calcium oxide (1 to 6%)
- Magnesium oxide (1 to 2%)
- Titanium oxide (1 to 2%)
- Inorganic arsenic (16 to 210 parts per million)

With the exception of arsenic, crystalline silica has the lowest PEL and the highest relative concentration of all constituents listed for fly ash. As such, it will be used as the indicator contaminant in conducting worker exposure monitoring and will typically be the driver for PPE upgrades.

Crystalline silica does not pose a contact or incidental ingestion hazard. As such, routine work clothing will be worn in areas where airborne limits are below designated PELs. Good personal hygiene, such as hand and face washing, minimizing clothing contact and boot cleaning stations will be utilized to prevent gross quantities of fly ash being transported into office areas, personal vehicles and offsite.

Table 4-2 presents additional information on these chemical constituents. Worker monitoring for potential exposure to fly ash components is discussed in Section 5.0 of this plan.

TVA is a Federal entity and is therefore governed by Federal OSHA PEL's. In addition, there are several contracting partners onsite that are required to follow the Tennessee (TN)-OSHA PEL's. The PEL's that will be mandated for compliance will be most conservative of either TN or Federal OSHA.

The Threshold Limit Values (TLV), found in American Conference of Governmental Industrial Hygienist (ACGIH) and / or the Recommended Exposure Limits (REL) found in National Institute of Occupational Safety and Health (NIOSH) will be typically used as a lower level indicator to provide an early warning of potential exposure risks. These indications will provide an opportunity for initiating further reviews, performing an evaluation and implementing subsequent controls that will aid in maintaining exposures as low as reasonably achievable and maintain them to less than the established Action Levels required by law under both TN and Federal OSHA.

Table 4-2
Fly Ash Constituent Information

Constituent[1]	Cas #	Applicable PEL Most Restrictive of Fed or TN OSHA	Site Action Level [2]	Lower Level Indicator [3]	Routes of Exposure	Symptoms of Exposure	Target Organ	NIOSH Method
Total Particulates	N/A	15 mg/m^3	7.5 mg/m^3	10.0 mg/m^3 TLV	Inhalation, skin and/or eye contact	Irritation eyes, skin, throat, upper respiratory system	Eyes, skin, respiratory system	0500 37mm
Respirable Particulates	N/A	5.0 mg/m^3	2.5 mg/m^3	3.0 mg/m^3 TLV	Inhalation, skin and/or eye contact	Irritation eyes, skin, throat, upper respiratory system	Eyes, skin, respiratory system	0600
Silica–Quartz[4] respirable Cristobalite	14808-60-7 14464-46-1	0.05 mg/m^3 TN[6]	0.025 mg/m^3 TLV	0.025 mg/m^3 TLV	Inhalation, skin and/or eye contact, ingestion	Cough, dyspnea wheezing, progressive respiratory symptoms (silieosis), irritation eyes	Eyes, respiratory system	7500 7601 7602
Aluminum Oxide	1344-28-1	15 mg/m^3	7.5 mg/m^3	1.0 mg/m^3 TLV	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, respiratory system	Eyes, skin, respiratory system	0500 0600
Antimony (Sb)	7440-36-0	0.5 mg/m^3	0.25 mg/m^3	0.5 mg/m^3 REL & TLV	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat, mouth; cough; dizziness; headache; nausea, vomiting, diarrhea; stomach cramps; insomnia; anorexia; unable to smell properly	Eyes, skin, respiratory system, cardio-vascular system	7300 37mm
Arsenic [4] (inorganic)	7440-38-2	0.01 mg/m^3	0.005 mg/m^3	0.01 mg/m^3 TLV	Inhalation, skin absorption, skin and/or eye ingestion	Ulceration of nasal septum, dermatitis, gastrointestinal disturbance, peripheral neuropathy, respiratory irritation	Liver, kidneys, skin, lungs, lymphatic system	7300 7301 7303 7900 9102

Constituent[1]	Cas #	Applicable PEL Most Restrictive of Fed or TN OSHA	Site Action Level [2]	Lower Level Indicator [3]	Routes of Exposure	Symptoms of Exposure	Target Organ	NIOSH Method
Barium (Ba)	7440-39-3	0.5 mg/m^3 TN[6]	0.25 mg/m^3	0.5 mg/m^3 PEL & TLV	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, upper respiratory system; skin burns; gastroenteritis; muscle spasm; slow pulse, extrasystoles; hypokalemia	Eyes, skin, respiratory system, heart, central nervous system	7300
Beryllium[5] (Be)	7440-41-7	0.002 mg/m^3	0.0001 mg/m^3	0.00005 mg/m^3 ACGIH TLV: TWA	Inhalation, skin and/or eye contact	Berylliosis (chronic exposure): anorexia, weight loss, lassitude (weakness, exhaustion), chest pain, cough, clubbing of fingers, cyanosis, pulmonary insufficiency; irritation eyes; dermatitis; [potential occupational carcinogen]	Eyes, skin, respiratory system, a1	7300
Cadmium[4] (Cd)	7440-43-9	0.005 mg/m^3	0.0025 mg/m^3	0.01 mg/m^3 TLV	Inhalation, ingestion	Pulmonary edema, dyspnea (breathing difficulty), cough, chest tightness, substernal (occurring beneath the sternum) pain; headache; chills, muscle aches; nausea, vomiting, diarrhea; anosmia (loss of the sense of smell), emphysema, proteinuria, mild anemia; [potential occupational carcinogen]	Respiratory system, kidneys, prostate, blood	7300
Calcium Oxide	1305-78-8	5.0 mg/m^3	2.5 mg/m^3	2.0 mg/m^3 REL & TLV	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, upper respiratory tract, ulcer, perforation, nasal septum	Eyes, skin, respiratory system	7020 7303

Constituent[(1)]	Cas #	Applicable PEL Most Restrictive of Fed or TN OSHA	Site Action Level [(2)]	Lower Level Indicator [(3)]	Routes of Exposure	Symptoms of Exposure	Target Organ	NIOSH Method
Chromium Metal (Cr III)	7440-47-3	1 mg/m^3	0.5 mg/m^3	0.5 mg/m^3 REL & TLV	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin; lung fibrosis (histologic)	Eyes, skin, respiratory system	7300
Cobalt	7440-48-4	0.05 mg/m^3 TN[(6)]	0.025 mg/m^3	0.02 mg/m^3 TLV	Inhalation, ingestion, skin and/or eye contact	Cough, dyspnea (breathing difficulty), wheezing, decreased pulmonary function; weight loss; dermatitis; diffuse nodular fibrosis; resp hypersensitivity, asthma	Skin, respiratory system	7300
Copper (Cu-dust)	7440-50-8	1.0 mg/m^3	0.5 mg/m^3	1.0 mg/m^3 REL & TLV	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, nose, pharynx; nasal septum perforation; metallic taste; dermatitis; in animals: lung, liver, kidney damage; anemia	Eyes, skin, respiratory system, liver, kidneys (increased risk with Wilson's disease)	7300
Iron Oxide (Fe_2O_3)	1309-37-1	10 mg/m^3	5.0 mg/m^3	5.0 mg/m^3 REL	Inhalation	Benign pneumoconiosis with x-ray shadows indistinguishable from fibrotic pneumoconiosis (siderosis)	Respiratory system	7300
Lead (Pb)	7439-92-1	0.05 mg/m^3	0.025 mg/m^3	0.05 mg/m^3 REL, TLV & PEL	Inhalation, ingestion, skin and/or eye contact	Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypertension	Eyes, gastrointestinal tract, central nervous system, kidneys, blood, gingival tissue	7300

Constituent[1]	Cas #	Applicable PEL Most Restrictive of Fed or TN OSHA	Site Action Level [2]	Lower Level Indicator [3]	Routes of Exposure	Symptoms of Exposure	Target Organ	NIOSH Method
Magnesium	1309-48-4	10 mg/m^3 TN[6]	5.0 mg/m^3	10.0 mg/m^3 TLV	Inhalation, skin and/or eye contact	Irritation eyes, nose; metal fume fever: cough, chest pain, flu-like fever	Eyes, respiratory system	7300
Manganese (Mn)	7439-96-5	N/A	N/A	0.2 mg/m^3 TLV	Inhalation, ingestion	Manganism; asthenia, insomnia, mental confusion; metal fume fever: dry throat, cough, chest tightness, dyspnea (breathing difficulty), rales, flu-like fever; low-back pain; vomiting; malaise (vague feeling of discomfort); lassitude (weakness, exhaustion); kidney damage	Respiratory system, central nervous system, blood, kidneys	7300
Molybdenum	7439-98-7	10.0 mg/m^3	5.0 mg/m^3	N/A	Inhalation, ingestion, skin and/or eye contact	In animals: irritation eyes, nose, throat; anorexia, diarrhea, weight loss; listlessness; liver, kidney damage	Eyes, respiratory system, liver, kidneys	7300
Nickel	7440-02-0	0.1 mg/m^3 TN[6]	0.05 mg/m^3	0.015 mg/m^3 REL	Inhalation, ingestion, skin and/or eye contact	Sensitization dermatitis, allergic asthma, pneumonitis; [potential occupational carcinogen]	Nasal cavities, lungs, skin	7300
Potassium (as (KOH)	1310-58-3	N/A	N/A	N/A	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, respiratory system; cough, sneezing; eye, skin burns; vomiting, diarrhea	Eyes, skin, respiratory system	7300

Constituent[(1)]	Cas #	Applicable PEL Most Restrictive of Fed or TN OSHA	Site Action Level [(2)]	Lower Level Indicator [(3)]	Routes of Exposure	Symptoms of Exposure	Target Organ	NIOSH Method
Selenium	7782-49-2	0.2 mg/m^3	0.1 mg/m^3	0.2 mg/m^3 REL, TLV & PEL	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat; visual disturbance; headache; chills, fever; dyspnea (breathing difficulty), bronchitis; metallic taste, garlic breath, gastrointestinal disturbance; dermatitis; eye, skin burns; in animals: anemia; liver necrosis, cirrhosis; kidney, spleen damage	Eyes, skin, respiratory system, liver, kidneys, blood, spleen	7300
Sodium (Na)	N/A	N/A	N/A	N/A	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, mucous membrane; pneumonitis; eye, skin burns; temporary loss of hair	Eyes, skin, respiratory system	7300
Thallium (Soluble compounds, as TI)	7440-28-0	0.1 mg/m^3	0.05 mg/m^3	0.02 mg/m^3 TLV (skin)	Inhalation, skin absorption, ingestion, skin and/or eye contact	Nausea, diarrhea, abdominal pain, vomiting; ptosis, strabismus; peri neuritis, tremor; retrosternal (occurring behind the sternum) tightness, chest pain, pulmonary edema; convulsions, chorea, psychosis; liver, kidney damage; alopecia; paresthesia legs	Eyes, respiratory system, central nervous system, liver, kidneys, gastrointestinal tract, body hair	7300
Vanadium	1314-62-1	0.05 mg/m^3 TN[(6)]	0.025 mg/m^3	0.05 mg/m^3 TLV	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, throat; green tongue, metallic taste, eczema; cough; fine rales, wheezing, bronchitis, dyspnea (breathing difficulty)	Eyes, skin, respiratory system	7300

Constituent[(1)]	Cas #	Applicable PEL Most Restrictive of Fed or TN OSHA	Site Action Level [(2)]	Lower Level Indicator [(3)]	Routes of Exposure	Symptoms of Exposure	Target Organ	NIOSH Method
Zinc Oxide	1314-13-2	10.0 mg/m^3 TN [(6)]	5.0 mg/m^3	2.0 mg/m^3 TLV	Inhalation	Metal fume fever: chills, muscle ache, nausea, fever, dry throat, cough; lassitude (weakness, exhaustion); metallic taste; headache; blurred vision; low back pain; vomiting; malaise (vague feeling of discomfort); chest tightness; dyspnea (breathing difficulty), rales, decreased pulmonary function	Respiratory system	7300

NOTES:

(1) Constituents will be sampled as total weight vs. respirable fraction unless otherwise specifically noted within the table.
(2) Based on 50% of the 8 hour site PEL
(3) Based on the lower of the values recognized by NIOSH or ACGIH.
(4) Suspected human carcinogen
(5) Confirmed human carcinogen
(6) State of Tennessee PEL values used over applicable Federal PEL values.

4.5.2 Site and Process Chemicals

Routine chemicals such as fuels, hydraulic fluids and oils are expected to be used onsite. Under normal use, these do not present any unusual chemical hazards to site personnel. If work in enclosed spaces is required, further evaluation will be necessary to determine potential impact.

Any other chemicals intended to be used onsite must be coordinated and cleared through operations and the SSHO prior to their use. If necessary, controls will be established and monitoring protocols implemented to evaluate worker exposure.

4.5.3 Water Treatment Chemicals

Flocculants used to assist in the removal of particulates from water and acids used to maintain appropriate pH levels in the process system tend to pose a contact or dermal hazard. These chemicals must be coordinated and cleared through operations and the SSHO prior to their use. Appropriate chemical protective clothing, eye protection, etc. as well as emergency response equipment such as eye washes and showers will be made available and utilized as appropriate. Specific PPE and operational controls will be identified in the JSA associated with the operation.

4.6 BIOLOGICAL HAZARDS

During the course of the project, there is a potential for workers to come into contact with biological hazards, such as animals, insects, and plants. The JSA will include specific hazards and control measures for these hazards for each task.

4.6.1 Animals

During site operations, animals such as dogs, cats, foxes, rabbits, raccoons, skunks, mice and snakes may be encountered. Workers shall use discretion and avoid all contact with animals. If erratic animal behavior is noticed, personnel will stay clear of the animal and notify the SSHO as soon as possible. If these animals present a problem, efforts will be made to remove them from the site by contacting a licensed pest control technician. If any dead birds are found, the Environmental Program Manager and SSHO must be notified immediately.

The focus of this plan is on venomous snakes that are present in East Tennessee - Copperhead and Rattlesnake (Timber and Western Pigmy rattler). The Timber rattlesnake is yellow with black or brown cross-bands or heavy striplings of black or dark brown.

If a snake bite occurs, the victim must be immediately transported to the nearest medical facility. In addition, the snake should be identified, if possible, by noting color, markings, and size. Interim first aid can be provided by applying ice to the bite area and keeping the victim calm.

4.6.2 Insects

Insects, such as mosquitoes, ticks, bees, and wasps, may be present during certain times of the year. Workers are encouraged to use insect repellents and follow good work and housekeeping practices, control of food wastes, removal of standing water, use of insect repellents, and diligence should minimize the potential for problems to arise as a result of insects. For significant infestations, a licensed exterminator has been contracted to assist in removal. Contact the TVA Kingston Ash Recovery Facilities Manager for assistance.

4.6.3 Stinging Insects

Yellow jackets, wasps, and similar insects may be present in our work areas. Work areas should be checked for the presence of nests / hives prior to setting up the site. Any workers known to be allergic to these insects should relay this information to their supervisor, SSHO and associated crew members. If the employee carries an epinephrine pen to counteract stings, they should instruct their counterparts on the proper use of the device in the event they become incapacitated and cannot self administer the injection.

4.6.4 Spiders

In East Tennessee, spiders of potential concern are the brown recluse and black widow. Spiders may hide in clothing and PPE. Clothing should be inspected prior to donning. If personnel sustain a spider bite, they are to go to site medical for evaluation and report the bite to the SSHO. Information on these two spiders follows.

Brown Recluse is a small size arachnid. It measures approximately 0.25 to 0.5 inches (7 to 12mm) long. The brown recluse spider color is generally brown and its body shows a peculiar cephalothorax with a dark brown spot in a violin form; the legs are light brown and the abdomen, of an oval aspect, is dark brown, yellow, or greenish yellow. The most important characteristic is the existence of three pairs of eyes in the cephalothorax.

Black Widow is 1.5 inches (38mm) long, 0.25 inches (6.4mm) in diameter with a colored hourglass shape on their abdomens. Most people who are bitten suffer no serious damage, let alone death. But bites can be fatal—usually to small children, the elderly, or the infirm. Fortunately, fatalities are fairly rare. The spiders are nonaggressive and bite only in self-defense.

4.6.5 Ticks

All personnel and contractors should be aware of the potential presence of ticks in wooded areas. Rocky Mountain Spotted Fever is the most prevalent tick-borne disease in East Tennessee and may be transmitted by a dog tick. The early clinical presentation of Rocky Mountain Spotted Fever is often nonspecific and may resemble many other infectious and non-infectious diseases. Initial symptoms of Rocky Mountain Spotted Fever may include fever, nausea, vomiting, muscle pain, lack of appetite, and severe headache.

Specific precautions include:

- Wearing hooded coveralls to cover your body as much as possible. Light color clothing makes spotting of ticks easier.
- Eliminating possible paths by which the tick may reach unprotected skin. For example, tuck bottoms of pants into socks or boots and sleeves into gloves. (Duct tape or gators may be utilized to help seal cuffs and ankles).
- If heavy concentrations of ticks or insects are anticipated or encountered, Tyvek coveralls may be utilized.
- Conducting periodic and frequent (e.g., hourly) surveys of your clothing for the presence of ticks. Remove any ticks / insects that become attached to clothing.

- Using insect / tick repellents per the directions on the label. Repellents containing the compound N,N diethyl-meta-toluamide (DEET) can be used on exposed skin except for the face but they do not kill ticks and are not 100% effective in discouraging ticks from biting. Products containing permethrin kill ticks but they cannot be used on the skin; only on clothing. When using any of these chemicals, follow label directions carefully.

- When removing ticks, use tweezers and grab the tick as closely to the skin as possible. Do not try to remove ticks by squeezing them, coating them with petroleum jelly, or burning them with a match.
- If you remove a very small tick and want to have it tested for a tick-borne disease, place it in a clean pill vial or tight-sealed plastic storage bag.

Report any of the above symptoms and all tick bites to the SSHO for evaluation.

4.6.6 Poisonous Plants

Plants such as poison ivy and poison sumac may be prevalent at the site during certain times of the year. Poison ivy is a kind of harmful vine or shrub in the cashew family, and usually grows as a vine twining on tree trunks or straggling over the ground. However, the plant often forms upright on bushes if it has no support to climb upon. The leaves of poison ivy are red in early spring, later in spring, they change to shiny green, then in fall turn red or orange. Each leaf is made up of three leaflets more or less notched at the edges. Two of the leaflets form a pair on opposite sides of the leafstalk, while the third stands by itself at the tip of the leafstalk.

The key to avoiding exposure is the ability to recognize and avoid the plants. If it is necessary to work in wooded areas, the JSA should include discussion on how to recognize poisonous plants.

4.6.7 Blood-Borne Pathogens

Those personnel who provide first aid could be exposed to Blood-Borne Pathogens (BBP); therefore, all personnel who are trained in First Aid / cardiopulmonary resuscitation (CPR) must participate in BBP training. The primary pathogens of concern are the Hepatitis B Virus and Human Immunodeficiency Virus (also known as HIV). Typically, this training is provided by the CPR and / or First Aid training providers.

4.6.8 Pandemic Planning

The *TVA Pandemic Plan, Health and Safety Practice 8*, addresses actions for site personnel to take to maintain essential functions prior to, during, and after a pandemic - a global disease outbreak in humans. Site personnel are required to follow the direction of the Pandemic Planning Teams.

5.0 HEALTH HAZARD MONITORING

TVA will arrange for worker monitoring for exposure to potential occupational health hazards including air contaminants, noise, and thermal stress as illustrated on Figure 1 (Appendix I). The results will be compared to associated action levels to make decisions about adequacy of PPE levels, effectiveness of work practice controls and need for medical monitoring.

When feasible, direct reading instrumentation will be used as initial exposure screening to ascertain the need for integrated monitoring such as noise dosimetry, integrated air monitoring and personal heat stress monitoring. Direct reading instrument levels will also be used, when possible, to prioritize the sequence of integrated monitoring for the different exposure groups onsite.

If feasible, while integrated monitoring is performed, direct reading levels will be recorded with the expectation that a correlation can be established between direct reading instrument levels and integrated monitoring. If an adequate correlation can be established, exposure checks can be performed using direct reading instruments.

5.1 AIR CONTAMINANTS

5.1.1 Integrated Air Sampling

The PHSM, SSHO and Lead Industrial Hygiene Technologist, concurrent with activities that may generate contaminants in excess of 25% of the established PEL, shall perform assessment and evaluation of exposures to airborne contaminants through integrated personal sampling. This may include sampling for silica, respirable dust or associated heavy metals known to exist in fly ash. Refer to Appendix B, Health Hazard Evaluation for discussion of task anticipated contaminants, and exposure probability.

When integrated monitoring is performed, a statistically significant sample of workers per the direction of the PHSM and recommended NIOSH sample methods will be selected for exposure monitoring. Refer to Appendix K for full details of the Industrial Hygiene Monitoring Plan.

5.1.1.1 Exposure Group Evaluation

An evaluation of all tasks will be performed to determine recognized exposure groups within each activity. Once this has been done, a review of existing data from samples already collected will be evaluated and, if possible, correlated to exposure groups identified for each task. If data gaps exist, additional monitoring will be performed until all exposure groups have been adequately characterized until at least a 95 percentile confidence level has been achieved.

5.1.1.2 Routine Monitoring

Once all exposure groups are adequately characterized, routine monitoring will be performed on those groups perceived to be at highest risk based on collected data. Typically, this will include the following in order of highest priority:

- Exposure groups showing results higher than established action levels (50% of the established site PEL (most restrictive of Federal or TN OSHA).
- Exposure groups showing results greater than the established PEL.

- Exposure groups routinely working in areas with highest total dust concentrations independent of chemical specific results.
- Exposure groups working in direct proximity to any of the above groups.

Routine monitoring will be performed until statistical significance to at least the 95th percentile has been established for all groups and all data is properly validated.

Integrated monitoring should be documented on a form similar to the Integrated Air Monitoring Record (Form 077) found in Appendix D.

5.1.1.3 Cessation of Integrated Monitoring

Reduction or cessation of air monitoring may be approved by the PHSM when the rationale for the modification is documented in a field change notice. Rationale may include the following conditions:

- Adequate exposure group characterization has been achieved, generally to the 95% confidence level. This may be independent of whether integrated results indicate exposures above or below the associated PEL,
- A process change occurs or engineering controls implemented which effectively decreases monitoring levels to less than 25% of the associated PEL,
- Completion or cessation of the associated task or removal of the associated exposure group from the exposure environment.

5.1.2 Direct Read Instrument Screening

After the start of any new task, project phase or field activity and when feasible for the contaminants of concern, exposure groups should be screened using direct reading instruments. If this is performed it should be done as soon as possible, with areas of highest potential exposures screened first. Direct reading measurements should be recorded on the Direct Read Air Monitoring (Form 075) found in Appendix D.

In order to keep a screening approach conservative and adequately protective of worker health, direct readings for dust will be assumed respirable dust and the upper percentage limits given for the various metals identified on fly-ash Material Safety Data Sheets (MSDS) will be assumed to be present in all dust readings.

Information used during screening can be used to help prioritize exposure groups for integrated monitoring, but in no way shall be used to replace integrated monitoring data.

5.2 DATA QUALITY ASSURANCE

5.2.1 Calibration

Instrument calibration shall be documented and included in a dedicated safety and health log book or on separate calibration pages. An Instrument Calibration Log (Form 072) for direct reading instruments can be found in Appendix D. All instruments shall be calibrated before use. A calibration check must be conducted at the end of shift or sampling event. Calibration checks may be used during the day to confirm instrument accuracy. Duplicate readings may be taken to confirm individual instrument response.

Air sampling pumps used to collect worker exposure samples shall be calibrated before use with a calibration check being performed at the end of sampling or shift. Calibration shall be accomplished using a primary standard calibration system (e.g., bubble tube or dry piston calibrators). (See Appendix A, HSE-07, Industrial Hygiene Personal Air Monitoring Procedure). Results of the calibrations shall be included on air sampling data sheets. Differences in pre and post calibration may be cause for voiding associated data collected on those instruments.

5.2.2 Operations

All instruments shall be operated in accordance with the manufacturer's specifications. Manufacturers' literature, including an operations manual for each piece of monitoring equipment, will be maintained onsite by the SSHO for reference.

Samples sent to a laboratory for analysis shall be packaged to prevent damage, spillage, or leaks. An appropriate number of blank samples must be included per the NIOSH sample method being utilized.

An air or bulk sample data sheet with chain-of-custody information must accompany any sample shipped.

5.2.3 Data Review

The PHSM or Certified Industrial Hygienist (CIH) designee (IH Lead Technologist) will interpret monitoring data with peer review by another CIH as necessary. Personnel exposure results will be tabulated and issued to individuals sampled, as soon as possible, after results are received. Monitoring and sampling data, along with all sample documentation, will be periodically reviewed by the PHSM.

5.2.4 Laboratories

Only analytical laboratories accredited by the American Industrial Hygiene Association shall perform chemical analysis of samples collected for assessment of employee exposures through integrated monitoring. The laboratory analysis will include field blanks, as required by the individual method or laboratory. Duplicate samples or splits with other laboratories may be used during the project. Laboratories may be required to submit a copy of their Accreditation Certificate and most recent Quarterly PAT Performance Report.

5.2.5 Noise Monitoring

Noise monitoring may be conducted in areas adjacent to heavy equipment operation or any other potential elevated noise source including the site perimeter. Work zones will be established and posted where hearing protection must be worn. Workers with 8-hour TWA exposures exceeding 85 dBA (82 dBA for 12 hour TWA) must be included in their company's hearing conservation program.

5.3 HEAT STRESS MONITORING

Monitoring shall be conducted, as necessary, to assist in determining initial work / rest regimens and to verify that these regimens are adequate as the work progresses. Heat stress monitoring shall be performed in accordance with guidance given in the latest edition of *TVA Safety Procedure 806, Heat Stress*. Two primary monitoring methods are used depending on the type

of protective clothing worn: 1) WBGT monitoring when wearing permeable protective clothing; and 2) Personal physiological monitoring when wearing impermeable protective clothing or working in areas of higher thermal loading than ambient conditions (i.e. interior of rail cars, confined spaces, etc.). As a minimum, each contractor onsite shall provide, if work scope warrants, a qualified person able to count and record pulses / minute and read and record body temperatures as a means to fully implement the personal physiological monitoring.

5.3.1 Ambient Monitoring

Personal physiologic monitoring (heart rate and body temperature, and fluid loss, if possible) of workers shall be used to assist in determining work / rest regimens whenever impermeable protective clothing is worn.

5.3.1.1 Wet Bulb Globe Temperature Technique

Keep in mind that disposable clothing such as Tyvek and raingear may be considered air or water vapor impermeable. The WBGT index is not normally used to determine work / rest regimens for impermeable protective clothing because the index takes into account the effects of evaporative cooling. Impermeable protective clothing impedes evaporative cooling; however, *TVA Safety Procedure 806, Heat Stress* provides guidelines on work / rest regimens when wearing protective clothing.

When appropriate, a WBGT index will be measured on the site per the guidelines established by the ACGIH. When the measured index exceeds established limits for the type of work being performed, work / rest cycles will be implemented accordingly. This information will be passed to each contractor's SSHO for coordination and implementation with their operations managers.

5.3.1.2 Adjusted Temperature Technique

The most important environmental conditions related to heat stress for workers wearing impermeable protective clothing are the ambient temperature and radiant (solar) heat.

These factors are combined into an index called the "adjusted temperature" using the formula shown below. In this formula, ambient temperature is measured with a dry bulb thermometer shielded from the sun, and the percent sunshine is the percent time the sun is not covered by clouds that are thick enough to produce a shadow.

Adjusted Temperature °F = ambient temperature °F + (13 x percent sunshine as a decimal)

The adjusted temperature values are then used to determine the initial work / rest regimen and physiological monitoring frequency. The length of the work cycle is governed by the frequency of the required physiological monitoring. Initially, rest periods are at least 15 minutes per cycle.

5.3.2 Personal Monitoring

A person competent to accurately measure pulse and / or body temperature shall perform physiological monitoring when other forms of monitoring for heat stress conditions are deemed inaccurate for the environment or activity. Measure the worker's pulse, either at the carotid (neck) or radial (wrist) artery at the beginning of the shift and periodically thereafter based on work activities. The following formula will be used to calculate the maximum pulse rate based on the age of an acclimatized worker.

Maximum pulse rate [beats per minute (bpm)] = (180 – age); if the pulse rate has not gone below 110 bpm after one minute, allow the worker to continue to recover.

If pulse measurement is not feasible, then aural temperature measurements may be used.

Like the pulse measurement, an initial measurement is necessary for a baseline value.

When core temperature for the acclimatized worker exceeds 101.3 °F or for the unacclimatized worker exceeds 100.4 °F, a rest period will be used to allow the worker to recover.

Any worker exhibiting signs of heat stress will be removed from the area for rest in a cool area. Heat strain symptoms will be monitored to ensure the worker does not progress into heat stroke. If the symptoms of heat stroke occur, the worker will be taken for immediate emergency care.

Monitoring results shall be recorded on a Heat Stress Physiological Monitoring form that must be approved by Jacobs. The form must be organized so that an individual worker's measurements for a full workweek can be recorded on one form. The program should contain, at a minimum, the elements of *TVA Safety Procedure 806, Heat Stress*.

Personal heat stress monitoring is the least preferred approach since site wide conclusions cannot be drawn from the effort due to the significant variability in the results. Therefore, personal heat stress monitoring will be performed any time area monitoring is considered inaccurate or not representative of a given task or exposure scenario.

5.4 COLD STRESS MONITORING

Cold stress monitoring will be conducted in accordance with TVA requirements. Considerations will include ambient temperature, wind speed, type of work being performed and thermal warming effects. Warming breaks may be implemented based upon these considerations.

6.0 PERSONAL PROTECTIVE EQUIPMENT

6.1 GENERAL REQUIREMENTS

The PPE outlined in this section has been selected according to the site characterization and analysis, job tasks, site hazards, intended use, and duration of potential employee exposures.

Maintenance and storage of PPE, decontamination, donning and doffing procedures, inspection and monitoring of effectiveness, and PPE limitations are outlined in this section.

A site-specific respiratory protection program has been established when use of such equipment is intended to lessen the potential for adverse health effects to any employee. The respiratory protection program for the site is detailed in Appendix C, and is to be followed should respiratory protection be required.

For those activities where fly ash is being processed dry, modified Level D PPE may be required. The key for exposure control is to prevent dust accumulation on clothing, hair and skin which in turn prevents prolonged passive exposures. Protective clothing in the form of dedicated coveralls and dedicated site work boots may be required if conditions warrant.

In the event that PPE items may create a hazard during the performance of specific tasks, such as wearing a high visibility vest during open flame or welding activity, the requirement may be waived. In order to waive the requirement, the JSA must document what the hazard is and why the PPE item creates a greater hazard with its use. With the exception of removing a high-visibility vest during hot work, other changes to basic PPE requirements must be approved by a site SSHO.

6.2 LEVELS OF PROTECTION

6.2.1 Level D Protection

Minimum level of PPE required in all non-office work environments:

- Coveralls or work clothing as dictated by the weather
- Steel-toe work boots (ANSI Z41)
- Safety glasses with permanent side shields (ANSI Z87)
- Hard hat, Type E (ANSI Z89.1)
- High visibility yellow reflective vests (ANSI Z107)

6.2.2 Level C Protection

All components of Level D Protection, plus:

- Hooded chemical coveralls suitable for particulates (DuPont ProShield®, NexGen™ or Tyvek®)
- Gloves outer – leather, nitrile, neoprene or natural rubber
- Gloves inner – cotton
- Full face or half mask respirator with P-100 filter (dependent on protection factor needed)

- Chemical protective boots or boot covers
- Safety glasses (with half mask)

6.2.3 Levels A and B

Based on present site knowledge, protective Levels A and B will not be required.

6.3 SELECTION OF PERSONAL PROTECTIVE EQUIPMENT

The selection of specific types of PPE will be conducted after a thorough evaluation of the potential hazards involved for each task. Site specific addenda will evaluate the planned tasks, potential chemical hazards, nature of environmental conditions, and other factors when determining specific types of PPE to be used. The initial PPE to be worn is provided in Appendix B.

Changes to initial levels of protection may be requested by Project Management whenever site conditions warrant, but must be approved by the SSHO and PHSM. PPE change request will be submitted on the PPE Downgrade Rationale (Form 079) found in Appendix D. Once approved, changes will be made to the associated Work Package as appropriate.

7.0 WORK PACKAGE DEVELOPMENT

The Work Package is a systematic way of planning work and identifying the potential health and safety hazards associated with the work, and the methods to avoid, control and mitigate those hazards. Work Packages will be used to train work crews in identifying and controlling hazards prior to beginning a task.

Each contractor's operations staff and site safety professionals are responsible for developing accurate Work Packages or obtain them from their subcontractors, and review them for accuracy.

7.1 WORK PACKAGE COMPONENTS

Task-specific work packages will be reviewed and approved by the SSHO or their designee and the appropriate operations manager/team lead. The Work Package, at a minimum, shall include the following:

1. Cover sheet
2. Two Minute Rule card
3. JSA
4. Pre-Job Briefing Checklist
5. Step Text for work instructions, including acceptance criteria as required.
6. Permits/Inspections/Hold Order Boundaries
7. Post-Job Review Checklist

7.2 JOB SAFETY ANALYSIS DEVELOPMENT FROM WORK PACKAGE

The superintendent or foreman as well as the work crew participate in developing the JSA as a collective effort. A JSA is a key component of the work package, tying the step text to the hazards of the work and the controls to prevent incident. Section 4 of this plan identifies many site hazards and general controls to be used to protect workers and can be utilized during development of the JSA.

8.0 WORK ZONES, SITE CONTROL, AND PERSONAL HYGIENE

Site control will be maintained in part, by identifying, delineating or communicating the locations of EZs, CRZs, and SZs. Those zones are defined as follows:

- Exclusion Zones – Work areas where fly ash is handled, stockpiled or otherwise actively being manipulated.
- Contamination Reduction Zones – Areas where personnel and equipment cleaning and / or decontamination is occurring. Also areas where fly ash exists from the original release, but is not being actively manipulated.
- Support Zones – Office areas, equipment storage areas, public roads or other areas not meeting the definition of an EZ or CRZ. It is imperative that these areas remain free of fly ash. If this cannot be accomplished they may be deemed an EZ or CRZ as appropriate.

Figure 2 (Appendix I) provides an overview of the established site zones; Figure 2 (Appendix I) illustrates the typical work area layout. All changes to the EZ need to be approved by the Remedial Project Manager. The notification and approval process can be conducted verbally or via e-transmission, but is to be followed up with the Work Zone Classification Change Notice (Form 085) found in Appendix D within 48 hours. These changes must also be explained to those personnel working in impacted areas.

With the exception of those individuals who meet the exceptions outlined in Section 11.0, only those authorized workers who have completed proper HAZWOPER training, medical monitoring when applicable and site orientation will be allowed to enter an EZ or CRZ. This approach will help keep untrained personnel away from higher hazard operations and reduce the number of workers in work areas. As work progresses and field conditions are monitored, work zone boundaries and site drawings may be modified. Work zones shall be clearly identified and marked using fences, signs, or tape when necessary.

Cleaning or decontamination of site vehicles prior to leaving the associated CRZ is required if the vehicles will be entering a support zone or traveling through nearby residential areas. Dedicated areas will be identified and equipped onsite for the vehicle cleaning, dust and dirt removal. Workers who are exposed to fly ash and dust at levels above the PEL or who frequently contact ash during the performance of their duties may be expected to wear coveralls and dedicated boots to avoid transferring materials offsite or to their personal vehicles.

8.1 BASIC WORK PRACTICES

One of the most important aspects of site control is good personal hygiene. This should minimize dispersion of materials, eliminate potential worker exposure and help ensure valid sample results by precluding cross contamination. Some recognized protocols are:

- Do not walk through areas containing fly ash unless integral to planned activities.
- Minimize direct handling or touching of materials.
- Make sure there are no cuts or tears in work clothing and PPE.
- Take particular care to protect any skin injuries.
- Stay upwind of material handling activities whenever possible.

- With the following exceptions, do not eat, drink or use tobacco products (smoking, dipping, chewing) in any EZ or CRZ:
  - Drinking, eating and tobacco use are allowed in approved SZs within the EZ and designated support areas outside of the EZs and CRZs.
  - Drinking water is allowed in enclosed cab, filtered heavy equipment (not motor vehicles) provided the equipment interior remains clean. This will likely require daily wet wiping and vacuuming of equipment interior to meet this requirement.
- Do not leave food in any EZ or CRZ work areas, if food is carried into these areas it must be brought directly to the interior SZs.
- Minimize the number of personnel and amount of equipment in an EZ or CRZ to that necessary for accomplishing the work.
- Whenever possible, designate site vehicles and equipment to be used for EZ, CRZ use only.
- Choose tools and equipment with nonporous exterior surfaces that can be easily cleaned.
- Keep excavated materials in dedicated areas and out of the way of workers.
- Upon exiting work areas, thoroughly clean hands and face, and remove any debris from work clothing. If wearing Level C PPE, perform proper dry decontamination and dispose of used PPE properly.

8.2 PERSONNEL HYGIENE FACILITIES AND CLEANING PROCEDURES

With the exception of personnel remaining in clean vehicles throughout their visit, personnel exiting EZs shall clean or be decontaminated as appropriate. All contaminated equipment and materials will be washed, rinsed and/or removed and disposed of in the EZ area or other designated location. Single use PPE will be disposed of in designated containers. A personnel decontamination area will be set up according to the type of work being conducted and the contamination level present. Table 8-1 lists the typical configurations for the decontamination stations. Figure 4 (Appendix I) is a schematic of a typical decontamination area layout.

Table 8-1
Standard Decontamination Station Configurations

Level D	Level C
1. Equipment drop	1. Equipment drop
2. Hand cleaning (arms and face as necessary)	2. Outer boot and glove wash
3. Boot wash	3. Outer boot and glove rinse
	4. Tape removal - boot and glove
	5. Outer boot and glove removal
	6. Coverall removal and disposal
	7. Respirator removal
	8. Inner glove removal and disposal
	9. Inner clothing removal
	10. Hand/face cleaning
	11. Shower when required
	12. Redress
	13. Respirator cleaning and sanitizing

8.2.1 General Cleaning Requirements

At a minimum, all personnel will thoroughly clean their hands upon exiting an EZ or CRZ prior to eating, drinking, using tobacco products (smoking, dipping, chewing), or any other actions that would increase the risk of material transfer. When necessary, the arms and face should also be washed.

All personnel must also thoroughly clean their boots and any clothing that has contacted ash. Boot washes are provided at all personnel entry control points and vehicle entry control points. In addition they are made available to the entrance of all interior SZs within the site.

8.2.2 Task Specific Cleaning Requirements

If certain tasks require decontamination procedures that differ from the general decontamination regimes described above, then it will be specified in the Work Package, and will be reviewed with all personnel prior to work.

Personnel performing certain tasks in some areas may be required to remove street clothes before the workday begins and shower at the end of the workday. Site-issued cotton coveralls may also be required. Showering is typically specified for those tasks where workers perform activities in dusty environments and the PEL for exposure to crystalline silica is exceeded. This increases the possibility that contamination could be on the worker's body, hair, etc. A shower located at the medic trailer would be provided in such cases.

8.2.3 Non-routine Cleaning Requirements

In the event of gross ash contact, such as an individual falling into wet ash, becoming stuck, sprayed, etc. a complete clothing change and shower is recommended. A shower facility will be provided onsite to be used for this type of circumstance (located at the Medic Trailer). Any clothing that has been covered in ash must be thoroughly cleaned prior to being removed from the site.

8.2.4 Bathroom Facilities

Water supply and bathroom facilities will be provided per the requirements of 29 CFR 1910.120(n). The requirements include:

- An adequate supply of potable water shall be provided on the site.
- Outlets for non-potable water, such as water for firefighting purposes shall be identified to indicate clearly that the water is unsafe and is not to be used for drinking, washing, or cooking purposes.
- Toilets per the site population meeting the requirements of Table H-120.2, Toilet Facilities. Typically one toilet seat and one urinal per 50 people.

8.3 EQUIPMENT DECONTAMINATION

A centralized heavy equipment decontamination area will be established onsite to accommodate large pieces of equipment and vehicles being permanently removed from the site.

Each contractor shall have a competent person to be consulted for specific decontamination requirements and procedures and to verify equipment temporarily or permanently leaving the site is properly cleaned. These guidelines are as follows:

- Vehicles and equipment, in general, should be free of all ash, dirt and/or residue. All large quantities of ash and or dirt will be removed (clumps/piles) both inside and outside of the vehicles and equipment.
- Both power washers and water truck hoses are approved for use. All areas of equipment or vehicles should be sprayed if they can be reached. No disassembly of heavy equipment or vehicles is required.
- If an area cannot be cleaned after a substantial amount of time due to limitations of approved cleaning equipment, a supervisor/foreman shall make the determination to move on. Workers need to inform supervisors/foremen of these problem areas.
- Actuation of moving parts should be done to accommodate complete cleaning.
- Avoid water cleaning of areas containing large quantities of grease or oil. Utilize rags/pads in these areas to ensure gross quantities of grease and/or ash are removed.
- Maintain consistency in inspections. Supervisors, foremen, and workers shall take time to ensure complete coverage of vehicles and/or equipment.

8.4 DECONTAMINATION DURING MEDICAL EMERGENCIES

Standard personnel decontamination practices will be followed whenever possible. For emergency life saving First Aid and/or medical treatment, normal decontamination procedures may need to be abbreviated or omitted. In this situation, site personnel shall accompany victims to advise emergency response personnel on potential contamination present and proper decontamination procedures.

Any personnel requiring medical attention will be given priority during personnel decontamination. Outer garments may be removed if they do not cause delays, interfere with treatment, or aggravate the problem. Protective clothing can be cut away. If the outer garments cannot be safely removed, a plastic barrier between the individual and clean surfaces or the individual will be suited in an additional clean coverall to help prevent contaminating the inside of ambulances or medical personnel. Outer garments can then be removed at the medical facility.

8.5 WASTE COLLECTION AND DISPOSAL

All material generated through the personnel and equipment decontamination processes (e.g., contaminated disposable items, gross debris, liquids, sludges) will be properly controlled, stored and disposed of per the Kingston Ash Recovery Project Waste Handling Plan.

In the case of liquids and sludges, this may include controlled discharge points or recycling back into the Sluice Trench.

With solid wastes this may include disposal with the ash.

9.0 MEDICAL SURVEILLANCE AND SUPPORT REQUIREMENTS

Health exposure monitoring data may indicate the need for medical monitoring per associated OSHA requirements (29 CFR 1910.120 or 29 CFR 1910 Subpart Z). Once health exposure monitoring determinations have been completed for a given exposure group, the PHSM will review the exposure levels and with the assistance of the Jacobs medical consultant when necessary, determine what type of medical monitoring, will be required. This surveillance could include biological monitoring for specific compounds or specialized medical examinations. As a minimum, employees exposed above any PEL for 30 or more days per year will receive the medical examinations required by 29 CFR 1910.120(f).

9.1 RESPIRATOR USE QUALIFICATION

Personnel required to wear respiratory protection must have a current medical qualification to wear respirators. Medical qualification shall consist of a qualified physician's written opinion regarding the employee's ability to safely wear a respirator in accordance with 29 CFR 1910.134. Documentation of employee medical qualification (e.g., physician's written opinion) will be maintained onsite and be made available for review if necessary. Documentation of a current, successful respirator fit-test conducted in accordance with OSHA requirements must be also maintained onsite.

10.0 EMERGENCY RESPONSE PLAN

Project emergencies happen unexpectedly and quickly and require an immediate response; therefore, contingency planning and advanced training of staff are essential. Specific elements of emergency support procedures that must be addressed include communications, local emergency support units, and preparation for medical emergencies, first aid for injuries incurred onsite, record keeping, and emergency site evacuation procedures.

Evaluation of emergency response drills and actual emergencies will be documented on the Emergency Response Best Practice (Form 076) found in Appendix D. This process will help track what occurred, how the response proceeded and what changes if any are required to the Emergency Response and Contingency Plan.

Roane County Emergency Services is the primary agency responsible for supporting this site. Per their request, the Kingston Ash Recovery Project will not develop a plan separate from the TVA KIF. In order to meet their request, the KIF Emergency Response Plan (ERP) will incorporate the requirements and needs of the Kingston Ash Recovery Project.

The following information includes emergency scenarios which are addressed in the KIF ERP. Details are provided in Appendix F for those instances where the Ash Recovery Site response includes unique details that are not completely addressed in the KIF ERP.

An emergency notification phone tree has been established for this site and details are included in Table 15-1 under Section 15.4.2.

If either localized or site-wide evacuation is required, affected personnel are to report to their designated assembly areas at trailer city or at Berkshire house as soon as possible so all personnel can be accounted for.

It is the responsibility of each contractor and organization onsite to account for their personnel. Within 30 minutes of an ordered evacuation, a headcount and status must be reported to the Jacobs HSE Manager who will then report status to the TVA and Jacobs onsite Program Manager. The TVA Shift Operations Supervisor must then be notified of evacuation status.

10.1 FIRE / EXPLOSION

Personnel onsite are not required to fight fires, however incipient stage fires may be extinguished with portable fire extinguishers which have been staged throughout the site. In any event of fire, the KIF Shift Operations Supervisor must be contacted at 865-717-2120 or the Electrical Control Operator at 865-717-2141.

In the event of a large fire or explosion, 911 should be contacted immediately. The Shift Operations Supervisor must then be contacted and may choose to initiate the KIF ERP.

10.2 MEDICAL EMERGENCIES

The KIF ERP has been updated to include medical emergencies occurring on the Kingston Ash Recovery Project site. As required by TVA, a site-specific AED Program has been developed. See Appendix A, HSE-08 Site-Specific Automated External Defibrillator (AED) Program, for details.

The following have been addressed and included here for reference:

10.2.1 Emergency Medical Service Site Access and Initial Response

CALL 911.Primary Emergency Medical Service (EMS) access to the site will be via the North Sector entrance (Trailer City) located on Swan Pond Road. Those personnel calling 911 during an emergency must send a runner to this entrance to escort EMS to the victim's location. In addition, arrangements must be made to meet the onsite paramedic at the Trailer City EZ entry control point and transport them to the victim's location. If the injury occurred on the water and the victim cannot be moved, the paramedic will be transported to the Skimmer Wall boat ramp where they can be brought to the incident scene. If the victim can be moved, the paramedic may either meet up with the moving transport boat or meet the transport boat at the designated Water Extraction Point (WEP). To summarize, the medical emergency response steps are as follows:

- Declare a medical emergency on channel 1 of the site radio. Request assistance to the area.
- Call TVA Police 800-824-3861 for escort or send a runner.
- Call the site paramedic. 865 755-2556.
- Ensure the area is safe and if trained, provide care.

10.2.2 On-Water Medical Response

In the event of an on-water injury requiring emergency response, a list of WEPs must be used to facilitate transitioning the victim from the water to an ambulance. The WEP locations are identified in Appendix F.

These should be laminated and kept on board vessels in emergency kits for easy reference.

If it is determined that it is unsafe to move the victim from the incident scene, the onsite paramedic will assist in the initial response and will be transported to the victim's location via boat.

10.3 HAZARDOUS MATERIAL / ENVIRONMENTAL RELEASE

For hazardous materials and environmental release, the KIF ERP will be followed. If shelter in place is required, individuals will mobilize to site trailers and houses with established escape respirators and goggles, close all windows and doors, turn off all HVAC equipment and wait for further instruction.

In the event of a non-emergency hazardous material release, local notification must be made to Program Management, Site Safety, and Site Environmental. Those numbers are listed on Table 15-1 under Section 15.4.2.

10.4 ANTHRAX

In the treat of anthrax, the KIF EAP will be followed.

10.5 WEAPONS OF MASS DESTRUCTION

In the threat of weapons of mass destruction, the KIF EAP will be followed.

10.6 NATURAL DISASTERS / TORNADO

For natural disasters and tornadoes, the KIF ERP will be followed. Designated shelters are identified in in Appendix F.

During inclement weather, the SSHO will monitor for severe weather using the internet and hand-held lightning devices. The National Oceanic Atmospheric Association and Doppler Radar will be used to determine the severity of weather conditions. The weather report, the size of the severe weather cell, the speed the cell is traveling and the direction of travel will be used to determine action to be taken for sheltering site employees.

When monitoring the weather indicates that the weather conditions are not subsiding or that a tornado warning is likely, departure of all project site personnel from the site will be evaluated by the SSHO.

If severe weather or a tornado watch has been issued, an announcement over the site radio emergency channel 1 will be issued with directions for work suspension or site evacuation. All personnel must remain within ready access of one of the tornado shelters.

If tornado warnings are imminent or have been issued and project personnel are still onsite employees will seek shelter in the locations listed below when the notification is made by the SSHO.

Personnel are to report to the nearest shelter and report to their supervisor. Car pooling with co-workers is encouraged. Buses will be used to transport field workers.

The SSHO will notify the Plant Electrical Control Building (ECB) 717-2141 and request the Scrubber Gate #25 and the Plant Filter Plant Gate be opened. The ECB operator will notify the Shift Operations Supervisor and the Scrubber Operator to open the gates.

Shelter locations are assigned in accordance with the employees work location. Since employees work in different locations on a daily basis their shelter may also change. To MAXIMIZE the available parking space BLOCKING cars in is PREFERRED. Exiting the parking area will be coordinated after the event.

10.6.1 Shelter Locations at the North End of the Project Site

To MAXIMIZE the available parking space BLOCKING cars in is PREFERRED. Exiting the parking area will be coordinated after the event. See Appendix F for emergency locations. The emergency shelter located at the north end of the site is located at:

- Berkshire House – Designated for employees working in the EZ close to this area. The Berkshire House basement will house approximately 100 people.

10.6.2 Shelter Locations at the South End of the Project Site

Employees need to drive and park at the furthest south parking area identified as the south stack shelter until that area is full and then park in the North Stack parking area until that area is full and then park in the FGD stack parking area. See Appendix F for emergency locations. Emergency shelters at the plant are located at:

- South Stack – Employees will drive to the north Scrubber access gate, drive past the Scrubber Stack, past the South Stack, and park between the Coal Yard Crusher Building and South Stack. The stack will house approximately 100 people.
- North Stack – Employees will drive to the north Scrubber access gate, drive past the Scrubber Stack, and park around the North Stack. The stack will house approximately 100 people.
- Scrubber Stack – Employees will drive to the north Scrubber access gate and park in the area of the Scrubber stack. The sack will house approximately 200 people.

10.7 LIGHTNING / SEVERE WEATHER

In the event a thunderstorm is forecasted, the SSHO, or designee, will monitor the activity on the National Weather Service (NWS) local Doppler Radar. Additionally, all site personnel will keep an “eye to the sky”, observing conditions. Operations will temporarily cease and an evaluation of the risk will be conducted when it is determined that thunderstorm cells are within 8 miles of the site, based on NWS Doppler Radar, lightning detection equipment or if lightning is observed from any location. If it is deemed that the storm presents an immediate or pending danger to work crews, work will remain suspended.

Lightning shut down and restart of operations will be announced on the site radios. Operations will restart 30 minutes after the last lightning is observed, unless NWS local Doppler Radar shows other storms approaching.

Severe weather procedures, including special marine considerations are further addressed in Appendix F, Severe Weather Procedures.

10.8 DAM FAILURE / FLOOD

For dam failure or flood danger, the KIF EAP process will be followed.

10.9 BOMB THREAT

In the event of a bomb threat, the KIF EAP process will be followed.

10.10 CIVIL DISTURBANCE

In the event of a civil disturbance, the KIF EAP process will be followed.

10.11 CRIMINAL ACTIVITY AND ILLEGAL ENTRY

In the event of criminal activity and illegal entry, the KIF EAP will be followed.

10.12 SUSPICIOUS PACKAGES

In the event of suspicious packages, the KIF EAP will be followed.

10.13 EVACUATION / SHELTER

In the event of evacuation or need to seek shelter, the KIF EAP process will be followed.

11.0 TRAINING AND SSHO MEETINGS

All project employers shall provide their employees with the health and safety training required to comply with subcontract requirements, achieve compliance with TVA requirements, regulatory standards, and other training and qualification necessary for an employee to complete the assigned job duties safely. This training will include HAZWOPER Training per 29 CFR 1910.120, Competent Person training and/or training required by 29 CFR 1926.21, General Safety Training and Education.

Assigned site personnel (craft and labor) are required to have the 10-hour OSHA Construction training and other modules prior to working onsite. Appendix G lists TVA training requirements which may apply.

Training for excavation competent person, crane operations and rigging *must* be obtained using the TVA specific courses. All other training must be evaluated for compliance with TVA requirements and industry standards. Training meeting the expectations and intent of these will not require retraining with TVA courses.

Documentation of required training (e.g., training certificates or attendance rosters) will be maintained onsite by each contractor and be available for review upon request by Jacobs, TVA, or regulatory agencies such as OSHA.

11.1 HAZWOPER TRAINING

Hazardous Waste Operations and Emergency Response training will be completed by site personnel as outlined in the following sections:

11.1.1 General Site Personnel

All general site personnel being provided unrestricted access to EZs and CRZs shall complete 40 hours of classroom training per 29 CFR 1910.120(e)(3)(i). In addition to the classroom training, a 24 hour period of supervised field experience must be documented using the Completion of Supervised Field Experience (Form 080) found in Appendix D. The supervision of the field experience period must be completed by an individual who attended the 8 hour supervisor course per the requirements of 29 CFR 1910.120(e)(4).

Personnel completing this training will receive a blue badge which indicates open site access to complete a broad range of tasks.

11.1.2 Task Specific Personnel

All personnel accessing EZs or CRZs for limited durations and specific tasks such as surveying, shall complete 24 hours of classroom training per 29 CFR 1910.120(e)(3)(ii). In addition to the classroom training, an 8 hour period of supervised field experience must be documented using Form 080 found in Appendix D. The supervision of the field experience period must be completed by an individual who attended the 8 hour supervisor course per the requirements of 29 CFR 1910.120(e)(4).

Personnel completing this training will be issued a red badge which indicates a focused site effort and narrowly defined site tasks.

11.1.3 Supervisory Training

Onsite management and supervisors directly responsible for, or who supervise employees engaged in hazardous waste operations must receive 40 hours initial training, and 3 days of supervised field experience and at least eight additional hours of specialized training per the requirements of 20 CFR 1910.120(e)(4).

Personnel completing this training will be issued a green badge indicating broad site access and the ability and responsibility to function in a supervisory role.

11.1.4 Support Zone Personnel

Personnel who do not enter EZs or CRZs are not required to attend HAZWOPER training, however site specific orientation must still be provided. Personnel not possessing HAZWOPER training will be issued a white badge.

11.1.5 Exceptions to Training Requirements

Those personnel being provided access to the site under all of the following conditions will not be required to meet the training requirements identified in Sections 11.1.1 through 11.1.4:

- Will be onsite not more than one day per month.
- Will be escorted by an authorized individual possessing the knowledge and authority to effectively function in an escort role and who has completed 40 hour HAZWOPER training.
- Will be performing hands-off activities.
- Will attend visitor orientation and sign in and out during each visit.

11.2 SITE-SPECIFIC TRAINING/ORIENTATION

Prior to commencement of field activities, all personnel assigned to the project will have completed site-specific training that will address all applicable site hazards. Training will also include activities, procedures, monitoring, and equipment used in the site operations, site and facility layout, locations of EZs, CRZs, potential hazards, risks associated with identified hazardous substances at the site, hazard communication as necessary, PPE, incident reporting, emergency response actions, and available emergency services.

This training allows workers to clarify anything they do not understand and to reinforce their responsibilities regarding safety and work operations for their particular activity. The Jacobs SSHO will conduct this training.

All escorted visitors must review the visitor ESH presentation and be provided a brief orientation relative to their specific function or tasks on the site. Once this is complete the visitor log must be signed by the visitor. The log should be signed for each visit.

11.2.1 Ammonia Awareness

Ammonia Awareness training will be completed by all personnel with the exception of escorted visitors. TVA provides this training and is required prior to being issued a badge.

11.3 FIRST AID AND CARDIOPULMONARY RESUSCITATION

Training consistent with the requirements of the American Red Cross (or other TVA-approved curriculum) will be provided for an adequate number of onsite personnel to provide support during an emergency situation. It is expected that a minimum of two personnel per active field operation per shift will have First Aid and CPR training.

As required per the site-specific AED program, an adequate number of personnel must be trained in the use of the AEDs which are staged throughout the site. Only AED trained personnel are authorized to utilize this equipment in an emergency. A site-specific AED procedure has been developed for this site. This procedure describes locations for staging AEDs, inspection process and training requirements.

11.4 BLOODBORNE PATHOGENS

Employee information and training for BBP shall be provided by the employer as required in 29 CFR 1910.1030 for all onsite contractor and subcontractor personnel who will be working in areas where pathogens may be present. This is only required for personnel whose assigned duties may create reasonably anticipated skin, eye, mucous membrane, or parenteral contact with blood or other potentially infectious materials.

11.5 OTHER REQUIRED TRAINING AND QUALIFICATIONS

Other training and qualifications may be required depending on the task work scope and assigned duties of an individual employee. This may include training for waste handling, hazardous materials transportation, respiratory protection, noise exposure or hearing conservation, and various Qualified and/or Competent Person requirements (e.g., operation of heavy equipment, forklifts, confined space entry, excavations, cranes, LO/TO).

Crane Operators must be certified by TVA in accordance with *TVA Safety Procedure 802, Safe Operation of Cranes* and riggers must be trained in accordance with *TVA Safety Procedure 721, Rigging*.

Equipment operators working on floating work platforms such as barges must be properly trained to do so and designated competent by contractor supervisory personnel. This includes those personnel required to operate heavy equipment and stationary mounted equipment such as drum hoists (tuggers).

Specific additional training and/or qualified/competent person requirements will be identified through the Work Package or task-specific health and safety planning process. The contractor employer is responsible for ensuring that identified training and/or qualified/competent person requirements are met for site workers. Documentation of this certification must be maintained onsite and be readily available for review. A list of qualified and/or competent persons will be maintained for each process or operation at the work locations.

12.0 HAZARD COMMUNICATION

Employee information and training on the Hazard Communication (HAZCOM) program shall be provided as part of the site-specific training. The following are required elements of the information and training program:

- Overview of HAZCOM as described in 29 CFR 1910.1200 and *TVA Procedure 216, Hazard Communication*;
- Ammonia awareness training per TVA requirements;
- A review of any operations in their work areas that involve hazardous materials;
- The location and availability of the written HAZCOM materials, including the list(s) of hazardous chemicals and MSDSs;
- Methods and observations that may be used for detecting the presence or release of hazardous chemicals;
- An understanding of the physical and health hazards of hazardous chemicals in the work area;
- How to understand the information in MSDSs;
- How to read the warnings on container labels including the National Fire Protection Association system;
- When and how to report leaks and spills;
- How to recognize the symptoms of overexposure and how to protect against it; and
- How to implement exposure control methods including work practices, engineering controls, administrative controls, PPE, and emergency procedures.

In the event that a new chemical hazard or new task is introduced in the workplace, the SSHO or designee shall conduct additional training that includes the following:

- Objectives of the task, if applicable;
- Physical and health hazards associated with the new chemical hazard or task;
- Methods to detect the presence or release of the hazardous chemicals;
- Procedures and practices recommended to protect themselves from the hazards;
- Emergency procedures in the event of a hazardous situation or exposure; and
- Location and availability of the written program, lists of chemicals, and MSDS.

Documentation is to be maintained for each employee trained in HAZCOM in accordance with *TVA Safety Procedure 401, Health and Safety Training* or equivalent.

13.0 SUBSTANCE ABUSE

All site employers shall maintain and implement a Drug Free Workplace program for site work activities. Use, or working under the influence of controlled substances (other than prescribed or over-the-counter medication) or alcohol on the job is strictly prohibited.

Site workers are subject to substance abuse testing at any time “for cause” or following a safety or property damage incident. Contractors are responsible for ensuring that pre-work and post-incident drug and alcohol testing are performed. Positive substance abuse tests resulting from “for cause” or post-incident substance abuse testing shall be reported to the Jacobs PHSM or SSHO immediately.

14.0 MEETINGS

14.1 DAILY SAFETY MEETINGS

All project field personnel, including subcontractors, shall participate in daily safety meetings prior to the start of each work shift. The Site Tailgate Meeting (Form 081) can be found in Appendix D. This form or equivalent can be used to document daily safety meetings.

The meeting shall include a discussion of the planned work activities and periodic special safety topics of interest to site personnel. Project personnel may be requested to present a safety briefing based upon their scope of work. In addition, the following items shall also be discussed as appropriate:

- Necessary training requirements and site work rules.
- Changes in work practices or environmental conditions.
- Precautions or safe work practices related to the day's site activities.
- New or modified site-wide procedures or requirements.
- Bulletins or Safety Reports.
- JSA review for each work group.

14.2 DAILY SITE SAFETY AND HEALTH STAFF MEETINGS

All designated contractor SSHO representatives must attend a daily telecom meeting chaired by the Jacobs Assistant Site Safety Officer or designee. The meeting will review program status, air monitoring results, upcoming activities, lessons learned and other topics deemed relevant by the group.

15.0 LOGS, REPORTS, AND RECORDKEEPING

The following is a summary of required health and safety logs, reports and recordkeeping.

15.1 MEDICAL AND TRAINING RECORDS

Copies or verification of training and medical clearance for use of respiratory protection, heavy equipment and crane operation will be maintained onsite by each contractor's designated SSHO. This includes records for all subcontractor employees.

Proof of initial HAZWOPER, annual refresher and supervisor training as appropriate must be provided during the initial pre-entry briefing. Workers will not be granted site access to EZs or CRZs without training documentation.

15.2 EXPOSURE RECORDS

All personal monitoring results, laboratory reports, calculations and air sampling data sheets are part of an employee exposure record. These records will be maintained in the onsite Document Control office during site work. At the end of the project they will be maintained according the 29 CFR 1910.120 and TVA procedures.

15.3 INCIDENT REPORTING, INVESTIGATION, AND CASE MANAGEMENT

15.3.1 Incident Definition

For all site activities, an incident is defined as follows:

- A work-related injury or illness.
- An exposure to a hazardous substance above the allowable exposure limit.
- Property/vehicle/equipment damage.
- An uncontrolled fire or explosion.
- A work stoppage due to lightning or tornado.
- An unplanned spill or release (including air releases) to the environment.
- A permit or permit equivalent exceedance.
- Any unexpected contact or damage to aboveground or below ground utilities.
- A "near miss" or an unplanned event that has a reasonable probability of resulting in one of the outcomes described above had the circumstances been different, and for which modifications to management programs will reduce the probability of occurrence or the severity of the outcome.

15.3.2 Verbal Notifications

All Project personnel have the responsibility to immediately report any incident to their supervisor. Individuals shall take appropriate corrective action and immediately verbally report the incident to the individuals identified in Table 15-1.

Table 15-1
Notification

Project Notification[1] – HSE Personnel to Call		
Name	**Organization**	**Number**
Kathryn Nash	TVA – GM	423-290-7820
Jack Howard	Jacobs – PM	865-399-7971
Tom Bock	Jacobs – HSE Manager	865-466-5771
Appropriate CM	Jacobs	
TVA Police	Tennessee Valley Authority Police	800-824-3861 / 800-632-3631
Jacobs CM to Call		
Appropriate Jacobs Project Mgr.		
Michelle Cagley (If environmental)	TVA – Environmental	865-696-5038
SOS (If environ. or derailment)	TVA – Kingston Plant	865-717-2119
Jacobs HSE Manager to Call		
TVA Sr. Manager	On Weekend Duty	See Weekly Board or email
Jacobs PM Personnel to Call		
Appropriate TVA TCM		
Medical Support Contacts		
Paramedics	TVA	865-755-2556
Plant Nurse *(Mon – Thu; 0600 – 1600)*	TVA	865-717-2589
TVA Police	TVA	800-824-3861
Fire Response Contacts		
Roane County Fire[2,3]	Roane County	911

Notes:

1. Provide initial medical care and initiate emergency control activities prior to making project notifications.
2. If an outside EMS or fire response is required, it will be essential to contact TVA police with your location so they can provide escort to the responding unit.
3. TVA has a dedicated fire brigade for in-plant response. For activities occurring out onsite, Roane County Fire (911) will provide primary response.

15.3.3 Incident Reports

An initial written incident report will be prepared for all incidents during the work shift when the incident occurred. With assistance of the supporting SSHO, the report is to be prepared by the supervisor responsible for the activity/area where the incident occurred and be submitted to the Jacobs HSE Manager for distribution no later than 24 hours after occurrence. As a minimum, the report will include a summary of what occurred, causal factors and actions to prevent reoccurrence. In addition to the standard distribution lists, the associated Jacobs PM must be included in the distribution as well.

All incidents categorized as first aid or worse (including near misses) will be entered into the TVA Problem Evaluation Report system by the Jacobs Methods and Process Coordinator.

15.3.4 Investigation Follow-Up

All contractors on the project shall establish a follow-up system for all investigation findings under their control. The system shall identify the corrective action(s) to be taken, the individual responsible for each corrective action, and the date the corrective action was implemented or verified.

15.3.5 Management of Potential Injuries or Illnesses

All contractors on the project are responsible for implementing and maintaining an effective Case Management program for their employees and contractor employees that addresses potential injuries or illnesses related to work at the site. The goal of the case management program is to ensure that workers receive the appropriate level of care, that injured or ill workers return to normal work duties as soon as possible, that injury or illness records are consistently and accurately maintained, that unnecessary or fraudulent injury or illness cases are avoided, and that the contractor actively seeks to minimize the impact of any incident with respect to recordability, restricted duty, and lost time aspects.

The case management program shall include the following elements:

- Employee Information – Each site worker shall be informed of the project incident reporting and investigation requirements and their responsibilities in the event that an incident occurs, including the location and hours of operation for the designated local medical provider.
- Employee Points of Contact – Each site worker shall be made aware of the primary person to report all incidents to, and what to do if that individual is unavailable. This includes whom to notify if a work-related condition develops or intensifies outside normal working hours.
- Subcontractor Representation at Clinic Visits – A knowledgeable contractor representative shall accompany any worker seeking medical attention for any incident related to work at the project. The contractor representative shall be knowledgeable in the worker's normal job duties; potential safety and health hazards present at the worksite, and be able to discuss any limitation or modification of normal duties with the local medical provider staff. The representative shall also be knowledgeable (or have access to someone who is knowledgeable) of treatment options that provide equivalent medical attention while avoiding any impact to recordability, restricted duty, and lost time recordkeeping. Items that may affect the recording status of an injury or illness (such as prescription medications, limitations to normal job duties, and further treatment) shall be reviewed with the medical provider at the time of the visit to ensure that appropriate medical attention is provided with a minimum of impact to recordkeeping.
- Status Reporting to TVA – Contractors shall keep the TVA Safety Officer informed of case management status, progress, and issues for the duration of any evaluation or treatment provided. The contractor shall provide updated information to the TVA Safety Officer regarding injury or illness status within 24 hours of each visit or change in status regarding recordability, restricted duty, or lost time.

15.3.6 OSHA Form 300

Each contractor is responsible for keeping their own OSHA Forms 300, 301 and 301A at the project site. All OSHA Recordable injuries or illnesses will be recorded on these forms as appropriate. Contractor employers must also meet the requirements of maintaining the OSHA

Injury and Illness forms. The criteria for determining OSHA Recordability will also follow the guidelines of 29 CFR 1904.4.

15.4 HEALTH AND SAFETY LOGBOOKS

All contractors and subcontractors shall complete and maintain logbooks in the field to document health and safety-related events as they occur during the day or utilize the SOR database for documentation of daily observations. Logbooks should document any significant safety-related information such as site monitoring and calibration, sampling, weather conditions, conversations, changes to PPE requirements, unusual conditions, and other items related to site health and safety.

The following logbook guidelines should be used:

- Use blue or black ink.
- Write clearly, print if necessary.
- Use an underline (rather than highlighter) to emphasize important information.
- Do not use correction fluid - draw one line through errors, write the correction above, then initial and date next to the correction.
- Start a new day at the top of a page with identifying information such as the project name, location, and date.
- Add entries in chronological order and note the time periodically throughout the day.
- If there is blank space at the end of the day, mark through it with a slash or N/A and initial at the bottom of the last page for the day.

15.5 HAZARD COMMUNICATION PROGRAM/MSDS

MSDS will be obtained for applicable substances and included in the site HAZCOM file. The HAZCOM program will be maintained onsite in accordance with 29 CFR 1910.1200 and *TVA Safety Procedure 216, Hazard Communication*.

15.6 WORK PERMITS

All work permits, including confined space entry, hot work, LO/TO, excavation and trenching, etc., will be maintained in each contractors project files.

Issuance of permits should be coordinated through the response site SSHO.

15.7 INSPECTIONS AND STRUCTURED FIELD VISITS

Regular inspections of active fieldwork areas shall be conducted to identify and correct potential worksite hazards as outlined below.

Administrative operations such as offices and storage areas have less frequent inspection requirements as the working conditions, and work practices in these areas are not expected to change as rapidly as active field work areas. The trailer and storage areas will be inspected on a monthly basis (fire extinguishers and First Aid kits) and on a quarterly basis drills will be conducted to test emergency response preparedness.

15.7.1 Daily Inspections (Health and Safety Supervisor or Designee)

Daily informal inspections of active field work area(s) will be conducted. The inspection shall cover workplace conditions, physical facility safety, and employee work practices. The inspection, conducted by the SSHO, shall include a walk-around of the site and a review of workplace conditions and work practices. The SSHO shall document any deficiencies and corrective actions in a logbook or in the SOR database.

15.7.2 Monthly Inspections (Site Supervision)

Informal monthly inspections of the active field work area(s) will be conducted. The inspection shall be performed by the first line supervisor, superintendent, or equivalent supervisory position and the SSHO. The inspection shall include a review of work activities and an evaluation of compliance with required procedures and plans, a walk-around of the site, physical facility safety, and employee work practices.

Noted discrepancies and areas of achievement can be documented on the Safety Observation Report (Form 061) found in Appendix D.

15.7.3 Safety Coaching Visits

Monthly visits of active field work area(s) will be conducted. The PM or their designee shall perform Safety Coaching Visits using the TVA Safety Coaching Visit (Form 020) program and checklist found in Appendix D or utilize the SOR process. Contractors shall schedule the time of the monthly inspection in advance with the Jacobs PM.

15.7.4 Client Sponsored Site Visits – Trilateral Safety Alliance

TVA will conduct bi-weekly site visits using the Trilateral Safety Alliance group. This group involves union contractors, client personnel and union craft personnel. This is a highly effective program that provides an opportunity for input by trade personnel onsite. All union contractors will be expected to support this program.

15.7.5 Equipment Inspections

Any equipment, including construction equipment, as well as watercraft, must be maintained in a safe operating condition. To assist in achieving this, formal documented inspections of specific equipment must be performed on a routine basis. Some equipment must be inspected on a daily basis using forms developed for the specific piece of equipment. The SSHO will provide forms or assist in the development of forms if one is not available. Additionally, an initial inspection of all construction equipment will be performed by the contractor. Selected inspection forms are included in Appendix D.

15.7.6 Corrective Action

Corrective actions shall be implemented in a timely manner and tracked through completion within the SOR database or the TVA Problem Evaluation Report database.

Contractors shall implement corrective actions to inspection findings at the time of the inspection, where feasible. Interim corrective actions shall be implemented as necessary for areas that present an immediate hazard to site workers. Interim corrective actions may include

suspension of work, barricading unsafe areas, posting of warning signs or other similar measures to effectively mitigate the immediate hazard.

16.0 REFERENCES

American Conference of Governmental Industrial Hygienists, Inc. 2010. *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices*. Cincinnati, OH.

National Institute of Occupational Safety and Health. *NIOSH Pocket Guide to Chemical Hazards.* Available at *http://www.cdc.gov/NIOSH/npg*. DHHS (NIOSH) Publication No. 2005-149.

U.S. Army Corps of Engineers. 2003 (November). *Safety and Health Requirements Manual.* EM385-1-1. Washington, D.C.

U.S. Department of Labor. Occupational Health Administration Regulations (Standards – 29CFR). Available at http://www.osha.gov/pls/osha.web

TVA Safety Manual, Rev. 14, October 1, 2009. Available at http://wikip.cha.tva.gov/wiki/Safety:Main_Page.

APPENDIX A

APPLICABLE PROGRAMS, PROCEDURES, AND GUIDELINES

HSE-01, Safe Work Hours Management Policy
HSE-02, Unified Safety Review “Safety Blitz”
HSE-03, Basic Heat Stress Requirements and Guidelines
HSE-04, Winter Weather Operation
HSE-05, Trailer City Evacuation Plan
HSE-06, Tornado and Severe Weather
HSE-07, Industrial Hygiene Personal Air Monitoring Procedure
HSE-08, Automated External Defibrillator (AED) Program
HSE-09, Non-Routine Site Activities
HSE-10, Safety Observation Report (SOR) Reporting Process
HSE-11, Incident Reporting

KINGSTON ASH RECOVERY PROJECT (KRP)

HSE-01 SAFE WORK HOURS MANAGEMENT POLICY

The March 3, 2013 Memo excerpt below applies to all KRP personnel and their personnel.

Kingston Ash Recovery Project – Safe Work Hours Management Policy
March 3, 2010

" Policy Each Project organization is responsible for formulating and implementing - with management, supervisory and employee involvement – a work hours management approach that is dedicated to maintaining safe operations. The intent of this approach is to focus on the safe completion of work as the primary goal, based upon the employee's fitness/ health, capability/experience for the work; work type (e.g., field, office, mix); duration (e.g., daily hours, work cycles, length of days/cycles); and work environmental factors (e.g., weather, equipment, surroundings). The following guidelines are offered:

1. For any consecutive 14 day work period, employees must be provided an appropriate mix of work hours, followed by an appropriate number of days off, that focus on safe work completion. As an upper limit, work hours for this 14 day period must not exceed 120 hours without the approval by the organization's Senior Project Manager/Official or designee.
2. A list of all employees, their hours worked and any related significant safety issues must be maintained for review.
3. Each organization must also prepare a checklist (please see the attached) for managers and/or supervisors that can be easily used, evaluated and effective in meeting and documenting results with respect to the overall safety goals noted above."

ATTACHMENT

Attachment 1: Checklist - Safe Work Hours Management, Kingston Ash Recovery Project

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Attachment 1
Checklist - Safe Work Hours Management, Kingston Ash Recovery Project
(Approval for Greater than 120 Work Hours in 14 Consecutive Work Days)

Employee(s) Name(s) - can be provided as a list: _____
Organization/Department/Section/Sub-section, as appropriate: _____
Date(s) to be Worked: _____ through _____
Hours to be Worked each Day: _____ For How Many Work Days: _____
Subsequently, How Many Days Off: _____

Employee Cleared for Work Period?

1. **Employee Fitness, Health, Experience, and Capability**	**Yes**	**No**	**Uncertain/Unclear**
*Fitness/Health			
Experience			
Capability			
2. **Work Type**			
Office			
Field			
Field and Office			
Intermittent			
Part-Time			
Full-Time			
3. **Work Duration**			
Daily Hours			
Work Cycles			
How Long Doing			
4. **Work Environmental Factors**			
Weather			
Equipment			
Physical Surroundings			
5. **Other Factors – (add as a separate sheet)**			

*Note – Please determine whether the employee has a medical condition that could increase the likelihood of fatigue because of long work hours.

Is this employee(s) cleared to work the hours/work period noted? Supervisory/Management Judgment – All Checklist responses, 1 through 4, must be evaluated and marked as "Yes." Each organization may include "other factors" for consideration/evaluation in reaching their decisions.

Yes _____ Supervisor/Manager _____

No _____ Date _____

Employee/Supervisor/Management Comments:

_____

_____

How many days off? _____ When does employee return to work? _____

KINGSTON ASH RECOVERY PROJECT (KRP)

HSE-02 UNIFIED SAFETY REVIEW "SAFETY BLITZ"

The goal of a Safety Blitz is to heighten the awareness of safety, operations, recognition of hazards, and execution by involving the line managers, supervisors, engineering, managers, quality, and safety in the process - with the ultimate goal of sustaining safety successes and encourage further improvements in the safety program for all workers. It involves bringing together applicable subject matter experts to review operations / tasks / areas that meet one or more of the following:

- Mobilization or demobilization
- Starting up or re-starting up an area of construction
- Potentially high risk work
- Utilization of new equipment
- Major change of personnel
- Change in Scope of Work
- Change of a lead person or persons associated with a high hazard risk activity
- Change of conditions or events that require a re-evaluation of hazard identification

The Unified Safety "Blitz" Team reviews the area and assigns areas of review responsibility which could include:

- Electrical / lockout / tagout
- Civil
- Heavy equipment
- Rigging / high hazard lifts
- Hot work
- Piping and mechanical
- Hydraulic
- Excavation and trenching
- Use of suspended man lifts
- Others as appropriate

Examples of tools the team can utilize and/or review include:

- Work Package
- Previous lessons learned
- Job Hazard Analysis and Job Safety Analysis (JSA)
- Applicable removal action work plan
- Engineering drawings and sketches
- Engineering specifications and reports

Potential areas of discussion include:

- Indentify and discuss positive safety work behaviors
- Hazards that can be physical, material, equipment and/or engineering related
- Review of adjacent work in area and any impact to work under review or to the other project / task
- Areas of risks
- Prior to work starting Pre-Job Briefing, and JSA review
- Human behaviors and performance requirements
- Housekeeping requirements and/or improvements
- Chemical, biological hazards
- Night shift requirements and night lighting
- Security
- Emergency response and incident reporting
- Worker egress and ingress / equipment access points
- Decontamination process
- Waste management / spill prevention
- Barricade and barriers
- Permits requirements
- Ash safety
- Work Hour assessment - hours and staffing
- Weather conditions
- Other potential safety improvements

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KINGSTON ASH RECOVERY PROJECT (KRP)
HSE-03 BASIC HEAT STRESS REQUIREMENTS AND GUIDELINES

Heat stress is a significant potential hazard during summer months at the KRP. A heat stress prevention program is implemented when ambient temperatures exceed 70°F for personnel wearing impermeable clothing and for other personnel when the wet bulb globe temperature (WBGT) index exceeds those established in the TVA Health and Safety Procedure 806. Heat stress monitoring will consist of either ambient, personal dosimeter, or personal physiological techniques. Monitoring shall be conducted as necessary to assist in determining initial work/rest regimens and to verify that these regimens are adequate as the work progresses. Heat stress monitoring shall be performed in accordance with guidance given in the latest edition of TVA Health and Safety Procedure 806. Two primary monitoring methods are used depending on the type of protective clothing worn:

- WBGT monitoring when wearing permeable protective clothing.
- Personal physiological monitoring when wearing impermeable protective clothing or working in areas of higher thermal loading than ambient conditions.

Contractors are responsible for monitoring their personnel and heat stress conditions and insuring the safety of their employees. KRP Safety department will provide monitoring of the WBGT and notification site-wide on Channel 1 and track on the Temperature Monitoring Record (KRP Form 083) form.

BASIC HEAT STRESS MONITORING AND NOTIFICATION PROCESS

When a WBGT reading of 70°F has been recorded by KRP Safety personnel, notification will be made to personnel performing tasks requiring Tyvek so appropriate work rest cycles per the “Maximum Allowable Stay Time” section can be implemented.

When a WBGT reading of 75°F or higher has been recorded by KRP Safety personnel, an initial announcement will be made via the site radios, Channel 1. The announcement will state the current WBGT reading. Supervisory personnel will consult their heat stress chart and implement proper work / rest cycles based on the nature of their work and the type of personal protective equipment (PPE) being worn by their work crews. The maximum work stay times are indicated in the “Maximum Allowable Stay Time” section. The recovery times (rest periods) are calculated by the formula indicated below the table. In the event WBGT readings are at or above 100°F, case-by-case authorization for work to proceed must be obtained and adequate precautions implemented in the work planning process.

Once an initial announcement has been made, KRP Safety will provide updates whenever the WBGT reading changes by 3°F. They will continue until the WBGT reading is below 75°F or the sun has set. Supervisory personnel will consult their heat stress chart and implement proper work / rest cycles based on the nature of their work and the type of PPE being worn by their work crews.

MEASURES TO MINIMIZE HEAT STRESS

Supervisors are responsible for providing adequate resources and opportunity for their personnel to minimize the impact of heat stress during the performance of their work activities. There are two basic approaches to minimizing heat stress on workers. The first is to minimize the impact of heat stress on workers as they perform their tasks. The second is to provide workers with adequate opportunity to use break areas to drink water and rest in shaded / cooled areas in order to properly recover from hot work environments. Depending on the location and nature of work, some of the typical controls that are feasible to be used on the KRP include:

- Mandatory: Requiring workers to take mandated breaks based on work rest cycles found in the attachment. Breaks must include drinking water and shaded and / or cooled areas.
- Umbrellas or shades for stationary workers such as flaggers.
- Utilizing cooling misters in work areas with large numbers of personnel or in break areas.
- Power assists for manual labor.
- Providing air conditioned break areas for workers to take brief cooling breaks. These break areas may be vehicles which transition location to location allowing personnel a period of time to sit in air conditioned environment. These vehicles must be kept clean if personnel will be drinking water while taking a break.

KINGSTON ASH RECOVERY PROJECT (KRP)
HSE-03 BASIC HEAT STRESS REQUIREMENTS AND GUIDELINES

- Creating temporary support zones as work locations change; this will allow easy access for personnel to take water breaks and get in shaded areas as needed. If these are to be used, they must be properly maintained and adequately shaded to provide relief from radiant heat.
- Drinking plenty of fluids to help ensure adequate hydration.

MAXIMUM ALLOWABLE STAY TIME

WBGT	Work Clothes			Cotton Coveralls			Double Coveralls			Cottons + Rain Suit/Tyvek		
	Physical Effort Level			Physical Effort Level			Physical Effort Level			Physical Effort Level		
	Low	Moderate	High	Low	Moderate	High	Low	Moderate	High	Low	Moderate	High
122	**NO WORK ALLOWED AT WBGT READINGS GREATER THAN 105°F**											
118												
115												
111												
108												
104	*90*	*45*	*20*	*90*	*40*	*10*	*60*	*25*	*-*	*45*	*20*	*-*
100	*120*	*45*	*30*	*90*	*45*	*25*	*90*	*30*	*10*	*60*	*25*	*-*
97	240	60	40	120	45	30	90	45	20	90	30	10
93	480	90	45	240	60	45	120	45	30	90	45	20
90	NL	120	60	480	100	50	240	60	40	120	45	30
86	NL	240	120	NL	120	90	480	90	45	240	60	40
82	NL	NL	240	NL	240	180	NL	120	60	480	90	45
79	NL	NL	480	NL	NL	480	NL	240	120	NL	120	60
75	NL	NL	NL	NL	NL	NL	NL	NL	240	NL	240	120
72	NL	NL	NL	NL	NL	NL	NL	NL	480	NL	NL	240
68	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	480
< 68	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL

Pre authorization required for work to proceed when WBGT readings are at or above 100°F

NL = No Limit

Recovery time (rest period) is calculated on an individual basis using the following formula:

Actual Work Time in the Hot Environment x 60 Minutes = Rest Period Time
Maximum stay Time Allowed

Physical Effort Level:

Low - Inspection/sampling type work, light lifting less than 25 pounds, minimal climbing

Moderate - Using had tools or portable power tools, lifting 25 - 40 pounds, moderate climbing

High - Heavy work such as scaffold building, rigging, lifting over 40 pounds, extensive climbing

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KINGSTON ASH RECOVERY PROJECT (KRP)
HSE-04 WINTER WEATHER OPERATION

During cold/extreme winter weather such as heavy snow, extreme cold, and /or icing conditions, KRP undertakes winter weather preparation prior to, and during, cold and extreme weather forecasts. Each contractor is responsible to provide safe working conditions for its employees and all other authorized personnel onsite, in accordance with the KRP *Site Wide Safety and Health Plan for the TVA Kingston Fossil Plant Ash Release Response* (SWSHP). KRP Safety is responsible for monitoring weather forecasts and weather conditions to determine if extreme weather preparation is required. When the temperature reaches 35°F, or the forecasted temperature is expected to drop below 32°F for an extended period of time, contractors should activate cold weather preparation procedures. Each contractor is responsible for maintaining equipment, tools, and materials, and must allocate manpower as required.

Contractors must ensure proper understanding of specific tasks and expectations are communicated to all employees. Supervisors must ensure appropriate check sheets are distributed to employees. The daily weather information and any winterization issues will be communicated to employees during the pre-job briefings. Each contractor has the responsibility to stop work when site conditions become unsafe. Any schedule changes made due to the weather must be communicated and agreed upon between the contractor and the Project Management Coordinator.

Any unforeseen activities that require assistance will be communicated through the Construction Manager and Field Superintendent to appropriate parties.

Hypothermia is a major concern in winter and can occur in temperatures above freezing. Each contractor will educate its employees on prevention, symptoms, and treatment of hypothermia. Heated support areas will be provided by each contractor for its employees to take breaks from the cold. It is also a good practice to have employees that will be working outside bring an extra change of clothes to deal with hypothermia conditions.

Extra protection, such as hard hat liners, layer glove systems, rain coats, face masks, and other articles, may be provided by each contractor to its employees, if deemed necessary.

GENERAL INFRASTRUCTURE

County Roads – Roane County has agreed to provide a designated resource in preparation of, and during, inclement weather on the county roads servicing the KRP. TVA has agreed to procure and store 100 tons of road salt, as well as, provide an operator and loader to load Roane County salt trucks. The salt will be covered and stored in a bin at 134 Berkshire Lane. In the event that inclement winter weather is forecasted or occurs, a request will be made to county to have the county crews salt Swan Pond Road, Swan Pond Circle Road, and Lakeshore Drive. TVA's Civil Projects group will provide an operator and equipment to load county salt trucks.

Plant Access Roads and Haul Roads – TVA Yard Operations will be responsible for snow removal and de-icing of the plant access road. CP will be responsible for snow removal and de-icing of all haul roads inside of the Exclusion Zone, Material Access Point (MAP) area, and Drag Line Road entrance.

Boat Ramp at South Point – TVA Yard Operations will be responsible for the boat ramp at South Point.

Marine Operations – See Appendix H of the SWSHP. All boat launches will be limited to the TVA South Boat Ramp during freezing and snowy conditions. Other necessary launch points must be approved by KRP Safety personnel prior to launching of vessels.

Houses, Buildings, Trailer, and Parking Lots – Contractors are responsible for winterizing their office and support trailers. Contractors are to provide rock salt (in water proof containers, with a scoop) for entry and exit doors, walkways and decks of their associated buildings, offices, and break trailers. Civil Projects is responsible for providing and spreading rock salt for the office trailer area and maintaining all parking areas. TVA Facilities is responsible for snow removal and de-icing TVA housing driveways along Berkshire Drive. Space heaters are to be approved by KRP Safety prior to use. Roane County is responsible for all county roads.

KINGSTON ASH RECOVERY PROJECT (KRP)
HSE-04 WINTER WEATHER OPERATION

Vehicles – Contractors are to winterize all vehicles and ensure there are necessary oils and fluids for winter operation. Batteries must be in strong working condition. All vehicles must have windshield scrapers to remove ice on vehicle windows prior to operation.

Decontamination Stations – When the outside temperature is below 32°F and freezing conditions exist, Civil Projects will bring manpower in two hours early to spread salt at vehicle access points such as the MAP and South Access Point.

Environmental Impact, Waste Management, and Environmental Release Plan – All new materials or products used for winterization must be approved by TVA Environmental and put into the Environmental Impact, Waste Management, and Environmental Release Plan prior to deployment for winterization.

Materials – Calcium Chloride (CaCl2 at 16% concentration) can be used instead of the water on ash, as dust suppressant, as needed, during extreme weather conditions. CaCl2 at 32% concentration will be used on the haul roads for dust suppression and will also be used to de-ice roads and parking lots if temperatures are expected to drop below 15ºF. Polymer (Floc Loc) and Paper Mulch can also be used to create a barrier on top of the ash to prevent fugitive dusting. Contractors are responsible for procuring materials needed to perform their contracted work with TVA during inclement weather. Contact KRP Safety for procurement information.

ATTACHMENT

Attachment 1: Maintenance Areas, Road Coverage, and Decontamination Stations

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Rev. No.	**Date**	**Description**
0	Feb. 20, 2013	Site Guidance Document issued as part of the SWSHP.

Attachment 1
Maintenance Areas, Road Coverage, and Decontamination Stations

TVA Site Construction Services Area of Maintenance for snow and Ice removal

County and TVA Road Coverage

Severe Weather Pedestrian Decontamination Stations

KINGSTON ASH RECOVERY PROJECT (KRP)
HSE-05 TRAILER CITY FIRE EVACUATION PLAN

PURPOSE

This procedure establishes the requirements for evacuating the KRP office trailer complex ("Trailer City") in the event of fire and/or periodic drills.

SCOPE

This procedure provides the guidelines in the event of an emergency requiring the evacuation of office spaces and the process in place to properly maintain this process.

PROCESS

Roles and Responsibilities

KRP Project Manager – Person responsible for the overall development and implementation of the fire emergency response procedure.

Jacobs Emergency Safety Coordinator – Is the owner of the procedure and shall be responsible for:

- Assigning Trailer Coordinators
- Scheduling
- Conducting training
- Establishing evacuation assembly area
- Coordinating drills
- Reviewing procedure annually
- Notifying trailers of an emergency
- Making notification to 911 and TVA Police
- Performing trailer evacuation accountability
- Maintaining proper documentation

Trailer Emergency Coordinator – Persons designated by Jacobs, who will:

- Notify the trailer occupants to evacuate
- Insure personnel with special needs are assisted
- Verify that their trailer is evacuated
- Report the status of evacuation to the Safety Coordinator

Employees – Employees are responsible for:

- Knowing the expectation for evacuating their offices
- Ensuring the Trailer Coordinator is notified of emergency
- Reporting to the Trailer Coordinator or supervisor at the assembly area
- Knowing the locations of assembly areas

Requirements

- Train employees on procedure
- Perform quarterly drills
- Assess drills
- Annual review of procedure

KINGSTON ASH RECOVERY PROJECT (KRP)
HSE-05 TRAILER CITY FIRE EVACUATION PLAN

Procedure Training

- Jacobs Safety personnel
- Trailer coordinators
- Trailer occupants

Assembly Area

Occupants of Trailers #2 (Site Construction Services [SCS], #3 (Environmental), #7 (Lab/TVA Surveyors), and the IT Trailer will assemble south of the trailers in the south parking lot, south of the SCS trailer as shown on Attachment 1.

Occupants of Trailers #1 (Jacobs), #4 (TVA/EPA/Stantec), #5 (Management), and #8 (Medic) will assemble in the north parking lot, north of the Management trailer as shown on Attachment 1.

Trailer occupants will assemble in groups consisting of personnel from their trailer.

Assembly areas may vary due to conditions and should not impede access of emergency response personnel.

Notification

Jacobs Safety personnel will make the announcement via radio and/or send a runner to notify all trailers of the emergency which is done by physically going to each trailer and announcing there is a fire, and that the trailer must be evacuated. In the event of a fire:

- Notify 911 if an emergency situation is determined
- Notify TVA Police 800-824-3861
- Notify Duty Manager during off hours and weekends 865-717-1652
- Notify Plant ECB operator 865-717-2141
- Performs roll call of Trailer Coordinators

Drills

Drills are to be performed quarterly as indicated below.

- First quarter is October 1 thru December 30
- Second quarter is January 1 thru March 31
- Third quarter is April 1 thru June 30
- Fourth quarter is July 1 thru September 30

After a drill has been completed, the Assessment of Drills/Alarms form (KRP Form 054) shall be filled out by each Trailer Coordinator.

Reporting Fires

Fires shall be reported immediately by calling 911 and/or the TVA Police, at 800-824-3861.

Staging Area

Staging area will vary depending on the location of the fire.

Water supplies and hydrants are not available at the KRP so this does not impact fire engine location.

The appropriate fire engine/fire fighting staging areas will be determined/identified on a case-by-case basis.

KINGSTON ASH RECOVERY PROJECT (KRP)
HSE-05 TRAILER CITY FIRE EVACUATION PLAN

RECORDS

- Assessment of drills
- Evacuation Roll Call Sheet

REFERENCES

- *Site Wide Health and Safety Plan for the TVA Kingston fossil Plant Ash Release Response*, prepared by Jacobs 2009.
- *Kingston fossil Plant Emergency Response Plan* KIF.EP.14.00.001

ATTACHMENT

Attachment 1: Trailer City Fire Assembly Stations

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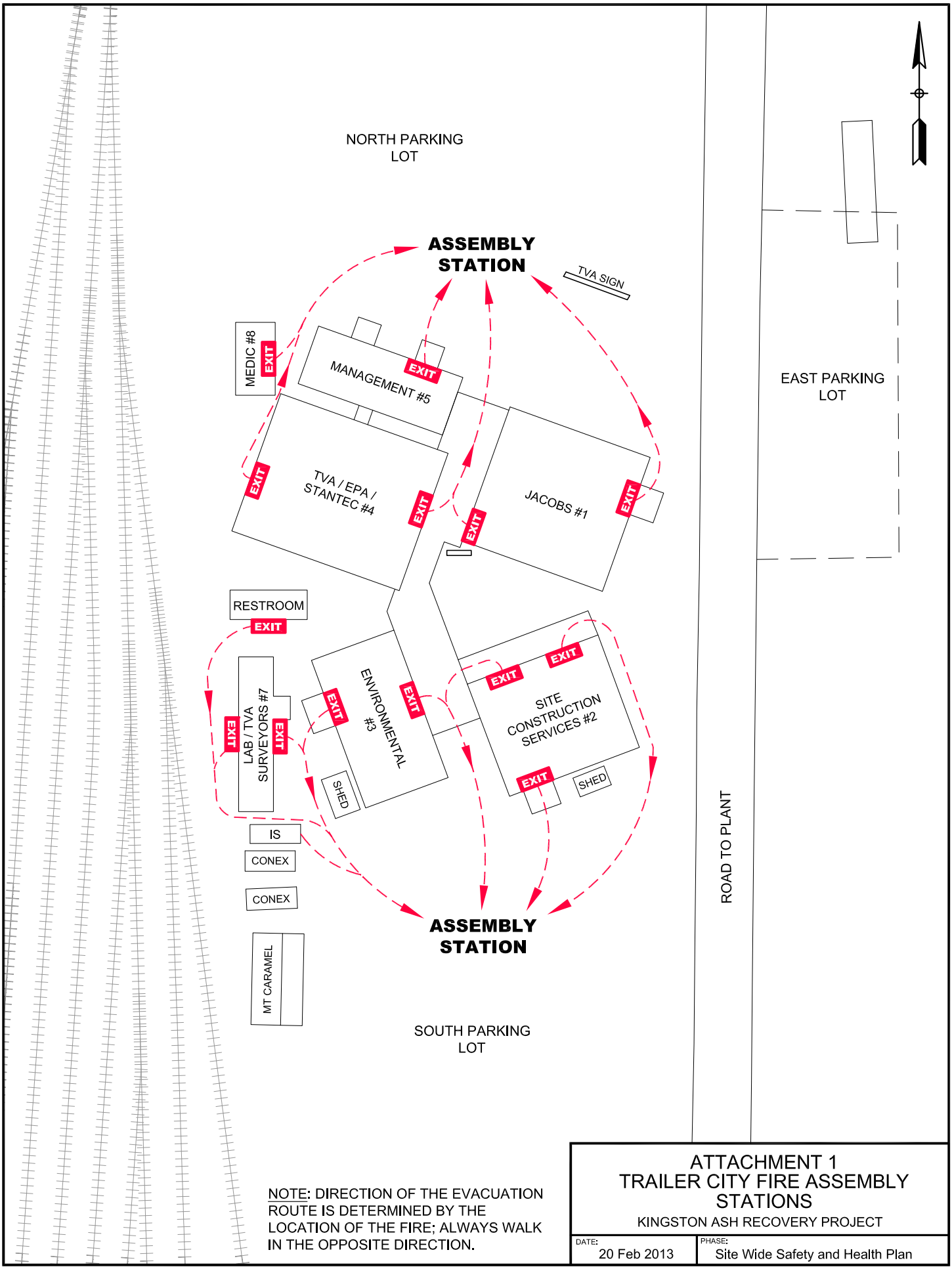

NOTE: DIRECTION OF THE EVACUATION ROUTE IS DETERMINED BY THE LOCATION OF THE FIRE; ALWAYS WALK IN THE OPPOSITE DIRECTION.

ATTACHMENT 1
TRAILER CITY FIRE ASSEMBLY STATIONS

KINGSTON ASH RECOVERY PROJECT

DATE:	PHASE:
20 Feb 2013	Site Wide Safety and Health Plan

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KINGSTON ASH RECOVERY PROJECT (KRP)
HSE-06 TORNADO AND SEVERE WEATHER

DETERMINING SEVERE WEATHER

During inclement weather, KRP Safety will monitor daily for severe weather using the Internet and hand-held lightning devices. The weather report, the size of the severe weather cell, the speed the cell is traveling, and the direction of travel will be used to determine action to be taken for sheltering site employees.

When monitoring the weather indicates that the weather conditions are not subsiding or that a tornado warning is likely, departure of all project personnel from the site will be evaluated by KRP Safety. If severe weather or a tornado watch has been issued, an announcement over the site radio emergency channel will be issued with directions for work suspension or site evacuation. All personnel must remain within ready access of one of the tornado shelters.

If tornado warnings are imminent or have been issued and project personnel are still on the site, employees will seek shelter in the locations listed below when the notification is made by KRP Safety. Personnel are to report to the nearest shelter and report to their supervisor. Carpooling with co-workers is encouraged. Buses will be used to transport field workers. KRP Safety will notify the Plant Electrical Control Building at 717-2141 and request the Scrubber Gate #25 be opened.

SHELTER LOCATIONS

Shelter locations are assigned in accordance with the employees work location. Since employees work in different locations on a daily basis their shelter may also change. To maximize the available parking space **blocking cars in is preferred**. Exiting the parking area will be coordinated after the event.

South End of the Site (Stacks):

- South Stack – Employees will drive to the North Scrubber Access Gate, drive past the Scrubber Stack and South Stack, and park between the Coal Yard Crusher Building and the South Stack. The stack will house approximately 100 people.
- North Stack – Employees will drive to the North Scrubber Access Gate, past the Scrubber Stack, and park around the North Stack. The stack will hold approximately 100 people.
- Scrubber Stack – Employees will drive to the North Scrubber Access Gate and start parking near the Scrubber Stack. The stack will hold approximately 200 people.
- Parking – Employees need to park at the furthest south parking area identified as the South Stack until that area is full, then park in the North Stack parking area until that area is full, and then park in the Scrubber Stack parking area. See Attachment 1.

North End of the Site:

- Berkshire House – Designated for employees working in the Exclusion Zone close to this area. The Berkshire house basement will hold approximately 100 people. See Attachment 2.

ATTACHMENTS

Attachment 1: Severe Weather Shelters - South End of the Site
Attachment 2: Severe Weather Shelter - North End of the Site

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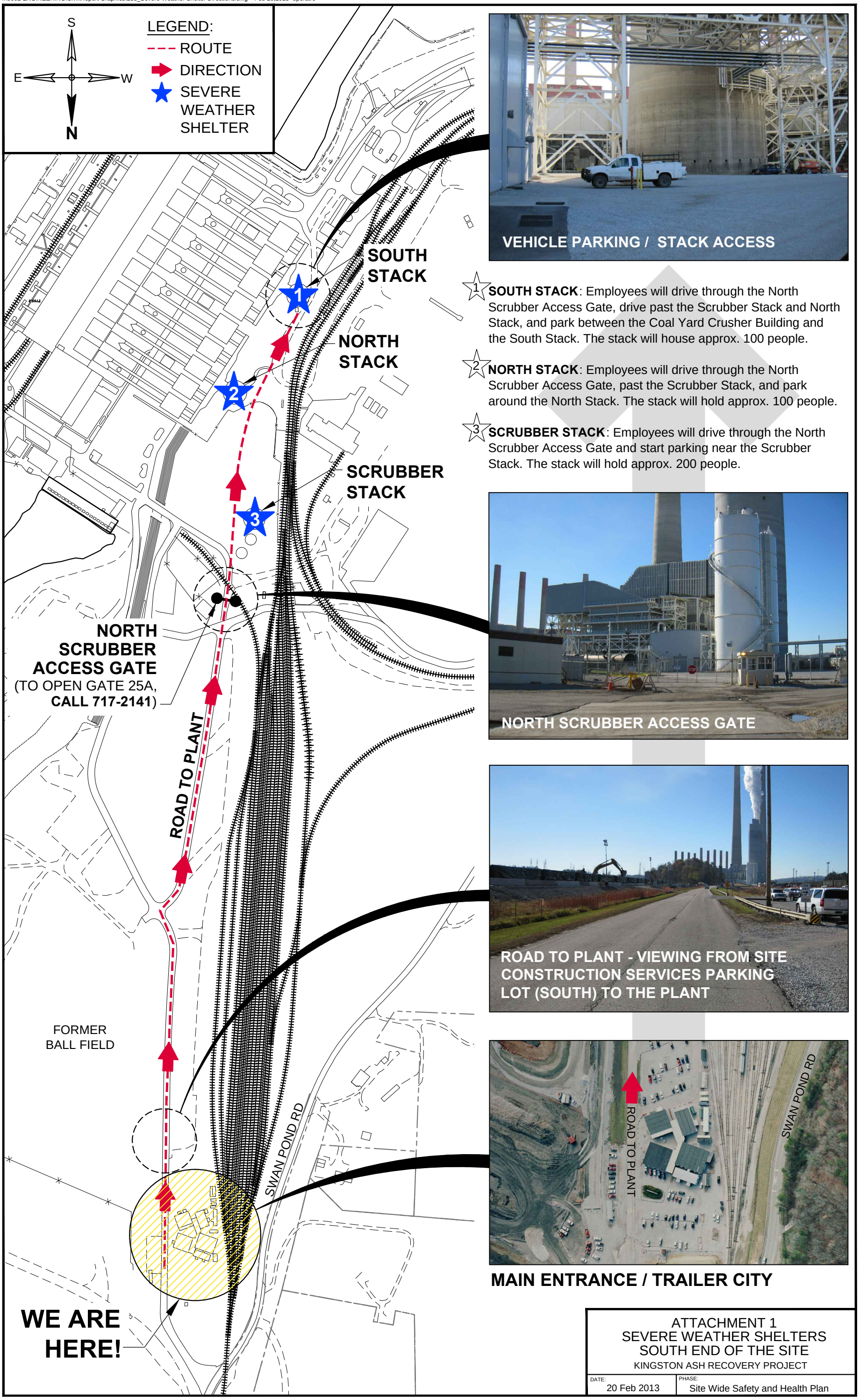


1 **SOUTH STACK**: Employees will drive through the North Scrubber Access Gate, drive past the Scrubber Stack and North Stack, and park between the Coal Yard Crusher Building and the South Stack. The stack will house approx. 100 people.

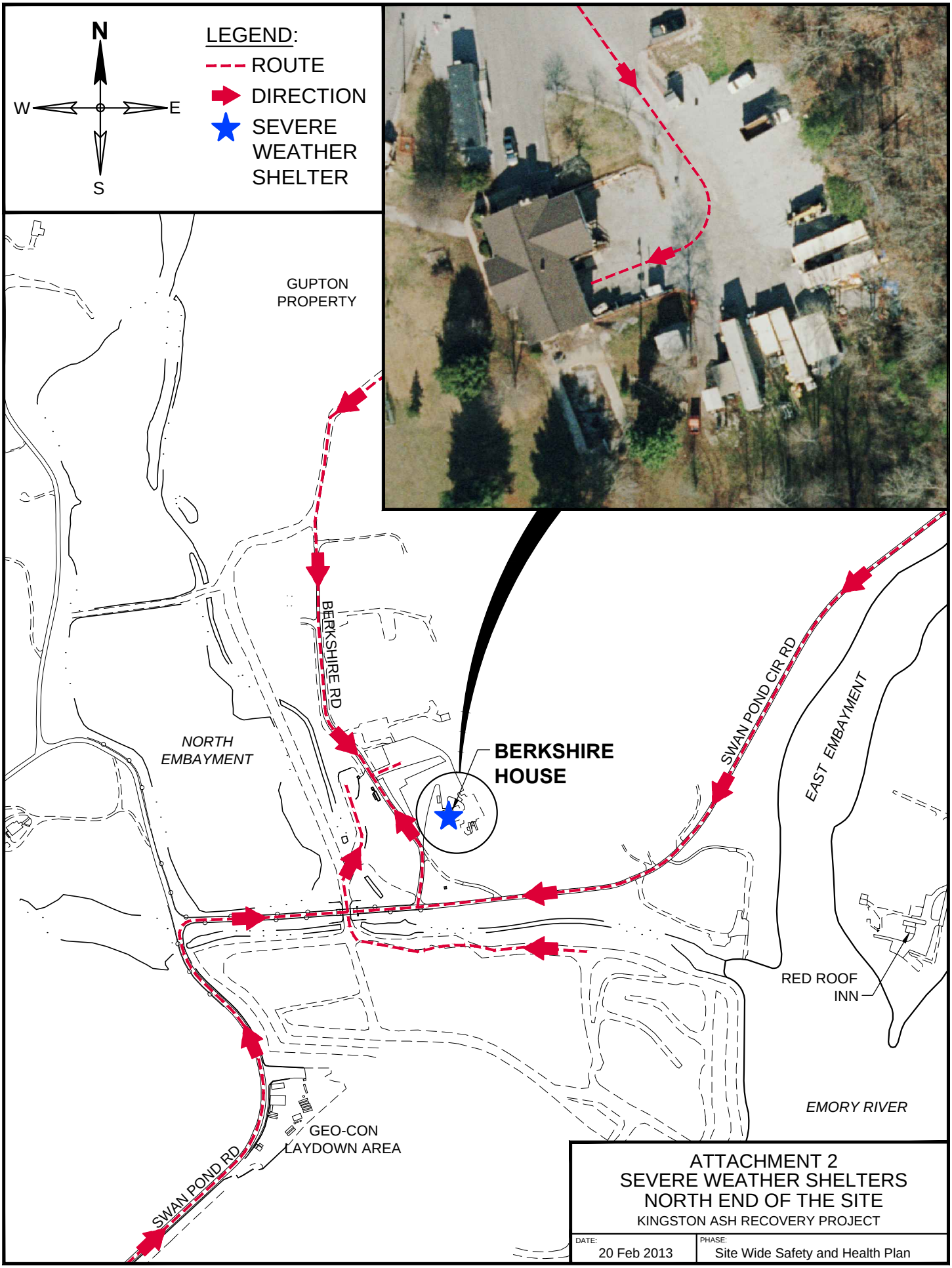
2 **NORTH STACK**: Employees will drive through the North Scrubber Access Gate, past the Scrubber Stack, and park around the North Stack. The stack will hold approx. 100 people.

3 **SCRUBBER STACK**: Employees will drive through the North Scrubber Access Gate and start parking near the Scrubber Stack. The stack will hold approx. 200 people.

MAIN ENTRANCE / TRAILER CITY

ATTACHMENT 1
SEVERE WEATHER SHELTERS
SOUTH END OF THE SITE
KINGSTON ASH RECOVERY PROJECT

DATE:	PHASE:
20 Feb 2013	Site Wide Safety and Health Plan



ATTACHMENT 2
SEVERE WEATHER SHELTERS
NORTH END OF THE SITE
KINGSTON ASH RECOVERY PROJECT

DATE:	PHASE:
20 Feb 2013	Site Wide Safety and Health Plan

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KINGSTON ASH RECOVERY PROJECT (KRP)
HSE-07 INDUSTRIAL HYGIENE PERSONAL AIR MONITORING PROCEDURE

PURPOSE

This procedure describes the uniform IH methods for sampling airborne contaminants utilizing personal air monitoring equipment.

SCOPE

This scope applies to all personal, integrated air monitoring performed by Jacobs for the Kingston Ash Recovery Project per guidance from the Industrial Hygiene (IH) Monitoring Plan (Appendix K of the Site Wide Safety and Health Plan [SWSHP]).

ACRONYMS

- AIHA – American Industrial Hygiene Association
- EQuIS® – Environmental Quality Information System data-base / data repository
- NIOSH – National Institute of Occupational Safety and Health
- OSHA – Occupational Safety and Health Administration
- SEG – Similar Exposure Group
- CoC – Chain-of-Custody

PROCEDURE

Identify an appropriate SEG and coordinate with the supervisor of the SEG to be monitored. Obtain all required sampling equipment and supplies based on the appropriate NIOSH method and industry guidance. (Reference SWSHP, Appendix K, Table 4-1, Recognized Sample Methods to be Utilized.)

Perform sampling pump calibration using the following steps:

Note: KRP Form 077 Integrated Air Monitoring Record (IAMR) is the primary repository for documenting all pertinent information required by this document or Appendix K of the SWSHP. Field log books may be utilized where necessary to capture field data for transposition to the IAMR when the IAMR is not accompanying the Industrial Hygiene (IH) technician in the field It is not the intent of this document to require complete duplication of records in a log book and on the IAMR.

1. Inspect equipment to ensure it is in good repair. Any defective equipment will be removed from service. Document the results of the inspection.

2. Record the serial number and/or identification numbers of the calibrator and each sampling pump.

3. Turn on each sampling pump and allow each to run for at least three minutes before calibration.

4. Attach the appropriate calibration sampling train to a sampling pump.

5. Attach the sampling pump and calibration sampling train to a primary standard (calibrator).

6. Follow the manufacturer's recommended operational methods for the calibration.

7. Adjust the flow rate of each sample pump to be used to the specified flow rate stated in the applicable NIOSH sampling method. (Reference SWSHP, Appendix K, Table 4-1, Recognized Sample Methods to be Utilized.)

8. Use an average of at least three calibration readings for each pump to establish the flow rate.

KINGSTON ASH RECOVERY PROJECT (KRP)
HSE-07 INDUSTRIAL HYGIENE PERSONAL AIR MONITORING PROCEDURE

9. Document the NIOSH sample method and actual sample pump flow rate. Label each sample cassette and blank(s) with a unique identification number using a weatherproof label and indelible ink. This unique number may be the pre-printed serial number on the cassette.

10. Construct the actual sampling train and attach the sampling media to the train prior to placing it on the monitored individual.

11. Document the unique identification number of the cassette.

Perform personnel sampling using the following steps.

12. Meet with the scheduled SEG supervisor and/or individuals participating in the IH integrated monitoring.

13. Inform the individual(s) of the reasoning and methods behind the study to get their buy-in, and also discuss with them the importance of controlling equipment against damage, loss, vandalism, and sampling sabotage.

14. With the assistance of the individual being monitored, complete the appropriate study information.

15. Remove the cassette cap and start the monitoring pump, ensuring the sampling media is appropriately attached, and record the start time. (Due to the configuration of some sampling chains, such as cyclones, the cassette cap will have been removed during chain construction.)

16. Place the sample pump on the individual being sampled so that it does not interfere with work performance.

17. Place the sample cassette in the breathing zone by attaching it to the individual's shirt collar/lapel or as close as practical to the nose and mouth of the employee, in a hemisphere forward of the shoulders, with a radius of approximately 6 to 9 inches.

18. Ensure the cassette inlet is in the face-down vertical position to avoid gross contamination.

19. Observe the pump operation for a short time to ensure proper operation.

20. Check the sampling train regularly during the sampling period to verify the sampler is still assembled properly and that the hose has not become pinched or detached from the cassette or the pump.

21. Note potential tampering as well as any field observations of visible airborne contaminants, work practices, potential interferences, movements, or other conditions in the field logbook or on the IAMR. If extensive notes are made in the field logbook, a reference may be made on the IAMR back to the page and date in the logbook in lieu of transposition of notes from the logbook to the IAMR.

22. Remove the cassette caps of the sample blank within the vicinity of the sampling environment then replace the cassette caps.

23. Upon completion of the personal air monitor IH sampling, turn off the sampling pump and record the stop time. If the sampling pump is equipped with a timer, document the pump time as well. This time will be checked against the start/stop time and will be utilized as the official sample time.

24. Replace the cassette caps.

25. Conduct a short interview to assess any personal observations of the monitored individual that may further explain any exposure results that may be included in medical records. Record any conversation notes and/or observations on the IAMR.

KINGSTON ASH RECOVERY PROJECT (KRP)
HSE-07 INDUSTRIAL HYGIENE PERSONAL AIR MONITORING PROCEDURE

26. Perform post-sample flow rate check of the sampling pump and document on the IAMR.

27. Ensure each sample cassette is properly labeled (including blank(s)) with a unique identification number.

28. Request an EQuIS® based CoC from the Sample Manager, or complete a hand written CoC with all appropriate data fields completed including the volume calculation result.

SAMPLE PACKAGING AND SHIPPING

In order to protect the chain of custody, all compliance samples must be shipped with some form of tracking, such as the U.S. Postal Service certified mail, or an alternate mode of shipment (Federal Express, United Parcel Service, etc.) can be used. In certain cases, overnight shipment is necessary. Examples include certain hexavalent chromium and methyl ethyl ketone peroxide samples. For more information specific to the analyte in question, consult OSHA's Chemical Sampling Information file or contact the lab used for the analyses.

Safe shipping begins in the field when the IH starts to collect the desired substance or material to be shipped and analyzed. Every effort should be made to keep the exterior of the container free of the substance being sampled. This will minimize the potential for cross contamination and prevent a hazard being introduced to personnel who open the shipping package and begin removing samples for evaluation.

Place each cassette in an individual re-sealable plastic bag. Seal the bag and place a tamper-resistant seal over the mouth of the bag. Affix the EQuIS® generated or hand written sample label to the outside of the bag. Place the CoC in a re-sealable plastic bag and seal the bag. Place all bags in the shipping container.

Samples should be shipped in boxes or other sturdy containers with sufficient packing material to fill the box. Do not use or place expanded polystyrene packing (Styrofoam™) or any static-producing materials, such as polycarbonate, polytetrafluoroethylene (PTFE or Teflon™), polyvinyl chloride and polystyrene plastic in containers with asbestos or other fibrous air samples. Do not use vermiculite. Loose vermiculite packaging material is not recommended due to its potential contamination of the sample cassette with excessive dust, and its tendency to attract a static charge which could affect the fiber count. Corn starch "peanuts," excelsior (shredded wood fiber) and some anti-static commercial products do not produce static electricity and may be used. Standard paper products may also be used.

Hazardous materials are articles or substances that are capable of posing a risk to health, safety, property, or the environment, and are listed as dangerous goods in Department of Transportation and/or International Air Transport Association Dangerous Goods Regulations Manual. The shipper is responsible for compliance with applicable transportation or postal laws and any additional regulations imposed by the carrier. The shipper must comply with any packaging requirements such as proper labeling and packing requirements. Each package must be large enough so that there is adequate space to affix all required markings and labels. The correct labels and forms must be used. All labels and forms must be complete, legible, and accurate. Before packing any dangerous goods the shipper must:

- Identify correctly and fully all dangerous articles and dangerous substances within the package.
- Determine any subsidiary hazards and assign each item of dangerous goods to one of the three packing groups within the assigned class or division.
- Follow the appropriate packing and labeling requirements.
- Classify each item of dangerous goods by determining under which of the nine classes it falls.

RECORDS AND DOCUMENT CONTROL

Any field notes, CoC, logged notes, Integrated Air Monitoring Records, and calibration information shall be maintained in accordance with TVA Litigation Hold Process.

KINGSTON ASH RECOVERY PROJECT (KRP)
HSE-07 INDUSTRIAL HYGIENE PERSONAL AIR MONITORING PROCEDURE

Field data to be collected for sampling is found in the IAMR. This data may be captured directly to the form or inserted in a field logbook to be transcribed to the form.

The following guidelines will be used when performing field documentation.

- Ensure logbooks are bound.
- Consecutively number each page of the logbook.
- Make entries into the logbook chronological so a time notation introduces each entry.
- Use only indelible ink for logbook entries.
- Record data directly and legibly into a field logbook.
- Line out errors in the logbook (a single line strike-through) and initial and date the correction.
- Avoid leaving any blank line(s) between logbook entries. Cross out any blank lines and initial and date the cross out.
- Initial and date each page of the logbook.

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KINGSTON ASH RECOVERY PROJECT (KRP)

HSE-08 AUTOMATED EXTERNAL DEFIBRILLATOR (AED) PROGRAM

AUTOMATED EXTERNAL DEFIBRILLATOR WRITTEN PLAN

This plan is designed for KRP to outline the key components of the implementation of the Automated External Defibrillator (AED) Program as required by the State of Tennessee and Recommended by Guidelines for Public Access Defibrillation Programs in Federal Facilities.

TRAINING COURSE

The following training programs in cardiopulmonary resuscitation and AED use are consistent with the scientific guidelines of the American Heart Association and have been approved by the Tennessee Emergency Medical Services Board. Additional training information is provided below.

- American Heart Association Heartsaver / AED Course
- American Red Cross Standard First Aid / AED Course
- American Red Cross AED Course for Training Instructors
- American Red Cross Adult CPR / AED Course
- National Safety Council Adult CPR/AED Course

All employees trained in Adult CPR / AED will be required to re-certify on an annual basis.

DEVICE REPRESENTATIVES

- Tom Bock, KRP Safety (primary)
- Chris Eich, KRP Safety (alternate)

MAINTENANCE AND TESTING SCHEDULE

An AED must be tested on a monthly basis according to the manufacturer's recommendations and a written record of testing and maintenance must be maintained by the AED owners. The inspection must be documented on the AED Maintenance Record (KRP Form 058c) form, shall comply with the manufacturer's checklist for unit inspection, and consist of the following minimum components:

- Examine the battery level indicator and replace with new battery when indicated.
- Check the integrity of the electrodes connectors and wires.
- Examine integrity of the electrodes connectors and cable and ensure they are connected to AED.
- Check the electrodes (defibrillation pads) to ensure they are properly sealed and packaged.
- Check the expiration dates on the defibrillator pads, and replace as needed.

DURING AED INSPECTION, VERIFY THE FOLLOWING EQUIPMENT IS PLACED WITH THE DEVICE:

- Simplified directions for CPR and the use of the AED
- Latex-free gloves
- Barriers with one way valves
- Disposable razor
- 4x4 gauze
- Bandage scissors or blunt edges scissors
- Spare electrodes
- Two biohazard or medical waste bags for waste or transporting the AED should it become contaminated
- Pad of paper and writing tool
- One absorbent towel

After use, all expendable accessories shall be replaced and the defibrillator checked to ensure that it is in proper working order.

KINGSTON ASH RECOVERY PROJECT (KRP)
HSE-08 AUTOMATED EXTERNAL DEFIBRILLATOR (AED) PROGRAM

A copy of AED Maintenance Record and the AED Use Report (Form 058b) shall be kept onsite in the KRP Safety (Trailer 1).

STAGING LOCATIONS

Due to the layout of the site and in an effort to keep response time to 3 to 5 minutes, AEDs will be staged in the following locations: Geo-Con Batch Plant; MAP Break trailer; Site Construction Services Berkshire House; Polymer Shack north end of Dragline Road and Dike C Road; RSI sample house on Lakeshore Drive; and Paramedic Station Office Trailer (inspected and maintained by onsite paramedic).

All site personnel will have access to these units and have the authority to bring them to an incident scene; however, only properly trained personnel are authorized to use the AED devices. Photos of the buildings equipped with AED units and their physical location are provided below.

PLAN AND USE NOTIFICATION

This program must be registered with Emergency Medical Services (EMS) in writing by supplying the information found in Written Notice of AED Program (KRP Form 058a). In the event of actual AED use, the AED Use Report (KRP Form 058b) must be provided to the Medical Director, Anne Roberts, M.D., and others as listed for distribution at the bottom of the form.

RESPONDERS

An adequate representation of personnel from the site will be trained in CPR / AED response. This number must be made up of personnel on both day and night shifts, office, field, and supervision. A list of trained personnel will be maintained in the KRP Safety with this plan.

RESPONSE DRILLS

Drills will be held quarterly to evaluate the effectiveness of response, adequacy of AED placement and ability of responders. This drill may be held in conjunction with other emergency response drills such as man overboard drills.

EMERGENCY RESPONSE

All medical emergencies at the KRP must be called in to 911 per the KIF Emergency Action Plan. In the event it is deemed necessary to request an AED, the requestor will state the following via site radio.

“Medical emergency, medical emergency. An AED and trained personnel are needed at (location).”

Those personnel closest to AED staging areas will verbally answer the radio request, retrieve the AED and immediately head to the designated location. Any AED trained personnel hearing the message will also answer the radio request and respond to the scene.

Upon arrival at an emergency, the trained responder will perform the following:

- Verify EMS and the onsite paramedic have been notified.
- Ensure the emergency scene is safe and free of hazards.
- Use universal precautions (such as medical gloves, barrier device, etc.).
- Perform CPR as trained.
- Utilize AED as trained and by following AED voice prompts. Remember: Before shocking, emergency oxygen must be removed from the patient and AED area.
- Continue CPR and leave AED attached until offsite EMS arrive and take over.
- Provide verbal description of events to EMS.

KINGSTON ASH RECOVERY PROJECT (KRP)

HSE-08 AUTOMATED EXTERNAL DEFIBRILLATOR (AED) PROGRAM

AED use must be consistent with the manufacturer's recommendations and the safety instructions listed in the attachments.

POST EMERGENCY RESPONSE ACTIONS

Upon termination of events, responder assures the expendable items used are restocked for AED and accessory equipment. The AED representatives determines if post-event support is needed. If needed, the AED representative contacts the Employee Assistance Program – Horizon Health at 888-482-2733. Complete the AED Use Report and if possible send a copy with the victim. Send the AED to TVA Occupational Health to download event data.

REFERENCES

American Heart Association. 2000 (March). Sudden Cardiac Death, AHA Scientific Position.

American Heart Association. 2000 (March). ILCOR Advisory Statement: Early Defibrillation. An Advisory Statement From the Advanced Life Support Working Group of the International Liaison Committee on Resuscitation.

The American Safety & Health Institute. 2001. Emergency Oxygen Educational Program, [Brochure]. Sub-Committee on Emergency and Medical Oxygen.

Cardiac Survival Act. http://frwebgate.access.gpo.gov/cgibin/getdoc.cgi?dbname=106_cong_public_laws&docid=f: publ505.106.

Christensen, J. and Hernandez, B. (2001). "Automatic External Defibrillator Intervention in the Workplace. A Comprehensive Approach to Program Development." American Academy of Occupational Health Journal 49 (2), 96-105.

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Emergency Medical Equipment: Final Rule. 2001 (April 21). Federal Register. 66FR19027.

Guidelines for Public Access Defibrillation Program in Federal Facilities. 2001 (May 23). Federal Register. 66FR28495.

Tennessee Department of Health Division of Emergency Medical Services, AED Requirements and Guidelines for AED Programs and Public Access Defibrillation in Tennessee.

ATTACHMENTS

Attachment 1: Onsite AED Locations

Attachment 2: Safety Instructions for Use of the AED

Attachment 3: Letter of Agreement – Stop Heart Attack

Attachment 4: TVA Core First Aid / CPR / AED / Bloodborne Pathogens (BBP) Courses

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Attachment 1
Onsite AED Locations

Geo-Con Batch Plant Trailer

Site Construction Services Berkshire House

MAP Break Trailer

Attachment 1
Onsite AED Locations

Polymer Stack North End of Dragline Road and Dike D Road

RSI Sample House on Lakeshore Drive

Medic Trailer at Trailer City

Attachment 2
Safety Instructions for Use of the AED

1. Do not touch the victim while the AED is analyzing. Touching the patient may cause movement.
2. Do not touch the victim while defibrillating. Ensure everyone is clear of the patient before delivering every shock.
3. Do not use alcohol to wipe the victim's chest.
4. Do not defibrillate anyone around flammable materials, such as gasoline or free-flowing oxygen. This may cause a flash fire.
5. Do not use an AED in a moving vehicle. The AED cannot analyze a rhythm accurately in a moving vehicle.
6. Do not use the AED on victims lying on, or in contact with, a conductive (metal) surface. Move the patient off, or away from, the conductive surface.
7. Do not use an AED on a victim in contact with water. Water is a good conductor of electricity. Dry the patient's chest or move the patient out of the wet environment before attaching the electrode pads. (It is fine to use the AED in the rain or on rain soaked pavement as long as the patient's chest and AED are kept dry.)
8. Do not use an AED on a child under the age of 8 or under 90 pounds.
9. Do not use an AED on a victim wearing any medication patch on the chest. A patch may block delivery of shocks or cause small burns to the skin. With your medical gloves on (to prevent you from absorbing the medication), remove the patch and wipe the area clean using a 4-inch x 4-inch gauze pad, or clean towel, before attaching the electrode pads. Put on a clean pair of medical gloves.
10. Do not place AED electrode pads directly over an implanted pacemaker or defibrillator. Placing the electrode pad directly over an implanted medical device may reduce the effectiveness of defibrillation. Place the AED electrode pad at least 1 inch to the side of any implanted device.
11. Do not use a cellular phone or radio within 6 feet of the AED. This may cause an electrical interference with the operation of the AED.

Attachment 3
Letter of Agreement – Stop Heart Attack

Occupational Health recommends that TVA adopt one brand of AEDs. The use of this one brand facilitates standardization regarding training, responding, and reporting requirements.

The vendor that TVA has a *Letter of Agreement* with is:

Mr. Floyd Larkin
Stop Heart Attack
320 West Stonebrook Place
Birmingham, AL 35226
Phone: 888-823-6967
Fax: 205-823-7817

Floyd Larkin has set up a website for ordering these AEDs and accessories.
Individual business units are responsible for purchasing AEDs, if they choose to have one.
Occupational Health must be notified prior to ordering AED units.

To order an AED, organizations MUST:

(1) Assign an AED site coordinator.
(2) Prepare AED Site Specific Plan.
(3) Have AED users who are trained and certified in CPR and AED. Training is required annually.

Attachment 4
TVA Core First Aid / CPR / AED / Bloodborne Pathogens (BBP) Courses

ATIS #	Course Length	Course Title
00051957	4 hours	Infant and Child CPR
00053561	2 hours	Bloodborne Pathogens (Initial)
00068427	.5 hours	Bloodborne Pathogens (Refresher)
00055326	4 - 6 hours	Adult CPR/AED/BBP - (Initial & Annual Refresher)
00055327	8 hours	First Aid/CPR/AED/BBP - (Initial)
00067012	4 hours	First Aid/CPR/AED/BBP - (Refresher)
00055329	8 hours	Healthcare Provider CPR/AED/BBP - (Initial)
00051960	4 hours	Healthcare Provider CPR/AED/BBP - (Refresher)
00056483	2 hours	Instructor Updates
00055328	16 hours	First Aid/CPR/AED/BBP Train the Trainer
00064863	8 hours	CPR/AED/BBP Train-the-Trainer Course for Laypersons

ATIS #	Course Length	Course Title	Course Description
00051957	4 hours	Infant and Child CPR (Initial & refresher)	Teaches how to perform infant and child CPR, use of an AED, barrier devices during rescue breathing, and relieve airway obstruction by a foreign body. (Initial and Refresher).
00053561	2 hours	Bloodborne Pathogens (Initial)	Provides discussion of the hazards and precautions to follow to protect from diseases caused by exposure to blood and other potentially infectious human body fluids. The "TVA Exposure Control Plan for Occupational Exposure to Bloodborne Pathogens" is covered in this program. Annual Refresher required.
00068427	.5 hours	Bloodborne Pathogens (Refresher)	Reviews the hazards and precautions to follow to protect from diseases caused by exposure to blood and other potentially infectious human body fluids. Reviews the "TVA Exposure Control Plan for Occupational Exposure to Bloodborne Pathogens". Prerequisite ATIS #53561. Required annually.
00055326	4 - 6 hours	Adult CPR/AED/BBP - (Initial & Annual Refresher)	Teaches how to perform adult CPR, use of an AED, use of a barrier device during rescue breathing, and relieve airway obstruction by a foreign body. Teaches how to recognize signs of four major emergencies: heart attack, stroke, cardiac arrest, and foreign body airway obstruction. Bloodborne Pathogens Training is included in both initial and refresher class. Use ATIS # 55326 & 53561 for initial classes. Use ATIS #55326 & 68427 for refresher. Separate rosters required. (Initial & Annual Refresher)
00055327	8 hours	First Aid/CPR/AED/BBP - (Initial)	Includes Adult CPR/AED (ATIS #55326), plus first aid for acute injuries and sudden illnesses. Individuals who successfully complete the national cognitive and skills evaluations in accordance with the curriculum are eligible to receive course completion cards. Bloodborne Pathogens Training is included. Annual Retraining (ATIS # 67012) required. Use ATIS #55327 & 53561. Separate rosters required.
00067012	4 hours	First Aid/CPR/AED/BBP - (Refresher)	This program targets responders, including plant fire brigade and/or medical response team members, police, security personnel and employees in the workplace who requires refresher to ATIS #55327. Bloodborne Pathogens Training is included. Prerequisite ATIS #55327. Annual retraining required. Use ATIS #67012 & 68427.

Attachment 4
TVA Core First Aid / CPR / AED / Bloodborne Pathogens (BBP) Courses

ATIS #	Course Length	Course Title	Course Description
			Separate rosters required.
00055329	8 hours	Healthcare Provider CPR/AED/BBP (Initial)	Designed to teach healthcare provider the skills of CPR for victims of all ages, use of an AED, and relief of foreign body airway obstruction. Bloodborne Pathogens Training is included. Upon successful completion, healthcare worker will receive the Healthcare Providers Course Completion Card (credential). Annual Refresher required. Use ATIS #55329 and 53561; Separate rosters required.
00051960	4 hours	Healthcare Provider CPR/AED/BBP (Refresher)	Reviews healthcare provider skills of CPR for victims of all ages, use of an AED, and relief of foreign body airway obstruction, including Bloodborne Pathogens retraining. Upon successful completion, healthcare worker will receive the Healthcare Providers Course Completion Card (credential). Prerequisite ATIS #55329. Annual retraining required. Use ATIS #51960 and #68427; Separate rosters required.
00056483	2 hours	Instructor Updates	TVA CPR instructors are required to complete mandatory instructor updates issued by respective training agencies. Upon completion, use ATIS # 56483 to document attendance.
00055328	16 hours	First Aid/CPR/AED/BBP - Train the Trainer Course (For Instructors)	This 16-hour course involves multiple learning activities. The instructor candidate is taught to use adult education concepts and appropriate teaching strategies in presenting material and in monitoring and coaching participants in skills acquisition. Instructor candidates must accurately demonstrate and teach the skills of 1 and 2 rescuer adult CPR, use of an AED, and management of foreign body airway obstruction in the responsive and unresponsive adult, infant, and child. The instructor candidate must also learn and teach how to assess victims and provide first aid for a variety of injuries and sudden illnesses.
00064863	8 hours	CPR/AED/BBP Train-the-Trainer Course for Laypersons	This 8 hour course provides instructor candidates with the opportunity to acquire the knowledge and skills necessary to teach and evaluate potential CPR and AED providers. This course is appropriate only for laypersons who wish to become instructors. The candidate is taught to use adult education concepts and teaching strategies in presenting material and in monitoring and coaching skills acquisition for adult/pediatric CPR and use of an AED.

KINGSTON ASH RECOVERY PROJECT (KRP)
HSE-09 NON-ROUTINE SITE ACTIVITIES

Non-routine hands-on activities are defined as a discrete, short duration support activity that occurs infrequently, usually less than once per month. Examples include, but are not limited to, the following:

- Specialized heavy equipment maintenance - Regular scheduled heavy equipment activity is not considered non-routine and as such would fall under normal site HAZWOPER requirements
- Product or equipment demonstration from vendors
- Research activities
- Rail repair
- Specialized diving operations
- Crane assembly

Workers performing non-routine activities are exempt from the HAZWOPER training requirements as long as a HAZWOPER-qualified escort is provided.

REQUESTING SITE CONTACT/SUPERVISOR

The Requesting site contact/supervisor is the individual onsite who has the authority and responsibility to plan and coordinate site activities. This individual must be HAZWOPER trained, and have all the requisite safety and health training for the associated activities to be performed. This person reviews and signs the Job Safety Analysis (JSA) as the supervisor. This person oversees the development of the JSA and Work Package, ensures participation and obtains signatures from the entire work crew, and ensures the work is conducted in accordance with the JSA. This person is ultimately responsible for the associated crew until they depart the site, either directly or through the use of an escort. He assigns a competent personnel to provide escort and field oversight throughout the associated tasks. Steps to take include:

1. The requesting site contact/supervisor to coordinate the arrival of the work team to be escorted and meet them at an access point. The work team must not be allowed to enter the KRP site without proper escort.
2. The work team will attend a site specific orientation appropriate for the work task and get badged. Check with site Safety to confirm orientation needs.
3. The Requesting site contact/supervisor must designate a responsible party to provide oversight and escort of the crew throughout the performance of their task. This individual must be (40-hour) HAZWOPER trained and be in a position of authority and responsibility. This person can be the requesting site contract/supervisor or for larger jobs or another person with the contractor. They must be someone the contractor has identified as sufficiently responsible to guide the untrained workers with respect to safety and HAZWOPER requirements and to always keep all untrained personnel in sight. The work team must be escorted continuously until they leave the site. For large groups, or groups that have dispersed activities, more than one escort may be needed. Inform work team of HAZWOPER requirements as they apply to the activities.
4. Once the entire work team has arrived, the Requesting site contact/supervisor must coordinate development of the Work Package with assistance of their company's Site Safety and Health Officer (SSHO) who provides assistance developing the associated JSA. The work package is reviewed and approved by KRP approvers.
5. The SSHO is expected to regularly audit and inspect associated tasks. SSHO has the authority to stop work in the event the crew is working outside of their Work Package or for unsafe conditions.
6. The Construction Manager (CM) must participate in or have opportunity to review the JSA prior to the start of the activity. The CM may decline participation or review of the JSA, if comfortable about the level of planning that occurred. The CM is to oversee associated activities and verify they are in compliance with the JSA and any associated procedures. The CM informs KRP SSHO of associated tasks.
7. KRP Safety must be informed of the location and duration of the activity. KRP Safety performs frequent field visits and oversight of associated tasks.

KINGSTON ASH RECOVERY PROJECT (KRP)
HSE-09 NON-ROUTINE SITE ACTIVITIES

8. The Requesting site contact/supervisor must inform the work team of all HAZWOPER and safety requirements, review and sign the JSA as it applies to their activities, and keep them in sight at all times.

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KINGSTON ASH RECOVERY PROJECT (KRP)
HSE-01 SAFETY OBSERVATION REPORT (SOR) REPORTING PROCESS

PURPOSE

The purpose is to document the method of resolution of KRP Safety Observation Reports (SORs) and the SOR Reporting Process.

SCOPE

This process applies to KRP site-wide.

PROCESS

Roles and Responsibilities

- Safety Administrator: Maintains SOR database and produces daily reports.
- Assistant Safety Officer (ASO): Responsible for providing SORs to Safety Admin and overall SOR process.
- Site Safety Officer (SSO): TVA KRP Site Safety Officer is responsible for overall safety program at the site.
- Team Members: Any KRP team member may issue a SOR to ASO.
- Responsible Party: Person assigned to apply corrective actions and close the SOR once all actions are completed.

Key

The following key is used to categorize and prioritize each SOR:

A. **High Hazard** – Situation presenting exposure to a potentially high level of danger - e.g., potential source of Imminent/immediate Danger to Life and Health which could result in high severity source of unmitigated Environmental, Safety, and Health (ESH) or property/operational loss.

B. **Low Hazard** – Situation presenting exposure to a potentially low level of danger - e.g., potential source of routine/average safety problems (resultant low severity source of unmitigated ESH or property/operational loss).

C. **Other Hazard** – Any other situation that, in your judgment, presents a potential hazard exposure that warrants at least some attention, correction, referral, review, analysis - e.g., potential ESH or other hazard(s) associated with maintenance, operations, monitoring, planning, management, follow-up, etc.

ATTACHMENT

Attachment 1: SORs & SOR Reporting Process

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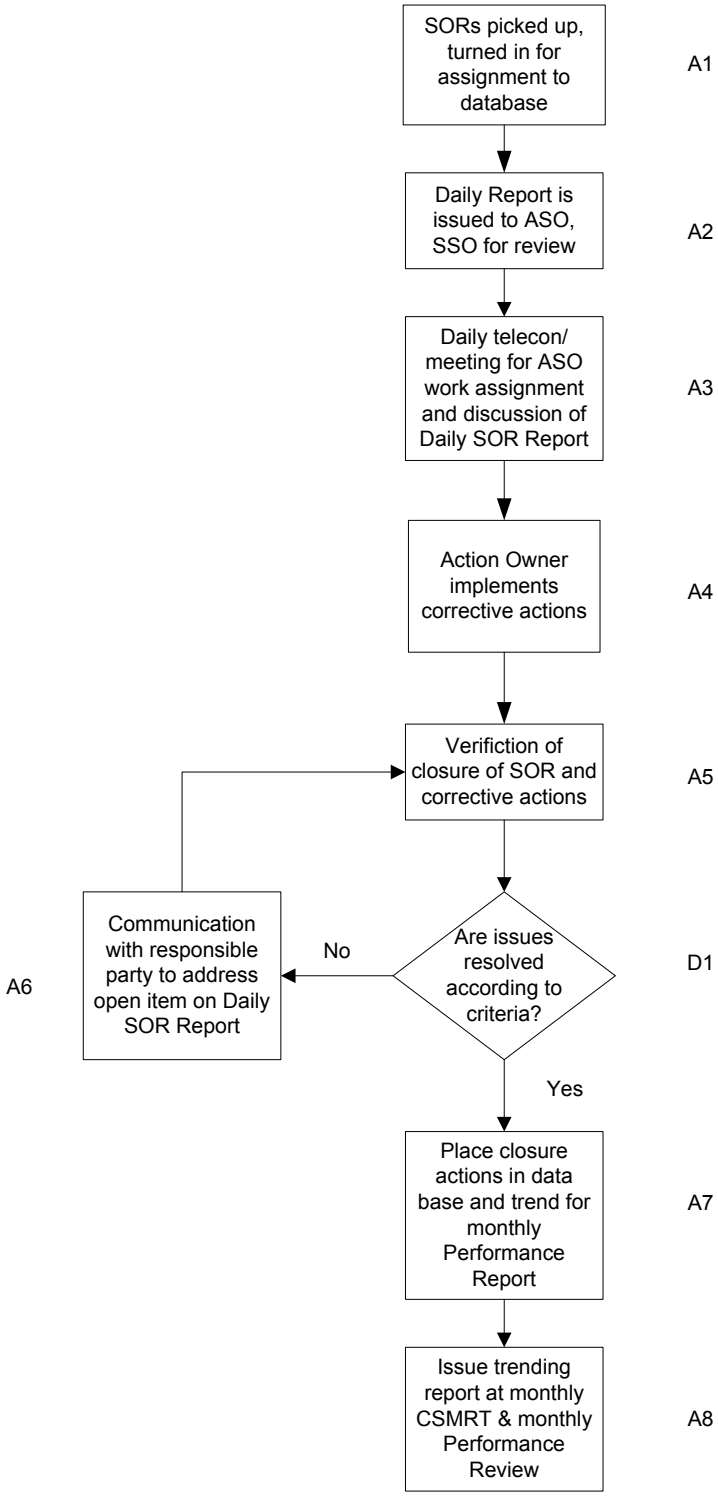
Attachment 1
SORs & SOR Reporting Process



KINGSTON ASH RECOVERY PROJECT (KRP)
HSE-011 INCIDENT REPORTING

Notification, investigation, reporting, and communication of corrective actions related to safety incidents and environmental events to include all KRP safety related events and "near-misses" involving occupational injuries and illnesses, property damage, fires, or reportable environmental events. For question/comments, call KRP Safety at 865-717-6517. The following require project notification:

- A work-related injury or illness
- Property/vehicle/equipment damage
- An uncontrolled fire or explosion
- A work stoppage due to lightning or tornado
- An unplanned spill or release (including air releases) to the environment
- A permit or permit equivalent exceedance
- Any unexpected contact or damage to aboveground or below ground utilities
- Any "near miss" or an unplanned event
- A First Aid

NOTIFICATION

Prior to notification, obtain appropriate medical treatment for the injured worker and assure the safety of other workers in the area.

Who/What	When	To Whom	How – By What Means
Responsible manager, supervisor or employee with knowledge of an incident - Initial Notification	Immediately after incident occurs	– KRP Safety – Organization management chain – Organization safety – Jacobs Construction Manager (CM)	Personal communication – Telephone – Radio – Email, etc.
Site Safety	Immediately after notification	– CM – TVA General Manager – Jacobs Program Manager – Jacobs Safety	Personal communication
Jacobs Safety Manager	Immediately after notification	– TVA Safety – TVA Ops Manager – TVA Sr. Manager on Duty	Personal communication
Jacobs CM	Immediately after notification	– Project Management Coordinator (PMC) – SOS (if environmental or derailment) – Michelle Cagley (if environmental)	Personal communication
PMC	ASAP, but no later than within 1 hour of incident notification	– TVA TCM	Personal communication
Jacobs Program Manager	As determined by Program Manager - ASAP, but no later than within 1 hour of incident notification	– Jacobs Corporate Management – TVA Senior Project Management	Personal communication

INVESTIGATION / REPORTING

Incident investigator or investigation team from KRP Safety and organizations involved in the incident – Secure scene, gather information, and determine extent of condition.

KINGSTON ASH RECOVERY PROJECT (KRP)
HSE-011 INCIDENT REPORTING

Who/What	When	To Whom	How – By What Means
TVA Preliminary Injury Reporting	ASAP, within 24 hours (one day)	– TVA Corporate	Preliminary Injury and Incident Report under Health and Safety tab of insidenet.tva.gov
Initial Draft Report – facts summary	First Wednesday after the incident	– Project Management Review Committee (MRC) meeting – TVA Senior PM – Jacobs Senior PM	Formal written Draft Report. Use Initial Event Report (KRP Form 067).
Final Report – (full report with causal factors / corrective actions)	Second Wednesday after the incident	– Project MRC meeting – TVA Senior PM – Jacobs Senior PM	Formal Final Report. Use Final Report (KRP Form 068). Reference WI-QA-001 *Trend Coding and Causal Analysis.*
Final Report – (full report with causal factors / corrective actions)	Second Wednesday after the incident	– Project MRC meeting – TVA Senior PM – Jacobs Senior PM	Formal Final Report. Use Final Report (KRP Form 068).
Experience Review	Before Final Report	– TVA Senior Operations – TVA Senior Safety	Use Experience Review (KRP Form 069).

COMMUNICATING CORRECTIVE ACTIONS

KRP Safety and Outreach Organizations are to follow the Corrective Action Program for the KRP site.

Who/What	When	To Whom	How – By What Means
Specific Corrective actions taken as a result of the incident	One week after the incident	All organizations assigned to the project	Site-wide email bulletin boards, safety meetings, flyers, and alerts
Broader lessons learned	Two weeks after the incident	Project organizations and corporate / TVA organizations	Formal transmittal – (e.g., email, memo, presentation)

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APPENDIX B
HEALTH HAZARD EVALUATION

HEALTH HAZARD EVALUATION

Process or Task	Chemical	Hazard	Hazard Level	Exposure Route	Identify Initial PPE	Comments, Unusual Issues
Equipment Staging and Mobilization	Crystalline Silica	Suspect Carcinogen	Low	Inhalation	Work clothing or coveralls, hard hat, safety glasses, steel-toe boots.	Incidental exposure may occur from vehicle dust generation.
	Inorganic Arsenic	Carcinogen Nephrotoxin Hepatoxin	Low	Inhalation		
Perimeter Wall Stabilization Construction	Crystalline Silica	Suspect Carcinogen	High	Inhalation	Work clothing or coveralls, hard hat, safety glasses, steel-toe boots. Respiratory protection for specific dust generating operations.	Maintain batch plant dust collection systems. Use material handling practices to minimize dust generation.
	Inorganic Arsenic	Carcinogen Nephrotoxin Hepatoxin	Low	Inhalation		
Rock/Sand Deliveries	Crystalline Silica	Suspect Carcinogen	Mod	Inhalation	Work clothing or coveralls, hard hat, safety glasses, steel-toe boots.	Wet process when deliveries are made to the MAP.
	Inorganic Arsenic	Carcinogen Nephrotoxin Hepatoxin	Low	Inhalation		
Drill Crew	Crystalline Silica	Suspect Carcinogen	Mod	Inhalation	Work clothing or coveralls, hard hat, safety glasses, steel-toe boots. Respiratory protection for grouting activities.	Wet process. Incidental exposure may occur from vehicle dust generation.
	Inorganic Arsenic	Carcinogen Nephrotoxin Hepatoxin	Low	Inhalation		
Hydroseed Crew	Crystalline Silica	Suspect Carcinogen	Low.	Inhalation	Work clothing or coveralls, hard hat, safety glasses, steel-toe boots.	Incidental exposure may occur from vehicle dust generation.
	Inorganic Arsenic	Carcinogen Nephrotoxin Hepatoxin	Low	Inhalation		
Ash Staging and Stockpiling Activities	Crystalline Silica	Carcinogen	Mod	Inhalation	Work clothing or coveralls, hard hat, safety glasses, steel-toe boots.	Use water trucks for primary dust control. Speed control of individual drivers.
	Inorganic Arsenic	Carcinogen Nephrotoxin Hepatoxin	Mod	Inhalation		

Process or Task	Chemical	Hazard	Hazard Level	Exposure Route	Identify Initial PPE	Comments, Unusual Issues
Equipment Maintenance and Repair	Crystalline Silica	Suspect Carcinogen	Mod.	Inhalation	Work clothing or coveralls, hard hat, safety glasses, steel-toe boots.	Incidental exposure to dust on equipment.
	Inorganic Arsenic	Carcinogen Nephrotoxin Hepatoxin	Low	Inhalation		
Process Management and Oversight	Crystalline Silica	Suspect Carcinogen	Low	Inhalation	Work clothing or coveralls, hard hat, safety glasses, steel-toe boots.	Incidental exposures possible.
	Inorganic Arsenic	Carcinogen Nephrotoxin Hepatoxin	Low	Inhalation		

Notes:

Hazard: Flammable (F), Combustible (C), Explosive (E), Reactive (R), Oxidizer (O), Corrosive (Corro), Radioactive (Radio), Primary or Secondary Irritant (I), Simple or Chemical Asphyxiants (Asphy), Anesthetic (Anes), Narcotic (Narco), Hepatotoxic or Nephrotoxic or Neurotoxin Systemic Poison (P), Sensitizer (Sens), Carcinogen (Carc), Mutagen (Muta), Teratogen (Terato)

Hazard Level: Low: ≤10% PEL, TLV, STEL, ceiling, peak, LEL
Moderate (Mod): >10% and < 100% PEL, TLV, STEL, ceiling, peak, LEL
High: ≥100% PEL, TLV, STEL, ceiling, peak, LEL. Note: Preplanning, management approval, and monitoring required for all IDLH tasks.

Exposure Route: Inhalation (Inh), Ingestion (Ing), Skin Absorption (Abs), Skin or Eye Contact (Con).

Personal Protective Equipment (PPE): Identify the specific PPE to be donned based on chemicals and chemical concentrations expected.

IDHL = immediately dangerous to life and health
LEL = lower explosive limit
PEL = permissible exposure limit
STEL = short term exposure limit
TLV = threshold limit value

APPENDIX C
SITE-SPECIFIC RESPIRATORY PROTECTION PLAN

APPENDIX C

SITE-SPECIFIC RESPIRATORY PROTECTION PROGRAM

SITE WIDE SAFETY AND HEALTH PLAN

For the

TVA KINGSTON FOSSIL PLANT

ASH RELEASE RESPONSE

SITE-SPECIFIC RESPIRATORY PROTECTION PROGRAM

This Site-specific Respiratory Protection Program has been developed to define site-specific procedures for respirator use at this site.

This program establishes acceptable HSE standards and procedures to be used when respiratory protection is required.

This United States Respiratory Protection Program has been developed in accordance with the provisions of 29 CFR 1910.134 and 29 CFR 1926.103.

Program Administrator: Sean Healey, CIH, CSP

Site HSE Supervisor: Tom Bock

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ATTACHMENT TABLES

1.0 PROGRAM ADMINISTRATION

The Program Administrator is responsible for the overall administration of this program and for required evaluations of the program's effectiveness.

The Program Administrator has designated the Site HSE Supervisor to assist with administration of the program and evaluation of the program's effectiveness.

Program components include:

- Program administration
- Medical evaluations of employees required to use respirators
- Procedures for selecting respirators for use in the workplace
- Fit testing procedures for tight-fitting respirators
- Procedures for proper use of respirators in routine and reasonable foreseeable emergency situations
- Training of respirator wearers in the respiratory hazards to which they are potentially exposed during routine and emergency situations
- Procedures and schedules for cleaning, disinfecting, storing, inspecting, repairing, discarding, and maintaining respirators
- Procedures to verify adequate air quality, quantity, and flow of breathing air for atmosphere-supplying respirators
- Procedures for regularly evaluating the effectiveness of the program

Regular program effectiveness observations should be documented through the use of the Respiratory Protection Program Checklist (Attachment C-3). Safety Observation Reports (SOR) and Safety Evaluation Reports (SER) can also be used to document program effectiveness.

The Site Supervisor, in conjunction with the Site HSE Supervisor, shall ensure that noted deficiencies are corrected as soon as possible.

2.0 MEDICAL EVALUATION

A medical evaluation will be completed to determine the worker's ability to use a respirator, before the respirator wearer is fit tested or required to use the respirator in the workplace.

Based on the findings of the medical evaluation, a medical examination may also be required.

2.1. MEDICAL EVALUATION PROCEDURES

A Physician or Other Licensed Health Care Professional (PLHCP) performs all respirator user medical evaluations. Each respirator wearer shall complete the Medical Questionnaire for Respirator Users (Attachment C-1), which is forwarded to their company physician for a written determination of the worker's ability to use the selected respirator, under the defined working conditions.

All respirator users will complete the Medical Questionnaire for Respirator Users (Attachment C-1).

If a pre-employment or annual physical is required and conducted, it may be used to meet the requirements of this section. If it includes the same information as the Medical Questionnaire for Respirator Users (Attachment C-1).

The medical questionnaire and examinations are administered confidentially during the respirator wearer's normal work hours or at a time and place convenient to the worker. The medical questionnaire is also administered in a manner that ensures the respirator wearer understands its content.

The respirator wearer is also provided an opportunity to discuss the questionnaire and examination results with the PLHCP.

Any worker who refuses to be medically evaluated for respirator use will not be allowed to use a respirator.

2.2. MEDICAL EXAMINATIONS

A medical examination is provided for any worker who gives a positive response to any of questions 1 through 8 in Section 2 of the Medical Questionnaire for Respirator Users (Attachment C-1) or whose initial medical examination demonstrates the need for a follow-up medical examination.

The medical examination shall include any medical tests, consultations, or diagnostic procedures that the PLHCP deems necessary to make final determination on the respirator wearer's ability to use a respirator.

2.3. SUPPLEMENTAL INFORMATION FOR THE PLHCP

Supplemental information concerning the specific type(s) of respirator to be used and the anticipated working conditions is provided to the PLHCP, with each Medical Questionnaire for Respirator Users (Attachment C-1) before the PLHCP makes a recommendation concerning a worker's ability to use a respirator.

2.4. MEDICAL RECOMMENDATION

Following the evaluation and/or examination, a written recommendation regarding the worker's ability to use the respirator must be provided by the PLHCP. The recommendation shall provide the following information:

- Any limitations on respirator use related to the medical condition of the worker or to the workplace conditions in which the respirator will be used, including whether or not the worker is medically able to use the respirator;
- The need, if any, for follow-up medical evaluations; and
- A statement that the PLHCP has provided the worker with a copy of the PLHCP's written recommendation.

For negative pressure respirator work, if the PLHCP finds a medical condition that may place the worker's health at increased risk, a Powered Air-Purifying Respirator (PAPR) can be provided if the PLHCP determines that the worker can use the PAPR.

If a worker is wearing a PAPR because of medical restrictions and if a subsequent medical evaluation finds that the worker is medically able to use a negative pressure respirator, then there is no longer a requirement to provide a PAPR.

3.0 ADDITIONAL MEDICAL EVALUATIONS AND/OR EXAMINATIONS

An additional medical evaluation and/or examination shall be conducted if:

- A worker reports medical signs or symptoms that are related to ability to use a respirator;
- A PLHCP, supervisor, Site HSE Supervisor, or the Respirator Program Administrator determines that a worker needs to be reevaluated;
- Information from the respiratory protection program, including observations made during fit testing and program evaluation, indicates a need for worker reevaluation; or
- A change occurs in workplace conditions, e.g., physical work effort, protective clothing, temperature, that may result in a substantial increase in the physiological burden placed on a worker.

4.0 RESPIRATOR SELECTION

This section presents the types of respirators available onsite and the criteria and procedure to be used to determine respiratory protection needed for specific tasks.

4.1. CRITERIA FOR RESPIRATOR SELECTION

The respirator type that is selected for each work scenario shall be appropriate for the chemical state and physical form of the contaminant. The respirator type is to be chosen using the selection logic presented in Attachment C-4. The parameters used making the selection are to be documented on Form 4-1, Respirator Selection Worksheet, or equivalent.

For each type of task for which respiratory protection is required, the selection sequence in Attachment C-4 shall be addressed. Task examples include permit-required confined space entry, first line breaks, process valve maintenance activities, painting, cleaning, or degreasing with solvents, etc.

For routine tasks, where conditions or hazards do not change, a single respiratory hazard selection evaluation is generally sufficient. If hazards, work sequences, or conditions change, the respirator selection criteria must be re-evaluated.

4.2. PARTICULATE EXPOSURE RESPIRATOR SELECTION

For particulate exposures, the particulate cartridge Types N, R, and P refer to standard performance designations established by the National Institute for Occupational Safety and Health (NIOSH).

- "N" refers to no oil exposure and 95%, 99%, or 100% (99.97%) filter efficiency.
- "R" refers to some oil up to eight hours and 95%, 99%, or 100% (99.97%) filter efficiency.
- "P" cartridge types can be used with oil exposure with no time restriction and 95%, 99%, or 100% (99.97%) filter efficiency. Individual manufactures may have different designations. To aid in decision-making on the appropriate type of respirator, individual manufacturer literature will also be used.

4.3. ASSIGNED PROTECTION FACTORS

Assigned Protection Factors (APF) as specified by the Occupational Safety and Health Administration (OSHA) and NIOSH are presented in Tables 1 through 3 in Attachment C-4.

The lower of the two factors for each respirator and contaminant type shall be used in conjunction with exposure limits and workplace concentrations to assess the appropriateness of the respirator.

Fit factors determined for an individual by quantitative fit testing or other methods are not to be substituted for the APF provided in the tables. The fit factor determined through fit testing must be greater than the APF; otherwise the respirator is not to be used.

4.4. FILTERING FACEPIECE RESPIRATOR

Filtering facepiece respirators (dust mask) are a class of air-purifying half-mask respirator. The APF of the filtering facepiece respirators are equal to that for the air-purifying half-mask

respirator. Filtering facepiece respirators are not to be used for contaminants with substance-specific standards (as listed in 29 CFR 1910.1001-1450, Subpart Z) or to protect against class A-1 carcinogens (as listed in American Conference of Governmental Hygienists Threshold Limit Value [TLV] and Biological Exposure Indices [BEI], 2006). This respirator provides protection against low levels of certain dusts and/or fumes, but does not supply oxygen, and shall not be used in an oxygen deficient atmosphere. It is not to be used in any atmosphere that is immediately dangerous to life or health.

All requirements that apply to Air-Purifying Respirators (APR) apply to filtering facepiece respirators when used for protection against contaminants with workplace concentrations greater than the respective action levels.

4.5. CARTRIDGE CHANGE SCHEDULE

At this time it is not expected that cartridges will be used on this site. The most likely item will be the P-100 filter. These filters can be used until the breathing resistance increases.

If task are identified which requires cartridges, change-out schedules will be established accordingly.

Form 4-1 - Respirator Selection Worksheet–Activities of Highest Exposure Potential

Task Description	Potential IDLH (Y/N)	Major Contaminant (separation line for each)	Exposure Limit (e.g., FEL Limits & Units)	Estimated Concentration & Units	Type of Respirator	Maximum Use Concentration	Cartridge Change Schedule
Staging and Stockpiling Activities (“Ball Field”)	N	Crystalline Silica	0.050 mg/m^3	< PEL	Air purifying, full facepiece	2.5 mg/m^3	As required based on breathing resistance
Railcar Prep and Loading	N	Crystalline Silica	0.050 mg/m^3	< PEL	Air purifying, full facepiece	2.5 mg/m^3	As required based on breathing resistance

5.0 IMMEDIATELY DANGEROUS TO LIFE OR HEALTH ATMOSPHERES

5.1. WORKER EXPOSURE

Worker exposure to any of the following Immediately Dangerous to Life or Health (IDLH) task conditions shall be avoided.

- Oxygen concentrations less than 19.5% or greater than 23.5%, or
- Atmospheres greater than 1% of the Lower Explosive Limit, or
- Atmospheres that are potentially IDLH, or
- Unprotected exposure to known human carcinogens, mutagens, or teratogens, or
- Unprotected exposure to known chemical sensitizers.

When work in these environments seems to be absolutely necessary, the Project Manager shall appeal to the appropriate Senior Operations Manager and Program HSE Manager for written approval to proceed and specific safe work procedures.

For tasks for which there is the *potential* for IDLH atmospheres, the respirator must be a full facepiece supplied-air respirator in positive pressure mode and 5 minute (minimum) escape cylinder.

Examples of jobs that have the *potential* to become IDLH:

- Breaking into flare lines,
- Initial opening of all H2S or CO equipment vessels and lines,
- Confined space entry work where inert gas (e.g., nitrogen purge), may be present, or
- Working in certain process or sanitary sewers.

In *potential* IDLH atmospheres, ongoing air monitoring shall be conducted to verify contaminant concentrations and to detect changes.

For work in atmosphere with the *potential* for IDLH conditions, trained rescue standby person(s) located outside the *potential* IDLH area are posted and equipped with an Self-Contained Breathing Apparatus (SCBA) or supplied-air respirator on separate supply. This includes work in confined spaces that require supplied-air respiratory protection.

Standby persons will be equipped with:

- Continuous-flow or pressure-demand SCBAs or a continuous flow or pressure-demand, supplied-air respirator with a 5minute (minimum) escape air cylinder and
- Appropriate retrieval equipment (harnesses, wristlets, anklets) for removing an employee, who enters the hazardous atmosphere.

Retrieval equipment must be used unless it would increase the overall risk of rescue. Situations may exist in which retrieval lines would pose an entanglement problem, especially if airlines and/or electrical cords are present.

Verify that visual or signal line communication is maintained between personnel in the *potential* IDLH atmosphere and personnel located outside the *potential* IDLH atmosphere.

6.0 FIT TESTING REQUIREMENTS

Respirator fit testing is performed in accordance with the fit test protocols and procedures described below.

6.1. GENERAL FIT TEST PROTOCOLS

The Program Administrator will designate qualified persons to conduct qualitative and/or quantitative fit tests.

The following fit testing requirements will be met:

- Each respirator wearer will be fit-tested on each, specific (model, size) respirator worn prior to initial use and annually thereafter.
- Spectacles (glasses), goggles, face-shields, or welding helmets will be worn in a manner that does not interfere with the facepiece seal of the respirator.
- Contact lenses (soft and gas permeable only) may be worn with a full-facepiece respirator. However, some clients have policies, which prohibit their use on their sites.
- Respirator wearers shall be clean-shaven. Facial hair shall not interfere with the sealing surface of the facepiece and the face or interfere with valve function.
- User seal checks are performed each time the respirator is donned.
- Fit tests shall be documented and retained until the next fit test is administered.
- Fit test Form 6-1, Qualitative Respirator Fit-Test Record, and Form 6-2, Quantitative Respirator Fit-Test Record, may be used to document the fit test.

The respirator wearer shall be allowed to pick the most acceptable respirator from a sufficient number of respirator models and sizes so that the respirator is acceptable to, and correctly fits, the user.

Prior to the selection process, the respirator wearer shall be shown how to don a respirator, how it should be positioned on the face, how to set strap tension, and how to determine an acceptable fit. A mirror will be available to assist the respirator wearer in evaluating the fit and positioning of the respirator. This instruction does not constitute the respirator wearer's formal training on respirator use, because it is only a review.

Respirator wearers shall be informed that they are being asked to select the respirator that provides the most acceptable fit.

The respirator wearer shall be instructed to hold each chosen facepiece up to the face and eliminate those that obviously do not give an acceptable fit. The more acceptable face-pieces are noted in case the one selected proves unacceptable.

The most comfortable facepiece is donned and worn at least 5 minutes to assess comfort. If the respirator wearer is not familiar with using a particular respirator, then he/she shall be directed to don the facepiece several times and to adjust the straps each time to become adept at setting proper tension on the straps.

Assessment of comfort shall include a review of the following points with the respirator wearer:

- Position of the respirator on the nose

- Room for eye protection
- Room to talk
- Position of respirator on face and cheeks

The following criteria shall be used to help determine the respirator fit:

- Chin properly placed
- Adequate strap tension, not overly tightened
- Fit across nose bridge
- Respirator of proper size to span distance from nose to chin
- Tendency of respirator to slip
- Self-observation in mirror to evaluate fit and respirator position

The respirator wearer shall conduct negative and positive pressure user seal checks each time the respirator is donned. Before conducting the negative and positive pressure user seal checks, the respirator wearer shall be told to seat the respirator on the face by moving the head from side-to-side and up and down slowly, while taking in a few slow deep breaths. Another facepiece shall be selected and retested if the respirator wearer fails the user seal check. The test shall not be conducted if there is any hair growth between the skin and the facepiece-sealing surface, such as stubble beard growth, beard, mustache, or sideburns, which cross the respirator-sealing surface. Any type of apparel or obstruction, which interferes with a satisfactory fit, shall be altered or removed.

If the respirator wearer exhibits difficulty in breathing during the tests, they shall be referred to a physician or other PLHCP for a medical re-evaluation to determine whether they can wear a respirator while performing their duties.

If the respirator wearer finds the fit of the respirator unacceptable, the respirator wearer shall be given the opportunity to select a different respirator and to be retested.

A tight-fitting PAPR can be fit tested by not turning the fan motor on.

Exercise Regimen: Prior to the commencement of the fit test, the respirator wearer shall be given a description of the fit test and the respirator wearer's responsibilities during the test procedure. The description of the process shall include a description of the test exercises that the respirator wearer will be performing. The respirator to be tested shall be worn for at least 5 minutes before the start of the fit test. The fit test shall be performed while the respirator wearer is wearing any applicable safety equipment that may be worn during actual respirator use, which could interfere with respirator fit.

Test Exercises: The following test exercises are performed for all fit testing methods prescribed in this procedure, except for the Control Negative Pressure (CNP) method. A separate fit testing exercise regimen is contained in the CNP protocol. The respirator wearer shall perform exercises, in the test environment, in the following manner.

6.1.1. Normal Breathing

In a normal standing position, without talking, the respirator wearer shall breathe normally.

6.1.2. Deep Breathing

In a normal standing position, the respirator wearer shall breathe slowly and deeply, taking caution so as not to hyperventilate.

6.1.3. Turning Head Side to Side

Standing in place, respirator wearer shall slowly turn his or her head from side to side between the extreme positions on each side. The head shall be held at each extreme momentarily so the respirator wearer can inhale at each side.

6.1.4. Moving Head Up and Down

Standing in place, the respirator wearer shall slowly move his or her head up and down. The respirator wearer shall be instructed to inhale in the up position (i.e., when looking toward the ceiling).

6.1.5. Talking

The respirator wearer shall talk out loud slowly and loud enough so as to be heard clearly by the test conductor. The respirator wearer can read from a prepared text such as the Rainbow Passage, count backward from 100, or recite a memorized poem or song.

6.1.6. Rainbow Passage

"When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the end of the rainbow."

6.1.7. Grimace

The respirator wearer shall grimace by smiling or frowning. (This applies only to Quantitative fit test (QNFT) requirements testing; it is not performed for Qualitative Fit Test [QLFT].)

6.1.8. Bending Over

The respirator wearers shall bend at the waist as if they were to touch their toes. Jogging in place shall be substituted for this exercise in those test environments, such as shroud type QLFT units, which do not permit bending over at the waist.

6.1.9. Normal Breathing

In a normal standing position, without talking, the respirator wearer shall breathe normally.

Each test exercise shall be performed for one minute except for the grimace exercise, which shall be performed for 15 seconds.

The respirator wearer shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of respirator shall be tried.

The respirator shall not be adjusted once the fit test exercises begin. Any adjustment voids the test, and the fit test must be repeated.

6.2. QUALITATIVE FIT TEST REQUIREMENTS

Negative-pressure air purifying respirators that will be worn in concentrations that are equal to or less than 10 times the Permissible Exposure Limit (PEL) may be fit tested using QLFT. (QLFT may only be used to fit negative pressure air purifying respirators that allow for a fit factor of 100 or less.) QLFT is not to be used to test for respirator fit if the site contaminants being protected against have a substance-specific standard or are class A1 carcinogens.

The person administering the QLFT will be able to prepare test solutions, calibrate equipment, and perform tests properly; recognize invalid tests; and ensure that test equipment is in proper working order.

The QLFT equipment is to be kept clean and well maintained so as to operate within the parameters for which it was designed.

6.3. QUANTITATIVE FIT TEST REQUIREMENTS

The following QNFT methods are acceptable:

- Quantitative fit testing using a non-hazardous test aerosol (such as corn oil, polyethylene glycol 400 [PEG 400], di-2-ethyl hexyl sebacate [DEHS], or sodium chloride) generated in a test chamber, and employing instrumentation to quantify the fit of the respirator. The QNFT is to be used for fit factors greater than or equal to 100 for tight fitting half-facepiece or greater or equal to 500 for tight fitting full facepiece respirators.
- If the site contaminants being protected against have a substance-specific standard or are class A1 carcinogens, it is required that the QNFT be used to test for respirator fit.
- QNFT using ambient aerosol as the test agent and appropriate instrumentation (condensation nuclei counter) to quantify the respirator fit.
- QNFT using controlled negative pressure and appropriate instrumentation to measure the volumetric leak rate of a facepiece to quantify the respirator fit.

QNFT Procedure:

- The person administering the QNFT will be able to calibrate equipment and perform tests properly, recognize invalid tests, calculate fit factors properly, and ensure that test equipment is in proper working order.
- The QNFT equipment must be kept clean, maintained, and calibrated according to the manufacturer’s instructions so as to operate at the parameters for which it was designed.
- Once a respirator has been modified or altered with a fit test probe, the facepiece will only be used for fit testing. When the facepiece is returned to the original NIOSH tested-and-certified configuration, the facepiece may be returned to service.

Form 6-1 - Qualitative Respirator Fit-Test Record

Name (print): _____ Respirator User ID Number: _____

Date: _____ Project: _____ Location: _____

Personal Use Conditions/Limitations

The following personal use conditions may affect the prospective respirator wearer's ability to obtain a proper face-seal, properly wear the respirator in the work environment, or may be prohibited by Jacobs *HSEP 13.9, Respiratory Protection Program*.

Check all that apply:

☐ None ☐ Beard/Facial Hair ☐ Dentures
☐ Prescription Eyeglasses ☐ Contact Lenses

Scars/Other: Explain: _____

Fit-Test Record

Respirator (Make, Model, and Size): _____

Qualitative Fit-Testing Agent:

☐ Bitrex™ (Denatonium Benzoate)
☐ Isoamyl Acetate (Banana Oil)
☐ Irritant Smoke (Stannic Chloride)
☐ Saccharin Solution

Fit-Test Results

☐ **PASS:** Fit-Test Agent Not Detected Inside the Facepiece by Respirator Wearer (Worker's signature is required.)

I have been fit-tested to assure proper respirator size, as well as facepiece to face seal. I have been instructed in the proper use, care and limitations of the respirator listed above. I have demonstrated the proper donning of this equipment according to training received.

☐ **FAIL:** Fit-Test Agent Detected Inside the Facepiece by Fit-Tested Worker.

Worker must not wear the respirator until a successful (passing) fit-test is obtained. This test is ended. Do not have this form signed.

Person Performing Fit Test: _____

Respirator Wearer's Signature: _____

Form 6-2 - Quantitative Respirator Fit-Test Record

Name (print): _____ Respirator User ID Number: _____

Date: _____ Project: _____ Location: _____

Personal Use Conditions/Limitations

The following personal use conditions may affect the prospective respirator wearer's ability to obtain a proper face-seal, properly wear the respirator in the work environment, or may be prohibited by Jacobs *HSEP 13.9, Respiratory Protection Program*.

Check all that apply:

☐ None ☐ Beard/Facial Hair ☐ Dentures
☐ Prescription Eyeglasses ☐ Contact Lenses

Scars/Other: Explain: _____

Fit-Test Record

Respirator (Make, Model and Size): _____

Quantitative Fit Testing

Ambient Aerosol Condensation Nuclei Counter (Portacount): ☐ Yes ☐ No

Controlled Negative Pressure: ☐ Yes ☐ No

Fit-Test Results

☐ **PASS:** I have been fit-tested to assure proper respirator size, as well as facepiece to face seal. I have been instructed in the proper use, care and limitations of the respirator listed above. I have demonstrated the proper donning of this equipment according to training received.

☐ **FAIL:** Worker must not wear the respirator until a successful (passing) fit-test is obtained. This test is ended. Do not have this form signed.

Person Performing Fit-Test: _____

Respirator Wearer's Signature: _____

7.0 PROPER RESPIRATOR USE

7.1. GENERAL REQUIREMENTS

All respirators, filters, cartridges, and components used at this site shall be certified by NIOSH and shall be worn in accordance with all manufacturers' instructions.

Respirators shall be used only for the purpose intended and shall not be modified in any way.

Tight-fitting facepiece respirators are not to be worn by workers, who have any condition that interferes with the face-to-facepiece seal or valve function (such as facial hair).

If a worker wears corrective glasses or goggles or other personal protective equipment, the Site HSE Supervisor shall ensure that such equipment is worn in a manner that does not interfere with the seal of the facepiece to the face of the user.

For all tight-fitting respirators, a user seal check is conducted each time the respirator is donned. Tight-fitting respirators that cannot be seal-checked are not acceptable for use.

Site management shall ensure appropriate surveillance of work area conditions and degree of worker exposure or stress. When there is a change in work area conditions or degree of worker exposure or stress that may affect respirator effectiveness, the Site HSE Supervisor shall reevaluate the continued effectiveness of the respirator. The worker's Supervisor will ensure that workers can leave the area:

- To wash their faces and respirator face-pieces as necessary to prevent eye or skin irritation associated with respirator use;
- If they detect vapor or gas breakthrough, changes in breathing resistance or leakage of the facepiece; or
- To replace the respirator or the filter, cartridge, or canister elements, when vapor or gas breakthrough is detected, changes in breathing resistance occurs, or when there is leakage of the facepiece. The respirator will be replaced or repaired before allowing the worker to return to the work area.

Prior to use, the following items are visually inspected, as appropriate:

- Tightness of connections
- Condition of facepiece
- Head straps
- Valves and connecting tube
- Cartridge/canisters
- Elastic parts (for pliability)
- Respirator function

7.2. PROCEDURES FOR USING THE RESPIRATOR

Inspect the respirator before use to verify that all parts are present and in good working order.

Follow the manufacturer's instructions when donning and adjusting the respirator straps. Some disposable single-use respirators utilize elastic straps and adjustable buckles.

If detection of vapor inside the facepiece (by smell or otherwise) or difficult breathing is experienced, workers are trained to leave the area immediately, report the condition to their supervisor, and provide the respirator to the Site HSE Supervisor for inspection.

7.3. PARTICULATE FILTER RESPIRATOR

Particulate Filter Respirators provide protection against low levels of certain dusts and/or fumes (Attachment C-4, Table 1). This respirator does not supply oxygen and shall not be used in an oxygen deficient atmosphere. These respirators cannot be used in any atmosphere that is immediately dangerous to life or health.

7.4. CHEMICAL CARTRIDGE RESPIRATOR/AIR PURIFYING RESPIRATOR (NON-IDLH)

Limitations – This respirator does not supply oxygen and shall not be used in an oxygen deficient atmosphere. These respirators cannot be used in any atmosphere that is immediately dangerous to life or health. Workers are trained to leave the area immediately if an odor is detected inside the respirator.

These respirators provide protection against low levels of certain gases and vapors. Respirator canisters or cartridges shall be specifically selected for concentrations of gases and/or vapors that may be encountered (Attachment C-4, Table 2).

APR shall not be used for rescue or emergency work.

Cartridges are replaced in accordance with cartridge change schedule stated in the Respirator Selection Worksheet, Form 4-1, or if workers can smell or otherwise detect vapors inside the facepiece, or if difficulty breathing is experienced, the cartridges will be changed.

7.5. AIRLINE RESPIRATOR

Limitations – An airline respirator shall not be used in any atmosphere that is immediately dangerous to life or health, including an oxygen deficient atmosphere, unless equipped with a self-contained escape (5, 15, or 30 minute) air cylinder.

Procedures for using airline respirators:

- Workers shall inspect all equipment before each use to assure all parts are present and in good working order.
- If using an escape air cylinder, user will ensure that air supply is of sufficient capacity (5, 15, or 30 minute) to permit safe escape from work area.
- The worker will then follow the manufacturer's instruction to select correct length of airline hose.
- Connect hose to regulator and air supply. (The maximum air pressure at the point of attachment of hose to air supply is determined by manufacturer's instructions.)
- The worker will then don the respirator and adjust to obtain a snug but comfortable fit and perform a user seal check.
- Next the worker shall connect the respirator to the regulator and adjust the airflow in the facepiece.
- In case of respirator malfunction, workers are trained to leave the area immediately, report the condition to their supervisor.

Procedures for using airline respirators with compressors:

- If using a compressor, the worker and their supervisor, or the Site HSE Supervisor, will verify that the compressor's air intake is in an uncontaminated area. Air-purifying filters and/or sorbents shall be used if necessary to assure Grade D quality air. (Refer to Section 7.7, Breathing Air Quality.)
- Record on a tag, which will be maintained at the compressor, the most recent filter change date and the signature of the person authorized to perform the filter change.
- If the compressor is oil-lubricated, it shall be equipped with high temperature and carbon monoxide alarms that are both audible and visual.
- For compressors that are not oil-lubricated, ensure that carbon monoxide levels in the breathing air do not exceed 10 parts per million (ppm).
- In-line air purifying sorbent filters with water and oil traps shall be installed between the compressor and user(s).

7.6. SELF-CONTAINED BREATHING APPARATUS

SCBAs are provided primarily for use in emergency response when spills, leaks, or other circumstances present respiratory hazards.

Grade D breathing air quality cylinders shall be stored and maintained in a fully charged state and shall be recharged if the pressure falls to 90% of the manufacturer's recommended pressure level.

Limitations – Air supply is generally rated for 30 minutes. Heavy exertion and excitement will increase the breathing rate and deplete the air supply sooner. Workers are trained to leave the area when the alarm indicates low air supply.

Procedures for using the equipment:

- Workers shall inspect the unit before each use and ensure a sufficient air supply (at or above 90%) and that the regulator and low pressure warning devices function properly.
- The user will then open the cylinder air supply valve.
- Next, don unit so cylinder is on the user's back with the valve pointing down and engage and tighten the harness.
- Then the worker will don the respirator and adjust to obtain a snug but comfortable fit and perform a user seal check.
- The worker will then connect the facepiece hose to the regulator.
- Workers are trained to use the bypass only in the event of regulator failure and to leave area immediately, whenever the low-pressure alarm sounds.

Care and maintenance of SCBAs is performed by a qualified person.

Bottles are refilled only with breathing air that meets the specifications for Grade D Breathing Air in Compressed Gas Association Commodity Specification G-7.1-1989. Grade D has an oxygen content of 19.5 to 23.5%, condensed hydrocarbon of 5 milligram per cubic meter (mg/m^3) or less, carbon monoxide of 10 ppm or less, carbon dioxide of 1,000 ppm or less, and lack of noticeable odor.

SCBA emergency use respirators are kept accessible to the work area and stored in compartments or in covers that are clearly marked as containing emergency respirators.

All respirators maintained for use in emergency situations shall be inspected at least monthly and in accordance with the manufacturer's recommendations, and shall be checked for proper function before and after each use.

Emergency escape-only respirators shall be inspected before being carried into the workplace for use.

For respirators maintained for emergency use, the Site HSE Supervisor or Supervisor will assure the presence of a tag or label containing the date the inspection was performed, the name (or signature) of the person who made the inspection, the findings, required remedial action, and a serial number or other means of identifying the inspected respirator. This information is provided on a tag or label that is attached to the storage compartment for the respirator, is kept with the respirator, or is included in inspection reports stored as paper or electronic files. This information shall be maintained until replaced following a subsequent inspection.

7.7. BREATHING AIR QUALITY

Air supply shall be free of harmful quantities of contaminants, and shall meet specification for Grade D Breathing Air as described in the Compressed Gas Association publication G-7 1988, Compressed Air for Human Respiration.

Compressed oxygen shall not be used in supplied-air respirators or in open circuit self-contained breathing apparatus.

Breathing air may be supplied to respirators from cylinders or air compressors. Cylinders must have a dated label or sticker affixed to them indicating "Certified Breathing Air" or equivalent.

Workers are instructed to stop work immediately if they experience difficulty in breathing, smell any unusual odors, or experience an ill feeling such as a headache or upset stomach, etc., and report the situation to their Supervisor.

7.8. USER SEAL CHECKS

Workers shall test the seal of their respirator to their face prior to using by performing both negative-pressure and positive-pressure user seal checks according to the following guidelines.

Negative-pressure seal check procedure:

- Close inlet openings of the respirator, canister(s), cartridge(s), or filter(s) by covering with palm of hands, by replacing the inlet seal on the canister(s), or by squeezing a breathing tube or blocking its inlet so as not to allow the passage of air.
- Inhale gently and hold breath for ten seconds.
- Verify that a satisfactory fit has been achieved by assuring that the facepiece collapses slightly and no inward leakage of air into facepiece is detected.
- If inward leakage is detected the respirator wearer will reposition the facepiece and/or straps and repeat this sequence until a satisfactory fit check is obtained.

Positive-pressure seal check procedure:

- Close exhalation valve or breathing tube or both.
- Exhale gently.
- Verify that a satisfactory fit has been achieved by assuring that a slight buildup of positive pressure is generated inside the facepiece without detection of outward leakage between the sealing surface and the face.
- If outward leakage is detected, the respirator wearer will reposition the facepiece and/or straps and repeat this sequence until a satisfactory seal check is obtained.

8.0 TRAINING

Training is provided to all workers who are required to use respirators, prior to them using the respirator in the workplace.

8.1. TRAINING CONTENT

The training is comprehensive and is to be conducted on an annual basis or more often, if necessary. At a minimum, the training includes the following topics:

- The nature of the hazard(s), including physical properties, odor characteristics, physiological effects on the body, and known concentration levels of toxic material or airborne radioactive level;
- How improper fit, usage, or maintenance can compromise the protective effect of the respirator;
- The physical characteristics, functional capabilities, and limitations of various types of respirators;
- How to use the respirator in emergency situations;
- How to inspect, don, doff, use, and check the seal of the respirator;
- Procedures for maintenance and storage of the respirator; and
- How to recognize the medical signs and symptoms that may limit or prevent the effective use of respirators.

8.2. TRAINING DOCUMENTATION

Training documentation is maintained for all workers who are assigned work that requires the use of a respirator. (Form 8-1 may be used to document training.)

Re-training is administered annually and when the following situations occur:

- Changes in the workplace or the type of respirator render previous training obsolete;
- Inadequacies in the respirator wearer's knowledge or use of the respirator indicate that the worker has not retained the requisite understanding or skill; or
- Situations arise in which retraining appears necessary to ensure safe respirator use.

Form 8-1 - Air-Supplied Respirator Training

Name (print): _____ Respirator User ID Number: _____

Date: _____ Project: _____ Location: _____

I Have Been Trained and Understand	APR (√ as applicable)	SAR (√ as applicable)
The workplace hazards		
Respirator capabilities and limitations		
How improper fit, usage, and maintenance can compromise respirator		
How to use the respirator		
How to use the respirator in an emergency		
How to don, doff, and seal check the respirator		
Cartridge change schedule (APR only)		
How to maintain and store the respirator		
The medical signs and symptoms that may limit effective use of respirator		

APR = Air-Purifying Respirator **SAR** = Supplied Air Respirator

Respirator Description	
Type (APR/SAR)	
Manufacturer	
Model	
Size	
Type (APR/SAR)	
Manufacturer	
Model	
Size	
Type (APR/SAR)	
Manufacturer	
Model	
Size	
Type (APR/SAR)	
Manufacturer	
Model	
Size	

Person Performing Training: _____

Respirator Wearer's Signature: _____

9.0 RESPIRATOR MAINTENANCE

9.1. CLEANING AND SANITIZATION

The following provides guidelines for cleaning and sanitizing respirators. Recommendations provided by the equipment manufacturer may be used provided the procedures are as effective as those listed here.

Respirators will be cleaned and sanitized before being issued. Commercial wipes may also be used by the wearer to clean his/her respirator between uses during the work shift.

Cleaning, disinfecting, and storage of respirators shall be performed as follows:

- Remove filters, cartridges, or canisters. Disassemble facepiece by removing speaking diaphragms, demand- and pressure-demand valve assemblies, hoses, or any components recommended by the manufacturer. Discard or repair any defective parts.
- Wash components in warm (110 ºF [43 ºC] maximum) water with a mild detergent or with a cleaner recommended by the manufacturer. A stiff bristle (not wire) brush may be used to facilitate the removal of dirt.
- Rinse components thoroughly in clean, warm (110 ºF [43 ºC] maximum), preferably running water. Drain.
- When the cleaner used does not contain a disinfecting agent, respirator components will be immersed for 2 minutes in one of the following:
  - Hypochlorite solution (50 ppm of chlorine) made by adding approximately one milliliter of laundry bleach to one liter of water at 110 ºF (43 ºC]);
  - Aqueous solution of iodine (50 ppm iodine) made by adding approximately 0.8 milliliters of tincture of iodine (6 to 8 grams ammonium and/or potassium iodide/100 cc of 45% alcohol) to one liter of water at 110 ºF (43 ºC); or
  - Other commercially available cleansers of equivalent disinfectant quality when used as directed, as recommended or approved by the respirator manufacturer.
- Rinse components thoroughly in clean, warm (110 ºF [43 ºC] maximum), preferably running water. Drain. The importance of thorough rinsing cannot be overemphasized. Detergents or disinfectants that dry on face-pieces may result in dermatitis. In addition, some disinfectants may cause deterioration of rubber or corrosion of metal parts if not completely removed.
- Components are hand-dried with a clean lint-free cloth or air-dried.
- Reassemble facepiece, replacing filters, cartridges, and canisters where necessary.
- Test the respirator to verify that all components work properly.

Chemical cartridges and mechanical filters shall be discarded and replaced as defined in Section 4.0 of this program.

9.2. INSPECTING AND STORING

Respirators are stored to protect them from damage, contamination, dust, sunlight, extreme temperatures, excessive moisture, and damaging chemicals, and they shall be packed or stored to prevent deformation of the facepiece and exhalation valve.

Inspection and replacement of respirator parts shall be performed according to the following:

- All respirators must be inspected by the wearer prior to each use.

- Storage shall be in a convenient, clean, and sanitary location. At a minimum, respirators shall be stored in a protective bag.
- SCBAs shall be inspected monthly and after each use by a qualified person. The wearer shall self-inspect the SCBA prior to each use. SCBA inspections shall include checking cylinder pressure and units shall be brought to the rated pressure. Units shall be recharged after each use.
- Airline respirators shall receive a functional check before and after each use.
- Replacement of parts shall be made only with those specifically designed for the respiratory device used. All maintenance and repair shall be performed only by appropriately trained persons and shall be documented. For some respiratory equipment's maintenance and repairs (e.g., SCBAs, escape units), the manufacturer will provide training certification for the person doing the maintenance or repairs.

9.3. REPAIRING, DISCARDING, AND MAINTAINING RESPIRATORS

Defective equipment shall be immediately removed from service and repaired prior to use. Repairs shall be made only by an appropriately trained, designated qualified person, and only with the manufacturer's approved replacement parts.

Defective equipment not repaired immediately shall be tagged:

Danger — Do Not Use – Defective

Specific defect(s) will be listed on the tag.

Users may self-perform repairs only if they have been appropriately trained and approved parts are available. Reducing and admission valves, regulators, and alarms for air-supplied respirators shall only be repaired by the manufacturer or a certified technician trained by the manufacturer.

10.0 VOLUNTARY RESPIRATOR USE REQUIREMENTS

Workers may voluntarily use a respirator with the approval of their Supervisor. The Site HSE Supervisor and Supervisor will evaluate requests for voluntary respirator use to determine if the worker can perform the activities safely and respirator use will not in itself create a hazard.

If it is determined that voluntary use will be permitted, a copy of Attachment C-2 of this program shall be provided to the worker.

A medical evaluation and PLHCP's written determination will also be provided for all workers who are permitted to use respirators voluntarily, prior to their use of a respirator. (See Section 2.0, Medical Evaluation).

Additionally, all requirements for cleaning, maintaining and storage of respirators contained in this program shall also apply to workers permitted to use respirators voluntarily. (See Section 9.0, Respirator Maintenance.)

Respirators worn on a voluntary basis do not require fit testing.

11.0 RESPIRATOR PROGRAM EVALUATION

The effectiveness of this site-specific Respiratory Protection Program will be evaluated with routine observations and formal program evaluations.

11.1. ROUTINE OBSERVATIONS

The Site HSE Supervisor shall be responsible for conducting routine observations related to the effective selection, use, maintenance, storage and other aspects of this program. Observations shall be noted through the use of SORs or equivalent documented routine safety inspections. Noted deficiencies shall be corrected as soon as possible.

11.2. PROGRAM EVALUATIONS

Formal program evaluations shall be conducted on an annual basis and documented on Respiratory Protection Program Checklist (Attachment C-3). SORs and SERs can also be used to document program effectiveness.

Noted deficiencies are corrected as soon as possible.

11.3. CONTENT OF PROGRAM EVALUATIONS

Program evaluations shall conform to the following:

- Program administration
- Medical evaluations of employees required to use respirators
- Procedures for selecting respirators for use in the workplace
- Training of respirator wearers in the respiratory hazards to which they are potentially exposed during routine and emergency situations
- Initial and annual fit testing for tight-fitting respirators
- Procedures for proper use of respirators in routine and reasonable foreseeable emergency situations
- Procedures and schedules for cleaning, disinfecting, storing, inspecting, repairing, discarding, and maintaining respirators
- Procedures to verify adequate air quality, quantity, and flow of breathing air for atmosphere-supplying respirators
- Procedures for regularly evaluating the effectiveness of the program
- Voluntary use procedures
- Other applicable observations

ATTACHMENTS

Attachment C-1 OSHA Respirator Medical Evaluation Questionnaire

Attachment C-2 Employees Using Respirators When Not Required Under the Standard

Attachment C-3 Respiratory Protection Program Checklist

Attachment C-4 NIOSH Respirator Selection Logic Sequence - 2004

Attachment C-5 Definitions

ATTACHMENT C-1
OSHA RESPIRATOR MEDICAL EVALUATION QUESTIONNAIRE

TO THE EMPLOYER: Answers to questions in Section 1, and to question 9 in Section 2 of Part A, do not require a medical examination.

TO THE EMPLOYEE: Can you read: ☐ Yes ☐ No

Your employer must allow you to answer this questionnaire during normal working hours, or at a time and place that is convenient to you. To maintain your confidentiality, your employer or supervisor must not look at or review your answers, and your employer must tell you how to deliver or send this questionnaire to the health care professional who will review it.

PART A. SECTION 1. **(Mandatory)** The following information must be provided by every employee who has been selected to use any type of respirator. (Please Print)

Today's Date:_____ Location/Job #:_____

Your Name: _____ DEN/SSN:_____

Your Age (to nearest year): _____ Sex: ☐ Male ☐ Female

Your Height: _____ft. _____in. Your Weight: _____lbs.

Your Job Title: _____

A phone number where you can be reached by the health care professional who reviews this questionnaire.

(Include the area code):_____

The best time to reach you at this number: _____ AM / PM

Has your employer told you how to contact the health care professional who will review this questionnaire?

☐ Yes ☐ No

Check the type of respirator you will use (you can check more than one category):

☐ N, R, or P disposable respirator (filter mask, non-cartridge type only).

☐ Other type (for example, half- or full-face piece type, powered-air purifying, supplied air, self-contained breathing apparatus).

Have you ever worn a respirator? ☐ Yes ☐ No

If yes, what type(s)? _____

Have you ever failed a respirator examination or pulmonary function test? ☐ Yes ☐ No

If yes, why? _____

Have you ever been denied or turned down for the use of a respirator? ☐ Yes ☐ No

If yes, why? _____

PART A. SECTION 2. **(Mandatory)** Questions 1 through 9 below must be answered by every employee who has been selected to use any type of respirator.

Name: _____

1. Do you **currently** smoke tobacco, or have you smoked tobacco in the last month? If **YES**, how long have you smoked? _____ What do you smoke? ☐ Cigarettes ☐ Cigars ☐ Pipe tobacco How much do you smoke per day? _____ If **NO**, are you a former smoker? ☐ Yes ☐ No How long since you quit? _____ How many years did you smoke? _____ How much did you smoke per day? _____	☐ Yes ☐ No
2. Have you **ever** had any of the following conditions?	
A. Seizures (fits)	☐ Yes ☐ No
B. Diabetes (sugar disease)	☐ Yes ☐ No
C. Allergic reactions that interfere with your breathing	☐ Yes ☐ No
D. Claustrophobia (fear of closed-in places)	☐ Yes ☐ No
E. Trouble smelling odors	☐ Yes ☐ No
Explain all **YES** answers here (include dates and treatment): _____ _____ _____ _____	
3. Have you **ever** had any of the following pulmonary or lung problems?	
A. Asbestosis	☐ Yes ☐ No
B. Asthma	☐ Yes ☐ No
C. Chronic bronchitis	☐ Yes ☐ No
D Emphysema	☐ Yes ☐ No
E. Pneumonia	☐ Yes ☐ No
F Tuberculosis	☐ Yes ☐ No
G. Silicosis	☐ Yes ☐ No
H. Pneumothorax	☐ Yes ☐ No
I. Lung cancer	☐ Yes ☐ No
J. Broken ribs	☐ Yes ☐ No
K. Any chest injuries or surgeries	☐ Yes ☐ No
L. Any other lung problem that you have been told about	☐ Yes ☐ No
Explain all **YES** answers here (include dates and treatment): _____ _____ _____ _____	

4. Do you **currently** have any of the following symptoms of pulmonary or lung diseases?	
A. Shortness of breath	☐ Yes ☐ No
B. Shortness of breath when walking fast on level ground or walking up a slight hill or incline	☐ Yes ☐ No
C. Shortness of breath when walking with other people at an ordinary pace on level ground	☐ Yes ☐ No
D. Have to stop for a breath when walking at your own pace on level ground	☐ Yes ☐ No
E. Shortness of breath when washing or dressing yourself	☐ Yes ☐ No
F. Shortness of breath that interferes with your job	☐ Yes ☐ No
G. Coughing that produces phlegm (thick sputum)	☐ Yes ☐ No
H. Coughing that wakes you early in the morning	☐ Yes ☐ No
I. Coughing that occurs mostly when you are lying down	☐ Yes ☐ No
J. Coughing up blood in the last month	☐ Yes ☐ No
K. Wheezing	☐ Yes ☐ No
L. Wheezing that interferes with your job	☐ Yes ☐ No
M. Chest pain when you breathe deeply	☐ Yes ☐ No
N. Any other symptoms that you think may be related to lung problems	☐ Yes ☐ No
Explain all **YES** answers here (include dates and treatment): _____ _____ _____ _____	
5. Have you **ever** had any of the following cardiovascular or heart problems?	
A. Heart attack	☐ Yes ☐ No
B. Stroke	☐ Yes ☐ No
C. Angina	☐ Yes ☐ No
D. Heart failure	☐ Yes ☐ No
E. Swelling in your legs or feet (not caused by walking)	☐ Yes ☐ No
F. Heart arrhythmia (heart beating irregularly)	☐ Yes ☐ No
G. High blood pressure	☐ Yes ☐ No
H. Any other heart problem that you have been told about	☐ Yes ☐ No
Explain all **YES** answers here (include dates and treatment): _____ _____ _____ _____	

6. Have you **ever** had any of the following cardiovascular or heart symptoms? A. Frequent pain or tightness in your chest B. Pain or tightness in your chest during physical activity C. Pain or tightness in your chest that interferes with your job D. In the past 2 years, have you noticed your heart skipping or missing a beat E. Heartburn or indigestion that is not related to eating F. Any other symptoms that you think may be related to heart or circulation problems Explain all **YES** answers here (include dates and treatment): _____ _____ _____ _____	☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No
7. Do you **currently** take medication for any of the following problems? A. Breathing or lung problems B. Heart trouble C. Blood pressure D. Seizures (fits) If **YES**, list medications and dosages: _____ _____ _____ _____	☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No
8. If you have used a respirator, have you **ever** had any of the following problems? (If you have never used a respirator, check the box and go to question 9) ☐ A. Eye irritation B. Skin allergies or rashes C. Anxiety D. General weakness or fatigue E. Any other problem that interferes with you use of a respirator Explain all **YES** answers here (include dates and treatment): _____ _____ _____ _____	☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No
9. Would you like to talk to the health care professional that will review this questionnaire about your answers on this questionnaire?	☐ Yes ☐ No

Questions 10 to 15 below must be answered by every employee who has been selected to use either a full-facepiece respirator or a self-contained breathing apparatus (SCBA). For employees who have been selected to use other types of respirators, answering these questions is voluntary.

10.	Have you **ever** lost vision in either eye (temporarily or permanently)? Explain all **YES** answers here (include dates and treatment): _____ _____ _____ _____	☐ Yes ☐ No
11.	Do you **currently** have any of the following vision problems? A. Wear contact lenses B. Wear glasses C. Color blind D. Any other eye or vision problem Explain all **YES** answers here (include dates and treatment): _____ _____ _____ _____	 ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No
12.	Have you **ever** had an injury to your ears, including a broken eardrum? Explain all **YES** answers here (include dates and treatment): _____ _____ _____ _____	☐ Yes ☐ No
13.	Do you **currently** have any of the following hearing problems? A. Difficulty hearing B. Wear a hearing aid C. Any other hearing or ear problem Explain all **YES** answers here (include dates and treatment): _____ _____ _____ _____	 ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No

14.	Have you **ever** had a back injury? Explain all **YES** answers here (include dates and treatment): _____ _____ _____ _____	☐ Yes ☐ No
15.	Do you **currently** have any of the following musculo-skeletal problems?	
	A. Weakness in any part of your arms, hands, legs, or feet	
	B. Back pain	☐ Yes ☐ No
	C. Difficulty fully moving your arms and legs	☐ Yes ☐ No
	D. Pain or stiffness when you lean forward or backward at the waist	☐ Yes ☐ No
	E. Difficulty fully moving your head up or down	☐ Yes ☐ No
	F. Difficulty fully moving your head side to side	☐ Yes ☐ No
	G. Difficulty bending at your knees	☐ Yes ☐ No
	H. Difficulty squatting to the ground	☐ Yes ☐ No
	I. Climbing a flight of stairs or a ladder carrying more than 25 pounds	☐ Yes ☐ No
	J. Any other muscle or skeletal problem that interferes with using a respirator	☐ Yes ☐ No
	Explain all **YES** answers here (include dates and treatment): _____ _____ _____ _____	

PART B: Discretionary Questions. Any of the following questions, and other questions not listed, may be added to the questionnaire at the discretion of the health care professional who will review the questionnaire.

1.	In your **present** job, are you working at high altitudes (over 5,000 feet) or in a place that that has lower than normal amounts of oxygen? If **YES**, do you have feelings of dizziness, shortness of breath, pounding in your chest, or other symptoms when you are working under these conditions? Explain below: _____ _____ _____ _____	☐ Yes ☐ No
2.	At work or at home, have you **ever** been exposed to hazardous solvents, hazardous airborne chemicals (e.g., gases, fumes, or dust), or have you come into skin contact with hazardous chemicals? If **YES**, name the chemicals if you know them: _____ _____ _____ _____	☐ Yes ☐ No
3.	Have you **ever** worked with any of the materials, or under any of the conditions, listed below: A. Asbestos B. Silica (e.g., in sandblasting) C. Tungsten / cobalt (e.g., grinding or welding this material) D. Beryllium E. Aluminum F. Coal (e.g., mining) G. Iron H. Tin I. Dusty environments J. Any other hazardous exposures If **YES**, describe these exposures: _____ _____ _____ _____	 ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No

4.	List any previous occupations: _____ _____ _____ _____	
5.	List your current and previous hobbies: _____ _____ _____ _____	
6.	List any second jobs or side businesses you have: _____ _____ _____ _____	
7.	Have you been in the military services? If **YES**, were you exposed to biological or chemical agents (either in training or combat): If **YES**, please list them in the space provided: _____ _____ _____ _____	☐ Yes ☐ No ☐ Yes ☐ No
8.	Have you ever worked on a HAZMAT team? If **YES**, please list them in the space provided: _____ _____ _____ _____	☐ Yes ☐ No
9.	Other than medications for breathing and lung problems, heart trouble, blood pressure, and seizures mentioned earlier in this questionnaire, are you taking any other medications for any reason (including over-the-counter medications)? If **YES**, please list them in the space provided: _____ _____ _____ _____	☐ Yes ☐ No

10.	Will you be using any of the following items with your respirator(s)? A. High Efficiency Particulate Air (HEPA) Filters B. Canisters (For example, gas masks) C. Cartridges	 ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No
11.	How often are you expected to use the respirator(s)? A. Escape only (no rescue) B. Emergency rescue only C. Less than 5 hours per week D. Less than 2 hours per day E. 2 to 4 hours per day F. Over 4 hours per day	 ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No
12.	During the period you are using the respirator(s), is your work effort: A. Light (less than 200 kilocalories [kcal] per hour) If **YES**, how long does this period last during the average shift: _____ hours _____ minutes *Examples of light work effort are sitting while writing, typing, drafting, or performing light assembly work; or standing while operating a drill press (1-3 lbs.) or controlling machines.* B. Moderate (200 to 350 kcal per hour) If **YES**, how long does this period last during the average shift: _____ hours _____ minutes *Examples of moderate work are sitting while nailing or filing; driving a truck or bus in urban traffic; standing while drilling, nailing, performing assembly work, or transferring a moderate load (about 35 lbs.) at trunk level; walking on a level surface about 2 mph or down a 5 degree grade about 3 mph; or pushing a wheelbarrow with a heavy load (about 100 lbs) on a level surface.* C. Heavy (above 350 kcal per hour) If **YES**, how long does this period last during the average shift: _____ hours _____ minutes *Examples of heavy work are lifting a heavy load (about 50 lbs) from the floor to your waist or shoulder; working on a loading dock; shoveling; standing while bricklaying or chipping castings; walking up an 8 degree grade about 2 mph; climbing stairs with a heavy load (about 50 lbs).*	 ☐ Yes ☐ No ☐ Yes ☐ No ☐ Yes ☐ No
13.	Will you be wearing protective clothing and/or equipment (other than the respirator) when you are using your respirator? If **YES**, please describe this protective clothing and/or equipment: _____ _____ _____ _____	☐ Yes ☐ No
14.	Will you be working under hot conditions (temperature of 77 ºF)?	☐ Yes ☐ No
15.	Will you be working under humid conditions?	☐ Yes ☐ No

16.	Describe the work you will be doing while you are using your respirator: _____ _____ _____ _____
17.	Describe any special or hazardous conditions you might encounter when you are using your respirator(s) (for example, confined spaces, life-threatening gases): _____ _____ _____ _____
18.	Provide the following information, if you know it, for each toxic substance that you will be exposed to when you are using your respirator(s): A. Name of the first toxic substance: _____ B. Estimated maximum exposure level per shift: _____ C. Duration of exposure per shift: _____ D. Name of the second toxic substance: _____ E. Estimated maximum exposure level per shift: _____ F. Duration of exposure per shift: _____ G. Name of the third toxic substance: _____ H. Estimated maximum exposure level per shift: _____ I. Duration of exposure per shift: _____ J. The name of any other toxic substances that you will be exposed to while using your respirator: _____ _____ _____ _____
19.	Describe any special responsibilities you will have while using your respirator(s) that may affect the safety and well-being of others (e.g., rescue, security): _____ _____ _____ _____
DATE: _____ SIGNATURE: _____	

ATTACHMENT C-2
EMPLOYEES USING RESPIRATORS WHEN NOT REQUIRED UNDER THE STANDARD

Respirators are an effective method of protection against designated hazards when properly selected and worn. Respirator use is encouraged, even when exposures are below the exposure limit, to provide an additional level of comfort and protection for workers. However, if a respirator is used improperly or not kept clean, the respirator itself can become a hazard to the worker.

Sometimes, workers may wear respirators to avoid exposures to hazards, even if the amount of hazardous substance does not exceed the limits set by OSHA or other applicable regulations or standards.

If your employer provides respirators for your voluntary use, or if you provide your own respirator, you need to take certain precautions to be sure that the respirator itself does not present a hazard.

You should do the following.

1. Read and follow all instructions provided by the manufacturer on use, maintenance, cleaning, and care, and warnings regarding the respirators limitations.
2. Choose respirators certified for use to protect against the contaminant of concern; in the United States, NIOSH respirators. A label or statement of certification should appear on the respirator or respirator packaging. It will tell you what the respirator is tested and certified for and how much it will protect you.
3. Do not wear your respirator into atmospheres containing contaminants for which your respirator is not designed to protect against. For example, a respirator designed to filter dust particles will not protect you against gases, vapors, or very small solid particles of fumes or smoke.
4. Keep track of your respirator so that you do not mistakenly use someone else's respirator.

ATTACHMENT C-3
RESPIRATORY PROTECTION PROGRAM CHECKLIST

Site Name: _____ Location: _____

Site Manager: _____ Site HSE Supervisor: _____

Reviewer:_____ Date Reviewed: _____

PROGRAM ADMINISTRATION

Yes	No	
☐	☐	Are the Program Administrator and Site HSE Supervisor identified?
☐	☐	Are the nine program elements followed?
☐	☐	If program include emergency respirator use, are procedures in place?
☐	☐	Is the Site HSE Supervisor effectively administering the program?
☐	☐	Is the written program updated as necessary to account for changes in the workplace affecting respirator use?
☐	☐	Equipment, training, and medical evaluations provided at no cost to employees?

Comments: _____

_____

MEDICAL EVALUATION

Yes	No	
☐	☐	All employees in respirator jobs have been evaluated to determine their ability to wear a respirator prior to respirator use.
☐	☐	A PLHCP has been identified to perform the medical evaluations.
☐	☐	Employees are provided follow-up medical exams if they answer positively to any of questions 1 through 8 in the medical questionnaire for respiratory use in Attachment C-1, or if their initial medical evaluation reveals that a follow-up exam is needed.
☐	☐	Medical evaluations are administered confidentially during normal work hours, and in a manner that is understandable to employees.
☐	☐	Employees are provided the opportunity to discuss the medical evaluation results with the PLHCP.
☐	☐	Written recommendations are obtained from the PLHCP regarding each employee's ability to wear a respirator, and the PLHCP has given the employee a copy of these recommendations.
☐	☐	Employees who are medically unable to wear a negative pressure respirator are provided with a PAPR if they are found by the PLHCP to be medically able to use a PAPR.
☐	☐	Employees are given additional medical evaluation when: • The employee reports symptoms related to his or her ability to use a respirator. • The PLHCP, respiratory protection program administrator, or supervisor determines that a medical reevaluation is necessary. • Information from the respiratory protection program suggests a need for reevaluation. • Workplace conditions have changed in a way that could potentially cause increased risk to the employee's health.

Comments: _____

_____

RESPIRATOR SELECTION

Yes	No	
☐	☐	The specific hazards for each respiratory protection task have been identified.
☐	☐	Respirators are NIOSH certified, and used under the conditions of the certification.
☐	☐	Respiratory job exposures characterized as routine or incident-related.
☐	☐	Respirator job exposures are evaluated for IDLH exposure potential.
☐	☐	Estimated exposure concentration is included for tasks with routine exposures.
☐	☐	Respirator manufacturer and model information are specified for each respirator job.
☐	☐	A sufficient number of respirator sizes and models are provided to be acceptable and correctly fit the users.
☐	☐	For IDLH jobs, full facepiece pressure demand SAR with escape cylinder or full face piece pressure demand SCBAs, with a minimum service life of 30 minutes, are provided.
☐	☐	Respirators used for escape only are NIOSH certified for the atmosphere in which they will be used.
☐	☐	Oxygen deficient atmospheres are considered IDLH.
☐	☐	Respirators selected are appropriate for the chemical state and physical form of the contaminant.
☐	☐	APRs used for protection against gases and vapors are equipped with end-of-service-life indicators or a change schedule has been specified and implemented.
☐	☐	APRs used for protection against particulate are equipped with NIOSH-certified HEPA filters or other filters certified by NIOSH for particulate.
☐	☐	APRs used for routine gas and vapor exposure protection have service life documentation using manufacturer software, attached to program.

Comments: _____

_____

FIT TESTING

Yes	No	
☐	☐	All employees who are using tight fitting respirator facepieces have passed an appropriate fit test prior to being required to use a respirator.
☐	☐	Fit testing is conducted with the same make, model, and size of respirator that the employee will be expected to use at the worksite.
☐	☐	Fit tests are conducted annually and when different respirator facepieces are to be used.
☐	☐	Provisions are made to conduct additional fit tests in the event of physical changes in the employee that may affect respirator fit.
☐	☐	Employees are given the opportunity to select a different respirator facepiece, and be retested, if their respirator fit is unacceptable to them.
☐	☐	Fit tests are administered using OSHA-accepted QNFT or QLFT protocols.
☐	☐	QNFT is used in all situations where a negative pressure respirator is intended to protect workers from contaminant concentrations greater than 10 times the PEL.

Yes	No	
☐	☐	For tight-fitting respirators and PAPR: • All tests are conducted in the negative pressure mode. • QLFT is achieved by temporarily converting the facepiece into a negative pressure respirator with appropriate filters, or by using an identical negative pressure APR.
☐	☐	QNFT is achieved by modifying the facepiece with an adaptor to allow for sampling inside the mask midway between the nose and mouth. The facepiece is restored to its approved configuration before being used in the workplace.

Comments: _____

_____

PROPER RESPIRATOR USE

Yes	No	
☐	☐	Workers using tight-fitting respirators have no conditions, such as facial hair, that would interfere with a face-to-facepiece seal or valve function.
☐	☐	Workers wear corrective glasses, goggles, or other protective equipment in a manner that does not interfere with the face-to-facepiece seal or valve function.
☐	☐	Workers perform user seal checks prior to each use of a tight-fitting respirator.
☐	☐	Procedures are in place for conducting ongoing surveillance of the work area for conditions that affect respirator effectiveness, and when such conditions exist, are taken to address those situations.
☐	☐	Employees are permitted to leave their work area to conduct respirator maintenance, such as washing the facepiece, or to replace respirator parts.
☐	☐	Employees do not return to their work area until their respirator has been repaired or replaced in the event of breakthrough, a leak in the facepiece, or a change in breathing resistance.
☐	☐	There are procedures for respirator use in IDLH atmospheres to ensure that the appropriate number of standby personnel are deployed; standby personnel and employees in the IDLH environment maintain communication; standby personnel are properly trained, equipped, and prepared; the Site HSE Supervisor is notified when standby personnel enter an IDLH atmosphere; and the Site HSE Supervisor will respond to the notification.
☐	☐	Standby personnel are equipped with a pressure demand or other positive pressure. SCBA, or a positive pressure supplied air respirator with an escape bottle, and appropriate retrieval equipment or other means for rescue.

Comments: _____

_____

TRAINING AND INFORMATION

Yes	No	
☐	☐	Employees can demonstrate knowledge of the following: • Why the respirator is necessary and the consequences of improper fit, use, or maintenance. • Limitations and capabilities of the respirator. • How to effectively use the respirator in emergency situations. • How to inspect, don, doff, use, and check the seals of the respirator. • Maintenance and storage procedures.
☐	☐	Training is provided prior to employee use of a respirator.

Yes	No	
☐	☐	Retraining is provided: • Annually. • Upon changes in workplace conditions that affect respirator use. • Whenever retraining appears necessary to verify safe respirator use. • Respirator voluntary use requirements are provided to voluntary users.

Comments: _____

_____

RESPIRATOR MAINTENANCE AND CARE

Cleaning and Disinfecting

Yes	No	
☐	☐	Respirators are provided that are clean, sanitary, and in good working order.
☐	☐	Respirators are cleaned and disinfected as often as necessary when issued for the exclusive use of one employee; before being worn by different individuals; after each use for emergency use respirators; and after each use for respirators used for fit testing. Commercially available mild detergents or cleaner/sanitizer recommended by the manufacturer are used.

Storage

Yes	No	
☐	☐	Respirators are stored to protect them from damage from the elements, and from becoming deformed.
☐	☐	Emergency respirators are stored, to be accessible to the work area, in compartments marked as such, and in accordance with manufacturer's recommendations.

Inspections

Yes	No	
☐	☐	Routine-use respirators are inspected before each use and after cleaning.
☐	☐	SCBAs and emergency respirators are inspected monthly and checked for proper function before and after each use.
☐	☐	Emergency escape only respirators are inspected before being carried into the workplace for use.
☐	☐	Inspections include: check of respirator function; tightness of connections; condition of the facepiece, head straps, valves, cartridges, and condition of elastomeric parts.
☐	☐	For SCBAs, inspection includes checking that cylinders are fully charged, and that regulators and warning devices function properly.
☐	☐	Emergency use respirators are inspected. The inspection documentation is attached to the respirator or its compartment, or stored with inspection reports.
☐	☐	Respirators that have failed inspection are taken out of service.

Repairs

Yes	No	
☐	☐	Repairs are made only by trained personnel.
☐	☐	Only NIOSH-approved parts are used.
☐	☐	Reducing and admission valves, regulators and alarms are adjusted or repaired only by the manufacturer or a technician trained by the manufacturer.

Comments: _____

_____

BREATHING AIR QUALITY AND USE

General

Yes	No	
☐	☐	Compressed breathing air meets the requirements for Grade D breathing air.
☐	☐	Compressed oxygen is not used in respirators that have previously used compressed air.
☐	☐	Oxygen concentrations greater that 23.5% are used only in equipment designed for oxygen service or distribution.
☐	☐	Breathing air couplings are incompatible with outlets for other gas systems.
☐	☐	Breathing gas containers are marked with appropriate NIOSH certification.

Breathing Air Cylinders

Yes	No	
☐	☐	Breathing air cylinders are tested and maintained according to DOT 49 CFR Part 173 and 178.
☐	☐	A certificate of analysis for breathing air has been obtained from the supplier.
☐	☐	Moisture content in the cylinder breathing air does not exceed a dew point of -500 °F at 1 atmosphere pressure.

Air Compressors

Yes	No	
☐	☐	Are constructed and situated to prevent contaminated air from getting into the system and are set up to minimize the moisture content.
☐	☐	Are equipped with in-line air-purifying sorbent beds and/or filters that are maintained or replaced following manufacturer's instructions and are tagged with information on the most recent change date of the filter and an authorizing signature.
☐	☐	Carbon monoxide does not exceed 10 ppm in the breathing air from compressors that are oil-lubricated, and high-temperature and carbon monoxide alarms are used on oil-lubricated compressors, or the air is monitored often enough to verify that carbon monoxide does not exceed 10 ppm if only a high-temperature alarm is used.

Comments: _____

_____

PROGRAM EVALUATION

Yes	No	
☐	☐	Workplace evaluations are being conducted to verify that the written respiratory protection program is being effectively implemented.
☐	☐	Employees required to wear respirators are being regularly consulted to assess the employees' views and to identify problems with respirator fit, selection, use and maintenance.
☐	☐	Any problems identified during evaluations are corrected.

RECORDKEEPING

Yes	No	
☐	☐	Records of medical evaluations are being retained for the term of employment plus 30 years.
☐	☐	Fit testing records are being retained for 1 year.
☐	☐	A copy of the current respiratory protection program has been retained onsite.
☐	☐	Access to these records is provided to workers.

Comments: _____

_____

CORRECTIVE ACTIONS REQUIRED

_____

_____

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ATTACHMENT C-4
NIOSH RESPIRATOR SELECTION LOGIC SEQUENCE - 2004

To use this selection logic, first assemble the necessary toxicologic, safety, and other relevant information for each respiratory hazard, as follows:

- General use conditions
- Physical, chemical, and toxicological properties of the contaminants
- Occupational Exposure Limit (Short-Term Exposure Limit [STEL], recommended exposure limit, PEL, TLV)
- Expected concentration of each respiratory hazard
- IDLH concentration
- Oxygen concentration or expected oxygen concentration
- Eye irritation potential
- Environmental factors such as presence of oil aerosols

General use conditions should include a description of the job task, including the duration and frequency, location, physical demands, industrial processes, and issues affecting the comfort of the respirators.

After all criteria have been identified and evaluated and after the requirements and restrictions of the respiratory protection program have been met, follow this sequence of questions to identify the class of respirators that should provide adequate respiratory protection. If there exist site contaminants with a substance-specific standard, respirator selection must meet or exceed the respirators required in that standard.

Step 1 Is the respirator intended for use during fire fighting?

a. If yes, only a full-facepiece, pressure-demand, SCBA meeting the requirement of the National Fire Protection Association 1981, Standard on Open-circuit Self-contained Breathing Apparatus for Fire and Emergency Services (2002 edition) is required.

b. If no, proceed to Step 2.

Step 2 Is the respirator intended for use in an oxygen-deficient atmosphere, i.e., less than 19.5% oxygen?

a. If yes, any type of SCBA other than escape only, or SAR with an auxiliary SCBA is required. Auxiliary SCBA must be of sufficient duration to permit escape to safety if the air supply is interrupted.
If yes, and contaminants are also present, proceed to Step 3 to determine if the hazard requires the SCBA or SAR/SCBA to meet a specific APF level.

b. If no, proceed to Step 3.

Step 3 Is the respirator intended for entry into unknown or IDLH atmospheres (e.g., an emergency situation)?

a. If yes, one of two types of respirators is required: a pressure-demand SCBA with a full facepiece or a pressure-demand SAR with a full facepiece in combination

with an auxiliary pressure-demand SCBA. Auxiliary SCBA must be of sufficient duration to permit escape to safety if the air supply is interrupted.

b. If no, proceed to Step 4.

Step 4 Is the exposure concentration of each of the contaminants, as determined by acceptable industrial hygiene methods, less than its respective exposure limit?

a. If yes, a respirator is not required for routine work. For escape respirators, determine the potential for generation of a hazardous condition caused by an accident, spill, or equipment failure. Proceed to Step 6.

b. If no, proceed to Step 5.

Step 5 Are conditions such that a worker who is required to wear a respirator can escape from the work area and not suffer loss of life or immediate or delayed irreversible health effects if the respirator fails, i.e., are the conditions not IDLH?

a. If yes, conditions are not considered to be IDLH. Proceed to Step 6.

b. If no, conditions are considered to be IDLH. See Section 5.0 for further guidance.

Step 6 Is the contaminant an eye irritant, or can the contaminant cause eye damage at the workplace concentration?

a. If yes, a respirator equipped with a full facepiece, helmet, or hood is required. Proceed to Step 7.

b. If no, a half-mask or quarter-mask respirator may still be an option, depending on the exposure concentration. Proceed to Step 7.

Step 7 Determine the maximum hazard ratio by the following:

- Divide the time-weighted average (TWA) exposure concentration for the contaminant determined in Step 4 by the applicable exposure limit. If the exposure limit is an 8-hour limit, the TWA used must be an 8-hour average. If the exposure limit is based on 10 hours, use a 10-hour TWA.
- If the contaminant has a ceiling limit, divide the maximum exposure concentration for the contaminant determined in Step 4 by the ceiling limit.
- If the contaminant has an STEL, divide the maximum 15-minute TWA exposure concentration for the contaminant determined in Step 4 by the STEL.
- For escape respirators, determine the potential for generation of a hazardous condition caused by an accident or equipment failure.

If the calculated maximum hazard ratio is greater than 1, proceed to Step 8.

Step 8 If the physical state of the contaminant is:

- A particulate (solid or liquid aerosol) during periods of respirator use, proceed to Step 9;
- A gas or vapor, proceed to Step 10; or
- A combination of gas or vapor and particulate, proceed to Step 11.

Step 9 Particulate Respirators

Is the particulate respirator intended only for escape purposes?

The maximum use concentration (MUC) is the maximum atmospheric concentration of a hazardous substance from which an employee can be expected to be protected by a class of respirator and is determined by the lesser of:

- APF X exposure limit
- The respirator manufacturer's MUC for a hazardous substance (if any)

If the respirator is intended for use in an oxygen-deficient atmosphere, only SCBA or SAR with an auxiliary SCBA, can be selected from the Table.

For multi-component mixtures the MUC can be calculated by:
C1/MUC1 + C2/MUC2 +…Cn/MUCn= 1

The MUC for the selected respirator class must exceed the expected contaminant concentration.

Step 10 Gas/Vapor Respirators

10.1 Is the gas/vapor respirator intended only for escape?

a. If yes, refer to escape respirators.

b. If no, the gas/vapor respirator is intended for use during normal work activities. Proceed to Step 10.2.

10.2 An air-purifying chemical cartridge/canister respirator that has a sorbent suitable for the chemical properties of the anticipated gas/vapor contaminant(s) and for the anticipated exposure levels is required. Information on cartridges or canisters approved for use for classes of chemicals or for specific gases or vapors can be found in the NIOSH Certified Equipment List http://www.cdc.gov/NIOSH/npptl/topics/respirators/cel/. Proceed to Step 10.3.

10.3 Respirators that have not been eliminated from Table 2 by the previous steps and that have APFs equal to, or greater than, the maximum hazard ratio determined in Step 7 are required. Note, however, that the MUC is the maximum atmospheric concentration of a hazardous substance from which an employee can be expected to be protected by a class of respirator and is determined by the lesser of:

- APF X exposure limit
- The respirator manufacturer's MUC for a hazardous substance (if any)

The IDLH, unless the respirator is a pressure-demand, full-facepiece SCBA or combination pressure-demand SAR with a full facepiece in combination with an auxiliary pressure-demand SCBA.

For multi-component mixtures the MUC can be calculated by:
$/C_1/MUC_1 + C_2/MUC_2 + \ldots C_n/MUC_n = 1$

If the respirator is intended for use in an oxygen-deficient atmosphere, only SCBA or SAR with an auxiliary SCBA, can be selected from Table 2.

Step 11 Combination Particulate and Gas/Vapor Respirators

11.1 Is the combination respirator intended for "escape only" purposes?

a. If yes, refer to the section on escape respirators, for a discussion and selection of "escape only" respirators.

b. If no, the combination respirator is intended for use during normal work activities. Proceed to Step 11.2.

11.2 From Table 3, select a respirator type, not eliminated by the previous steps, and have APFs equal to, or greater than, the maximum hazard ratio determined in Step 7. Note, however, that the MUC is the maximum atmospheric concentration of a hazardous substance from which an employee can be expected to be protected by a class of respirator and is determined by the lesser of:

- APF X exposure limit
- The respirator manufacturer's MUC for a hazardous substance (if any)
- The IDLH, unless the respirator is a pressure-demand, full-facepiece SCBA or combination pressure-demand SAR with a full facepiece in combination with an auxiliary pressure-demand SCBA.

For multi-component mixtures the MUC can be calculated by:
C1/MUC1 + C2/MUC2 +…Cn/MUCn= 1

If the respirator is intended for use in an oxygen-deficient atmosphere, only SCBA or SAR with an auxiliary SCBA, can be selected from Table 3.

Table 1 - Respirator Assigned Protection Factors–Particulate

Respirator Type	APF-NIOSH	APF-OSHA
Quarter mask	5	5
Air-purifying half-mask with appropriate type of particulate filter[1]	10	10
Air-purifying full facepiece with appropriate type of particulate filter	10	50
Air-purifying full facepiece with N-100, R-100, or P-100 filter.	50	50
Negative pressure (demand) supplied-air with half-mask	10	10
Negative pressure (demand) supplied-air with full facepiece	50	50
Powered air-purifying with hood or helmet and HEPA filter	25	25/1,000[2]
Powered air purifying with loose fitting facepiece		25
Powered air-purifying with tight-fitting facepiece (half-mask) and high efficiency filter	50	50
Powered air-purifying with tight-fitting full facepiece and high efficiency filter	50	1,000 ??
Continuous flow supplied-air with hood or helmet	25	25/1,000[2]
Continuous flow supplied-air with tight fitting half-mask facepiece	50	50
Continuous flow supplied-air with tight fitting full facepiece	50	1,000
Continuous flow supplied-air with loose fitting facepiece		25
Pressure-demand supplied air with half-mask	1,000	50
Pressure-demand supplied air with full facepiece	2,000	1,000
Pressure-demand self-contained with full facepiece [3]	10,000	10,000
Pressure-demand self-contained with helmet/hood		10,000

Notes:

[1] Includes elastomeric facepiece and filtering facepiece.

[2] Employer must have evidence provided by manufacturer that testing demonstrates performance at a level of protection of 1,000 or greater to received APF=1,000.

[3] May be in combination with auxiliary pressure-demand self-contained breathing apparatus.

Table 2 - Respirator Assigned Protection Factors–Gas/Vapor

Respirator Type	APF-NIOSH	APF-OSHA
Air-purifying half-mask with appropriate type of gas/vapor cartridge[1]	10	10
Air-purifying full facepiece with appropriate type of gas/vapor cartridge	50	50
Negative pressure (demand) supplied-air with half-mask	10	10
Negative pressure (demand) supplied-air with full facepiece	50	50
Powered air-purifying with hood or helmet with appropriate type of gas/vapor cartridge	25	25/1,000[2]
Powered air purifying with loose fitting facepiece		25
Continuous flow supplied-air with hood or helmet	25	25/1,000[2]
Continuous flow supplied-air with loose fitting facepiece		25
Continuous flow supplied-air with half-mask facepiece	50	50
Continuous flow supplied-air with full facepiece	50	1,000[2]
Powered air-purifying with tight-fitting facepiece (half-mask) and appropriate gas/vapor cartridge	50	50
Powered air-purifying with tight-fitting facepiece (full facepiece) and appropriate gas/vapor cartridge	50	1,000
Negative pressure (demand) self-contained with half mask.		10
Negative pressure (demand) self-contained with full facepiece	50	50
Pressure demand supplied air with half-mask	1,000	50
Pressure demand supplied air with full facepiece	2,000	1,000
Pressure demand self-contained with full facepiece[3]	10,000	10,000
Pressure demand self-contained with helmet/hood		10,000

Notes:

[1] Includes elastomeric facepiece.

[2] Employer must have evidence provided by manufacturer that testing demonstrates performance at a level of protection of 1,000 or greater to received APF=1,000.

[3] May be in combination with auxiliary pressure-demand self-contained breathing apparatus.

Table 3 - Respirator Protection Factors–Gas/Vapor and Particulate Combination

Respirator Type	APF-NIOSH	APF-OSHA
Air-purifying half-mask equipped with appropriate gas/vapor cartridge in combination with appropriate type of particulate filter[1]	10	10
Air-purifying full facepiece equipped with appropriate gas/vapor cartridge in combination with appropriate type of particulate filter[1]	10	50
Negative pressure (demand) supplied-air with half-mask	10	10
Negative pressure (demand) supplied-air with full facepiece	50	50
Powered air-purifying with hood or helmet	25	25/1,000[2]
Continuous flow supplied-air with hood or helmet	25	25/1,000[2]
Continuous flow supplied-air with loose fitting facepiece		25
Continuous flow supplied-air with half-mask facepiece	50	50
Continuous flow supplied-air with full facepiece	50	1,000[2]
Powered air-purifying with tight-fitting facepiece (half-mask) equipped with appropriate gas/vapor cartridge in combination with high efficiency filter	50	50
Powered air-purifying with tight-fitting facepiece (full facepiece) equipped with appropriate gas/vapor cartridge in combination with high efficiency filter	50	1,000
Powered air purifying with loose fitting facepiece		25
Negative pressure (demand) self-contained with full facepiece	50	50
Negative pressure (demand) self-contained with half-mask		10
Negative pressure (demand) self-contained with helmet/hood		50
Pressure demand supplied air with half-mask	1,000	50
Pressure demand supplied air with full facepiece	2,000	1,000
Pressure demand self-contained with full facepiece[3]	10,000	10,000
Pressure demand self-contained with helmet/hood		10,000

Notes:

1 Includes elastomeric facepiece.

2 Employer must have evidence provided by manufacturer that testing demonstrates performance at a level of protection of 1,000 or greater to received APF=1,000.

3 May be in combination with auxiliary pressure-demand self-contained breathing apparatus.

ATTACHMENT C-5
DEFINITIONS

Administrative Controls	Methods of controlling employee exposures to contaminants by job rotation, work assignment, or time periods away from the contaminant.
Air-purifying respirator	A respirator with an air-purifying filter, cartridge, or canister that removes specific air contaminants by passing ambient air through the air-purifying element.
Atmosphere-supplying respirator	A respirator that supplies the users with breathing air from a source independent of the ambient atmosphere, and includes Supplied-Air Respirators (SAR) and Self-Contained Breathing Apparatus (SCBA) units.
Canister or cartridge	A container with a filter, sorbent, or catalyst, or combination of these items, which removes specific contaminants from the air passed through the container.
Dust	Dry particulate aerosols generated by handling, crushing, or grinding organic or inorganic material. Particle size ranges from 1 micrometer (μm) to 1 millimeter diameter.
Emergency situation	Any occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment that may or does result in an uncontrolled significant release of an airborne contaminant.
End-of-service-life indicator	A system that warns the respirator user of the approach of the end of adequate respiratory protection, for example, that the sorbent is approaching saturation or is no longer effective.
Engineering Controls	Methods of controlling employee exposures by modifying the source or reducing the quantity of contaminants released into the work environment.
Escape-only respirator	A respirator intended to be used only for emergency exit.
Filter or air purifying element	A component used in respirators to remove solid or liquid aerosols from the inspired air.
Filter facepiece (dust mask)	A negative pressure particulate respirator with a filter as an integral part of the facepiece or with the entire facepiece composed of the filtering medium.
Fume	Aerosol particles generated from heating a solid material. These particles range in diameter from 0.001 to 1 μm.
Gas	A state of matter in which the material has very low density and viscosity, can expand and contract in response to changes in temperature and pressure, easily diffuses into other gases, and that uniformly distributes throughout any container.
High Efficiency Particulate Air (HEPA) filter	A filter that is at least 99.97% efficient in removing monodispersed particles of 0.3 μm or greater in diameter. The equivalent NIOSH particulate filters are the N100, R100, and P100 filters.
Hood	A respiratory inlet covering that completely covers the head and neck and may also cover portions of the shoulders and torso.
Immediately Dangerous to Life or Health (IDLH)	An atmosphere that poses an immediate threat to life, would cause irreversible adverse health effects, or would impair an individual's ability to escape from a dangerous atmosphere.

Mist	Suspended droplet aerosols produced from bulk liquids by mechanical processes such as splashing, bubbling, or spraying. Particle sizes range from 0.01 to 10 μm in diameter.
Negative pressure respirator (tight fitting)	A respirator in which the air pressure inside the facepiece is negative during inhalation with respect to the ambient air pressure outside the respirator.
Oxygen deficient atmosphere	An atmosphere with an oxygen content below 19.5%.
Positive pressure respirator	A respirator in which the pressure inside the respiratory inlet covering exceeds the ambient air pressure outside the respirator.
Pressure-demand respirator	A supplied-air respirator that admits breathing air to the facepiece only when a negative pressure is created inside the facepiece by inhalation.
Powered Air Purifying Respirator (PAPR)	An air purifying respirator that uses a blower to force the ambient air through air purifying elements to the inlet covering.
Pressure demand respirator	A positive pressure atmosphere-supplying respirator that admits breathing air to the facepiece when the positive pressure is reduced inside the facepiece by inhalation.
Qualitative Fit Test (QLFT)	A pass/fail fit test to assess the adequacy of respirator fit that relies on the individual's response to the test agent.
Quantitative Fit Test (QNFT)	An assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator.
Radionuclides	An atom capable of spontaneously emitting radiation.
Respiratory inlet covering	That portion of a respirator that forms the protective barrier between the user's respiratory tract and an air purifying device or breathing air source, or both. It may be a facepiece, helmet, hood suit, or mouthpiece respirator with nose clamp.
Self-Contained Breathing Apparatus (SCBA)	A supplied-air respirator for which the breathing air source is designed to be carried by the user.
Supplied-Air Respirator (SAR) or airline respirator	A supplied-air respirator for which the source of breathing air is not designed to be carried by the user.
Tight fitting facepiece	A respiratory inlet covering that forms a complete seal with the face.
User seal check	An action conducted by the respirator user to determine if the respirator is properly seated to the face.
Vapor	The gaseous form of a substance, which is at equilibrium with its liquid or solid state.

APPENDIX D
FORMS

Certificate of Worker/Visitor Acknowledgement (Form 078)
Completion of Supervised Field Experience (Form 080)
Confined Space Entry Assessment and Permit (Form 073)
Cutting, Welding, Open Flame, and Spark Production Permit (TVA 6561a)
Daily Job Safety Analysis (Form 086)
Direct Read Air Monitoring Record (Form 075)
Drill Rig Inspection (Form 129)
Emergency Response Best Practice (Form 076)
Excavation and Trenching Permit (Form 041)
Excavation Permit (TVA 29205)
Float Plan (Form 057)
Hazard Level-Based ES&H Corrective Actions Tracking Report (Form 084)
Instrument Calibration Log (Form 072)
Integrated Air Monitoring Record (Form 077)
Job Safety Analysis (TVA 15943)
Job Safety Analysis Surveillance Pocket Card (Form 060)
Lift Plan (Form 074)
PPE Downgrade Rationale (Form 079)
Safety Coaching Visit Checklist (Form 020)
Safety Observation Report (Form 061)
Safety Observation Report Pocket Card (Form 061A)
Site Tailgate Meeting (Form 081)
TVA Take Two Card
Visitor Orientation (Form 082)
Wet Bulb Globe Thermometer (WBGT) Readings (Form 083)
Work Zone Classification Change Notice (Form 085)

Kingston Ash Recovery Project

CERTIFICATE OF WORKER/VISITOR ACKNOWLEDGEMENT

CONTRACTOR'S NAME: _____

EMPLOYEE'S NAME: _____

The contract for the above project requires the following: that you be provided with and complete formal and site specific training; that you be supplied with proper personal protective equipment including respirators (as needed); that you be trained in its use; and that when necessary, you receive a medical examination to evaluate your physical capacity to perform your assigned work tasks, under the environmental conditions expected, while wearing the required personal protective equipment. These things are to be done at no cost to you. By signing this certification, you are acknowledging that your employer has met these obligations to you.

I HAVE BEEN BRIEFED ON, UNDERSTAND AND AGREE TO FOLLOW THE SITE SAFETY AND HEALTH PLAN. I HAVE ALSO BEEN GIVEN THE SITE WIDE SAFETY AND HEALTH PLAN BOOKLET.

Signature: Date:

_____ _____

SITE SPECIFIC TRAINING: I have been provided and have completed the site specific training required by this Contract. The Site Safety and Health Officer conducted the training.

RESPIRATORY PROTECTION: ☐ I have ☐ Have not at this time, been trained in accordance with the criteria in the Contractor's Respiratory Protection program. I have been trained in the proper work procedures and use and limitations of the respirator(s) I wear. I have been trained in and will abide by the facial hair policy.

RESPIRATOR FIT TEST TRAINING: ☐ I have ☐ Have not at this time, been trained in the proper selection, fit, use, care, cleaning, and maintenance, and storage of the respirator(s) that I will wear. I have been fit tested in accordance with the criteria in the Contractor's Respiratory Program and have received a satisfactory fit. I have been assigned my individual respirator. I have been taught how to properly perform positive and negative pressure fit check upon donning negative pressure respirators each time.

Kingston Ash Recovery Project

COMPLETION OF SUPERVISED FIELD EXPERIENCE

Date:_____

I certify the following individuals have completed their 24 hours of supervised field experience at the TVA Fly Ash Response Site per the requirements of 29 CFR 1910.120:

NAME	COMPANY	POSITION

Supervisor Company: _____

Supervisor Name: _____

Supervisor Signature: _____

Kingston Ash Recovery Project

CONFINED SPACE ENTRY ASSESSMENT AND PERMIT

Date:	Confined Space Name/Location:
Confined Space Entry Supervisor:	Describe Tasks Involved:

SECTION I — ASSESSMENT

Hazards Identified	Y	N	NA	Detail of Hazard and Appropriate Control
ISOLATION HAZARDS				
Access points to space labeled ”Danger, Permit-Required Confined Space, Do Not Enter”				
Access points to space protected with barrier tape, barricades, or fencing				
Lines and tanks flushed, purged, and clean				
Blanks installed				
Electrical lock-out/tag-out installed and tested				
Mechanical lock-out/tag-out installed and tested				
Radioactive source removed or shielded				
PHYSICAL HAZARDS				
Ladders, scaffolds, work platforms safeguarded				
Fall protection required				List fall protection equipment under PPE section
Walking and working areas dry and clean				
Minimum illumination of 5 foot-candles				
Continuous audio or visual communication				Identify communication method used
ATMOSPHERIC/CHEMICAL HAZARDS				
Identify and measure all chemical hazards in the confined space				
High pressure				
High temperature or heat stress				
Chemicals generated due to work processes				
Burning, cutting, welding controlled				Specify method: Mechanical ventilation or respiratory protection
Hazardous materials in surface coating (lead, etc.)				Identify the hazardous material
Possibility of toxic/ inert gases leaking/sinking in				
Continuous Atmospheric Monitoring required				Complete Continuous Atmospheric Testing Section
Mechanical ventilation required				Calculate air changes per hour required
Respiratory protection required				List respiratory protection in PPE Section
Supplied air or self contained air required				
Asbestos disturbed				
Potential IDLH				SCBA or airline respirator, and retrieval harness required
ELECTRICAL HAZARDS				
All equipment bonded, grounded and tested				
GFCIs for all electrical equipment				
All equipment explosion proof/ intrinsically safe				
Work Activities				
Permits required: Hot Work, Excavation, etc.				Identify permits
Hazardous work activities in surrounding areas				
Other hazards not listed above				
PPE (Describe all required PPE including retrieval equipment and harnesses.)				
Eye Protection				
Protective Clothing				
Hand and Foot Protection				
Respiratory Protection				
Fall Protection				

SECTION II — PERMIT

This confined space permit is valid only for the work, location, and time listed. If changes occur, the confined space must be re-evaluated and the permit re-issued. All hazards listed in the Assessment and Permit Section must be addressed in the SPA.

Oxygen 20.8% (19.5 - 23.5%)	☐ Yes ☐ No	If oxygen is < or > 20.8%, determine why
Combustible gas concentration < 1 % LEL	☐ Yes ☐ No	
Carbon monoxide < 25 ppm	☐ Yes ☐ No	
Carbon dioxide < 1,000 ppm	☐ Yes ☐ No	
Hydrogen sulfide < 10 ppm	☐ Yes ☐ No	

List other Chemicals	Monitoring Levels and Action Levels	Exposure Limits (PEL, TLV, etc.)

For non-continuous atmospheric testing, state type of testing, calibration dates, and monitoring frequency.

For continuous atmospheric testing, list monitoring instruments and calibration dates.

Has rescue plan been assembled and practiced? ☐ Yes ☐ No

List name of emergency rescue service and identify the equipment that will be used to summon rescue service.

Printed Names of Trained Entrants	**Printed Names of Trained Attendants**	
Printed Name of Entry Supervisor		
Entry Supervisor's Signature	Date	Time
HSE Supervisor's (or Project/Site Manager) Signature	Date	Time

SECTION III — CLOSURE

After confined space entry is complete, the supervisor shall record in this space any incidents and actions taken and any lessons learned.

Supervisor Closure Signature	Date and Time of Permit Closure

CONFINED SPACE AUTHORIZED ENTRANTS SIGN-IN AND SIGN-OUT LOG

Client:	Project:	Location:	Date:
Name/Description of Confined Space:		Entry Supervisor:	
Standby Attendant 1 Name (printed):		Standby Attendant 2 Name (printed):	

Entrant's Name Printed	Entrant's Signature	Enter Time In and Out											
		In	Out	In	Out	In	Out	In	Out	In	Out	In	Out

Cutting, Welding, Open Flame, and Spark Production Permit

NO: _____

Location: _____ Date: _____

_____ Time: _____

Work to be performed:

Permit from _____ Date _____ Time to _____ Date _____ Time

Hazardous Gas/Liquid Area: _____ Dust: _____ Controlled Area: _____

REQUIRED	NOT REQUIRED	N/A	PROTECTION
☐	☐	☐	1. Fire suppression in service.
☐	☐	☐	2. Floors clean of combustibles. 35 feet
☐	☐	☐	3. Combustible floors protected. 35 feet
☐	☐	☐	4. Flammable liquids removed. 35 feet
☐	☐	☐	5. Combustible materials protected. 35 feet
☐	☐	☐	6. All wall or floor openings covered. 35 feet
			MISCELLANEOUS
☐	☐	☐	7. Inspect for possible conduction of heat to remote combustibles.
☐	☐	☐	8. Flammable liquids and vapors removed from all enclosed equipment.
			FIRE ATTENDANT
☐	☐	☐	9. Provide a fire watch during and up to: (check one) ☐ 30 minutes after work ☐ 2 hours after coal handling work NAME:
☐	☐	☐	10. Provide additional fire suppression equipment (e.g., extinguishers, hose, etc.).
☐	☐	☐	11. Explosive atmosphere test required.
☐	☐	☐	12. Wet down or wash down required.

Special restrictions, precautions or comments:

The above location has been inspected and the permit issued subject to the precautions noted above.

By: _____
Issuing Authority

Where the work permit shall extend beyond the shift issue, the supervisor assuming responsibility shall sign and date below.

1st shift following issue X _____

2nd shift following issue X _____

3rd shift following issue X _____

4th shift following issue X _____

5th shift following issue X

Please add additional signature sheets to re-validate the permit as necessary.

Work Started _____ Work Completed _____ Final Check _____

The work area and all adjacent areas to which sparks and heat might have spread (such as the floor above and below and the opposite side of the walls) have been inspected and found fire safe.

By: _____

Permit to be posted in work area. After completion of work, return completed form to the plant safety designee.

TVA 6561A [06-25-2012]

Kingston Ash Recovery Project

DAILY JOB SAFETY ANALYSIS

Use for your daily team review and sign-off. Review the existing Activity Hazard Analysis (AHA), modify as necessary after considering the critical items listed below. If no AHA exists for your task, contact HSE or create one using a blank Job Safety Analysis form.

Date:	Site Name:	Task:

DAILY SITE CONDITION OR ACTIVITY (circle all that apply)		IMPACT ON ACTIVITIES	SAFE PLAN
Weather Conditions	Temp Range: Precipitation: Wind:		
Classification of Work Zone (circle one) EZ CRZ SZ			
Non-routine Chemical Usage			
Excavation Entry			
Energized Electrical Work			
Hot Work (open flame, welding, grinding)			
Work at Heights			
Crane Usage / Critical Lifts			
Confined Space Entry			

Team Lead: _____

Team Members: _____ _____ _____

_____ _____ _____

_____ _____ _____

Kingston Ash Recovery Project

DIRECT READ AIR MONITORING RECORD

Instrument: _____ Monitored By: _____ Date: _____

LOCATION/GRID	WIND	TIME	LEL	O2	CO	PID/FID (SPECIFY)	DUST	DETECTOR TUBE (SPECIFY)

FORM 075

Drill Rig Inspection

Date_____ Inspector_____

Rig # _____ Company_____

Rig Type_____ Oversight_____

	Drill Rig/Support Equipment	Yes	No	N/A	Repaired
1.	Are there obvious hose/connection leaks on rig?	☐	☐	☐	☐
2.	Are hydraulic system safety shut offs in proper condition?	☐	☐	☐	☐
3.	Are hand tools and power tools maintained in good repair?	☐	☐	☐	☐
4.	Is there evidence of wearing or grooving of cathead to a depth greater than 1/8", indicating replacement required?	☐	☐	☐	☐
5.	Are casing hammer cables, shackles, and hammer rails in safe condition?	☐	☐	☐	☐
6.	Are air and water hoses/connections in good repair; whip checks installed properly?	☐	☐	☐	☐
7.	Is pumping equipment properly secured to rig?	☐	☐	☐	☐
8.	Are pump pressure regulators set at approved PSI rating?	☐	☐	☐	☐
9.	Is welding equipment properly secured to rig?	☐	☐	☐	☐
10.	Are oxygen & acetylene bottles properly stored & labeled?	☐	☐	☐	☐
11.	Are welding torches (gas) equipped with anti-flashback check valve between bottle regulator & torch manifold?	☐	☐	☐	☐
12.	Are compressed air tanks regularly purged of excess moisture accumulation (air brakes)?	☐	☐	☐	☐
13.	Are fossil fuels and flammable solvents stored/dispensed from approved safety cans? Properly labeled?	☐	☐	☐	☐
14.	Are discharge hoses on dual type percussion rig properly restrained/barricaded against striking personnel?	☐	☐	☐	☐
15.	Is Haz Mat spill control kit available/well stocked?	☐	☐	☐	☐
16.	Are proper number and kinds of outrigger pads, blocking, cribbing on hand?	☐	☐	☐	☐
17a.	Are kill switches operating? Initials of person who tested switches: _____	☐	☐	☐	☐
17b.	Indicate how to activate kill switch.	☐	☐	☐	☐
	Rigging/Material Handling Equipment				
18.	Is all material handling equipment used and maintained in accordance with 29 CFR 1926.251 and/or manufacturers recommendations?	☐	☐	☐	☐
19.	Has all hoisting equipment been completely inspected for broken wires, crushing, bird-caging, or other damage?	☐	☐	☐	☐
20.	Do all wire ropes have sufficient rated capacity for the hoisting equipment used and the lifts being performed?	☐	☐	☐	☐
21.	Are correct number of wire rope clamps in use & installed?	☐	☐	☐	☐
22.	Is a thimble installed in all hoisting eyes?	☐	☐	☐	☐
23.	Do hooks have approved safety latch installed?	☐	☐	☐	☐

	Drill Rig/Support Equipment	Yes	No	N/A	Repaired
24.	Does hook rating match rated tonnage of winch?	☐	☐	☐	☐
25.	List hoisting equipment inspected:	☐	☐	☐	☐

Serial Number **Description**

	Protective Systems/Equipment				
26.	Are all guards, etc. in place around pinch points, moving machinery etc. and in good repair?	☐	☐	☐	☐
27.	Are mechanical pinch points on drilling rig properly labeled/color coded?	☐	☐	☐	☐
28.	Is there adequate fall protection equipment available if climbing the mast is necessary?	☐	☐	☐	☐
29.	If derrick platform is more than 4 ft. above grade, is it equipped with safety railing and toe boards as required?	☐	☐	☐	☐
30.	Are signs stating caution/danger shock or electrocution hazard in place on the mast?	☐	☐	☐	☐
31.	Is there a possibility for exhaust fumes from the drilling rig to accumulate and affect worker's health?	☐	☐	☐	☐
32.	Is adequate lighting, in accordance with NFPA 70-1984, installed for night operations?	☐	☐	☐	☐
33.	Are all workers wearing proper hard hats, safety boots, and safety glasses?	☐	☐	☐	☐
34.	Are there an adequate number of fire extinguishers, portable eye wash(es), and first aid kit(s) on site?	☐	☐	☐	☐
	Programs/Plans				
35.	Are assured grounding procedures for equipment and power tools being followed?	☐	☐	☐	☐
36.	Are drillers following a "code of safe practices" developed by the contractor?	☐	☐	☐	☐
37.	Is there a safe procedure in place for guiding drill rods or pipe sections into racks or onto transport vehicle?	☐	☐	☐	☐
38.	Is a certified CPR/First Aid trained individual with the rig?	☐	☐	☐	☐

Comments:

Kingston Ash Recovery Project

EMERGENCY RESPONSE BEST PRACTICE

Date of Event: _____ **Location:** _____

Contractor(s) / Crew(s) Involved: _____

_____

Completed By: _____

Planned Drill? ☐ Yes ☐ No

Changes Required to Emergency Response and Contingency Plan? ☐ Yes ☐ No

Type of Response (check all that apply):

☐ Weather Emergency	☐ Fire	☐ Man Overboard
☐ Medical on Water	☐ Medical on Land	☐ Chemical Release
☐ Motor Vehicle	☐ Underground Utilities	☐ Other _____

Describe Event:

Summarize Response Actions:

Summarize Best Practices Identified:

Kingston Ash Recovery Project

EXCAVATION AND TRENCHING PERMIT

PART A – PERMIT AND EXCAVATION APPROVAL

I. Permit No. KRP - EX - _____ **Task Order No.** _____

II. Location and Description: _____

_____

_____

_____

_____

III. Permit and Excavation Approval:

	Print	Signature	Date
Responsible Supervisor			
Competent Person			
Engineer (Jacobs)			
Engineer (Civil Projects)			
Professional Engineer (if required)			
Program Administrator-Environ.			
Construction Manager (Jacobs)			
Manager (Civil Projects)			
HSE (Jacobs)			

PART B - PERMIT AND EXCAVATION FINAL CLOSURE

I. All Excavation Activities Completed:

	Print	Signature	Date
Responsible Supervisor			
Competent Person			
Engineer (Jacobs)			
Engineer (Civil Projects)			
Construction Manager (Jacobs)			

II. Excavation Documentation Received and Archived:

Document Control			

Return Excavation Permit to Document Control when work is completed

Excavation Start Date:		**Depth of Excavation:**	
Requesting Organization:			
Permit Issued Date:		**Does TVA Procedure 613 or 614 apply?** ☐ **Yes** ☐ **No** **Clearance #**_____	
Method of Excavation: ☐ Hand ☐ Power	**Drawing References (Civil, Mechanical, Electrical):**		

Identify how all underground obstructions were located and approximate depth restrictions:

☐ TN-1-Call (800-351-1111) Ticket Tracking # _____

_____

_____

_____

_____

_____

☐ In House _____

_____

_____

_____

_____

To Be Completed by Competent Person

Soil Classification

Maximum allowable slopes for excavations less than 20 feet (6.09 m) based on soil type and angle to the horizontal are as follows:

Soil Type	Height/depth ratio	Slope angle
☐ Stable Rock	Vertical	90 degrees
☐ Type A	¾:1	53 degrees
☐ Type B	1:1	45 degrees
☐ Type C	1½ :1	34 degrees
☐ Type A (short-term)	½ :1	63 degrees
(For a maximum excavation depth of 12 feet)		

Evaluation by Competent Person

Evaluation Question		
1.	Has the excavation area been checked for embedded pipes and other utilities and their locations identified and marked?	☐ Yes ☐ NA
2.	Are pipes/utilities (including overhead power lines which could be contacted by excavation equipment) required to be de-energized/blanked off and necessary hold orders established?	☐ Yes ☐ No
3.	Do employees need to be briefed on the permit, work procedures, special hazards, and required personal protective equipment (PPE)?	☐ Yes ☐ No
4.	Do any surface encumbrances need to be removed or supported?	☐ Yes ☐ No
5.	Are adequate precautions being taken to control water accumulation?	☐ Yes ☐ NA
6.	Are standard guardrails required because employees have to cross the excavation by bridge or ramp or when they must work near the edge of the excavation?	☐ Yes ☐ NA
7.	Have all employees who are responsible for supervising or entering excavation and trenches completed the training course “Excavations and Trenching - Affected Person?”	☐ Yes ☐ NA
8.	Will walkways or bridges be required for foot traffic?	☐ Yes ☐ No
9.	Are employees protected from loads or objects falling from lifting or digging equipment?	☐ Yes ☐ NA
10.	Is a flagman required wearing warning vests or other suitable garments marked with or made of reflectorized or high visibility materials?	☐ Yes ☐ NA
A Registered Professional Engineer (RPE) shall design/approve shoring or stability of the structure in question if ANY of the questions 11-14 are YES. Is an RPE required?		☐ Yes ☐ No
11.	Will the excavation exceed 20 feet in depth?	☐ Yes ☐ No
12.	Do sloping protective measures meeting 29CFR 1926, Subpart P, “Excavations” require RPE?	☐ Yes ☐ No
13.	Is the excavation adjacent to or beneath any structure or foundation such that the stability of the structure could be affected?	☐ Yes ☐ No
14.	Will vehicles cross the excavation?	☐ Yes ☐ No
If excavation is 4 feet or less, THEN questions 16-23 may be skipped 15.	Is excavation 4 feet or less?	☐ Yes ☐ No

Evaluation Question		
16.	Does the shoring/shielding or sloping system used meet requirements?	☐ Yes ☐ NA
17.	Does the excavation require testing/monitoring for oxygen deficiency or flammable/toxic atmospheres?	☐ Yes ☐ NA
18.	Have adequate warnings, barricades, or stop-logs been provided where mobile equipment is operated adjacent to the excavations?	☐ Yes ☐ NA
19.	Are trenches provided with a fixed means of egress?	☐ Yes ☐ No
20.	Is spacing between ladders or other means of egress such that a worker will not have to travel more than 25 feet laterally to the nearest means of egress?	☐ Yes ☐ NA
21.	Are ladders secured and extend a minimum of 36 inches above the landing?	☐ Yes ☐ NA
22.	Have adequate barricades and warning signs been provided in proximity to pedestrians or vehicle traffic?	☐ Yes ☐ No
23.	Will excavated material and equipment positioned at least 2 feet from the edge of the excavation and/or otherwise restrained from falling into the excavation?	☐ Yes ☐ NA

Daily Excavation Inspection Log

Permit Number: _____

Location: _____

Date	Time	Condition	Competent Person

Generating Plant Excavation Permit Cover Page

See TVA SAFETY MANUAL PROCEDURE NUMBER 804

Part A – Permit and Excavation Approval

I. Permit No. EX - _____ **Work Order No.** _____

II. Location and Description: _____

_____

_____

_____

_____

_____

III. Permit and Excavation Approval:

	Print	Signature	Date
Responsible Supervisor			
Engineer (Elec)			
Engineer (Mech)			
Competent Person			
Registered Prof Engineer			
Program Administrator-Environmental			
RADCON			
Security			
Maintenance Manager			

Generation Sensitive Activity ☐ Yes ☐ No **If Yes, THEN describe:**

_____

_____

Shift Operations Supervisor/ Shift Manager GSA Concurrence			
Operations Manager			
Engineering Manager			

Part B - Permit and Excavation Final Closure

I. All excavation activities complete and configuration control either complete or in progress:

	Print	Signature	Date
Responsible Supervisor			
System Engineer (Elec)			
System Engineer (Mech)			
Shift Operations Supervisor/Shift Manager			

II. Excavation Documentation Received and Archived:

Engineering Manager			

TVA Excavation Permit

Date	Permit Number	Work Order Number	Excavation Start Date

Reason for Excavation	Location of Excavation	Depth of Excavation

Requesting Organization	Responsible Supervisor	Competent Person	Registered PE

Permit Issued by Engineering Manager	Permit Issued Date	Clearance Number

Method of Excavation ☐ Hand ☐ Power	Drawing References (Civil, Mechanical, Electrical)

Sketch Area

Identify all underground obstructions and approximate depth restrictions:

_____

_____

_____

_____

Excavation Permit Closure

Excavation Completed (Competent Person Name)	Closure Date

Return Excavation Permit to Engineering when work is completed

TVA Excavation Permit

Soil Classification

Maximum allowable slopes for excavations less than 20 feet (6.09 m) based on soil type and angle to the horizontal are as follows:

Soil Type	Height/depth ratio	Slope angle
☐ Stable Rock	Vertical	90 degrees
☐ Type A	¾:1	53 degrees
☐ Type B	1:1	45 degrees
☐ Type C	1½ :1	34 degrees
☐ Type A (short-term)	½ :1	63 degrees
(For a maximum excavation depth of 12 feet)		

Evaluation by Competent Person

Evaluation Question		
1. Has the excavation area been checked for embedded pipes and other utilities and their locations identified and marked?	☐ **YES**	☐ **NA**
2. Are pipes/utilities (including overhead power lines which could be contacted by excavation equipment) required to be de-energized/blanked off and necessary hold orders established?	☐ **YES**	☐ **NO**
3. Do employees need to be briefed on the permit, work procedures, special hazards, and required personal protective equipment (PPE)?	☐ **YES**	☐ **NO**
4. Do any surface encumbrances need to be removed or supported?	☐ **YES**	☐ **NO**
5. Are adequate precautions being taken to control water accumulation?	☐ **YES**	☐ **NA**
6. Are standard guardrails required because employees have to cross the excavation by bridge or ramp or when they must work near the edge of the excavation?	☐ **YES**	☐ **NA**
7. Have all employees who are responsible for supervising or entering excavation and trenches completed the training course “Excavations and Trenching - Affected Person?”	☐ **YES**	☐ **NA**
8. Will walkways or bridges be required for foot traffic?	☐ **YES**	☐ **NO**
9. Are employees protected from loads or objects falling from lifting or digging equipment?	☐ **YES**	☐ **NA**
10. Is a flagman required wearing warning vests or other suitable garments marked with or made of reflectorized or high-visibility materials?	☐ **YES**	☐ **NA**
A Registered Professional Engineer (RPE) shall design/approve shoring or stability of the structure in question if ANY of the questions 11-14 are YES. Is an RPE required?	☐ **YES**	☐ **NO**
11. Will the excavation exceed 20 feet in depth?	☐ **YES**	☐ **NO**
12. Do sloping protective measures meeting 29CFR 1926, Subpart P, “Excavations” require RPE?	☐ **YES**	☐ **NO**
13. Is the excavation adjacent to or beneath any structure or foundation such that the stability of the structure could be affected?	☐ **YES**	☐ **NO**
14. Will vehicles cross the excavation?	☐ **YES**	☐ **NO**

TVA Excavation Permit

If excavation is 4 feet or less, THEN questions 16-23 may be skipped 15. Is excavation 4 feet or less?	☐ **YES**	☐ **NO**
16. Does the shoring/shielding or sloping system used meet requirements?	☐ **YES**	☐ **NA**
17. Does the excavation require testing/monitoring for oxygen deficiency or flammable/toxic atmospheres?	☐ **YES**	☐ **NA**
18. Have adequate warnings, barricades or stop-logs been provided where mobile equipment is operated adjacent to the excavations?	☐ **YES**	☐ **NA**
19. Are trenches provided with a fixed means of egress?	☐ **YES**	☐ **NO**
20. Is spacing between ladders or other means of egress such that a worker will not have to travel more than 25 feet laterally to the nearest means of egress?	☐ **YES**	☐ **NA**
21. Are ladders secured and extend a minimum of 36 inches (0.9m) above the landing?	☐ **YES**	☐ **NA**
22. Have adequate barricades and warning signs been provided in proximity to pedestrians or vehicle traffic?	☐ **YES**	☐ **NO**
23. Will excavated material and equipment positioned at least tow (2) feet from the edge of the excavation and/or otherwise restrained from falling into the excavation?	☐ **YES**	☐ **NA**

TVA Excavation Permit

Daily Excavation Inspection Log

Permit Number: _____

Location: _____

Date	Time	Condition	Competent Person

KINGSTON ASH RECOVERY PROJECT

FLOAT PLAN

Kingston Ash Recovery Project site contractors are to complete this plan before going boating. Upon completing this float plan, leave the form with the land Point of Contact (POC) while you're on the water. **The POC is to notify TVA Police (800-824-3861) if you do not return by the "Planned Return Time" time and you cannot immediately be located.** Upon return, take the plan back from the POC and submit it to the Contractor Safety & Health Officer for filing.

THIS PLAN DOES NOT HAVE TO BE FILED WITH THE COAST GUARD

Pilot's Name: _____ Cell Phone #: _____

Address: _____

DESCRIPTION OF VESSEL

Vessel Name: _____ Make: _____

Vessel Registration #: _____ State: _____

Type: _____ Hull Color: _____ Trim Color: _____

Hull Material: _____ Distinguishing Features: _____

Engine(s) Number/Type/Horsepower: _____ Fuel Type/Capacity: _____

☐ Watercraft checked-in proper working order

TRAILER INFO

Tow Vehicle Registration #: _____ State: _____

Tow Vehicle Make / Model / Color: _____

Trailer Registration #: _____ State: _____

Ramp Location: _____

PASSENGERS ON-BOARD

Passenger Name	Cell Phone #

TRIP DETAILS

Departure Date: _____ Departure Time: _____ AM / PM

Planned Return Date: _____ Planned Return Time: _____ AM / PM

Point of Departure: _____ Point of Return: _____

Destination(s)/Purpose of Trip: _____

SAFETY EQUIPMENT ONBOARD

☐ Personal Flotation Devices ☐ Flares ☐ Flag and Flashlight ☐ Dock and Anchor Lines

☐ Anchor ☐ Paddle ☐ VHF Radio (Monitor Channel 10 and Weather Alert Channel)

Kingston Ash Recovery Project
HAZARD LEVEL-BASED ES&H CORRECTIVE ACTIONS TRACKING REPORT

#	OBSERVATIONS						HAZARD			IF KNOWN AND/OR APPROPRIATE		APPROPRIATE CORRECTION ACTION		CLOSED	
	Date	Organization	Location	Description	Observed By	New or Follow-Up	Hi Hazard Δ	Lo Hazard •	Other □	Recommendation / Reference	Responsible Party	Yes	No	Yes - Date	No - Follow-Up Date
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
13															
14															
15															

Notes:

1. High Hazard - Situation presenting exposure to a potentially high level of danger - e.g., potential source of imminent/immediate danger or IDLH (resultant high severity source of unmitigated ES&H or property/operational loss).
2. Low Hazard - Situation presenting exposure to a potentially low level of danger - e.g., potential source of routine/average safety problems (resultant low severity source of unmitigated ES&H or property/operational loss).
3. Other Hazard - Any other situation that, in your judgment, presents a potential hazard exposure that warrants at least some attention, correction, referral, review, analysis - e.g., potential ES&H **or** other hazard(s) associated with maintenance, operations, monitoring, planning, management, follow-up, etc.

KINGSTON ASH RECOVERY PROJECT

INSTRUMENT CALIBRATION LOG

Instrument: _____ Serial Number: _____ Month: _____

DATE	TIME	CAL SOURCE	LOT NUMBER	CONCENTRATION	SPAN SETTING	INITIALS	CAL CHECK	TIME	INITIALS

FORM 072

Kingston Ash Recovery Project

INTEGRATED AIR MONITORING RECORD

Employee Name: _____ Cell Number: _____

SEG/Company: _____ Shift Duration: _____ hours

Project Name: _____ Project Number: 05DJ5400

Sampled By: _____ Sample Date: _____

Sampling Method and Analyte: _____

Justification for Sampling: _____

Sample Type:

☐ Personal-TWA ☐ Area ☐ Bulk Does Sampling Represent Typical Exposure? ☐ Yes ☐ No

Temperature: _____ Humidity: _____ Wind: _____ Barometer Pressure: _____

Collection Media:

☐ Charcoal Tube ☐ Filter (Total) # _____ ☐ Passive Dosimeter

☐ Silica Gel ☐ Filter (Resp.) # _____ ☐ Cyclone: # _____

Sample Pump

Mfg. and Model No: _____ Serial No: _____

Calibration/Flowcheck Date: _____ By: _____

Sample equipment in good condition? (Y/N) _____

Calibrator

Mfg. and Model No: _____ Type: _____ Serial #: _____

Calibration Date: _____

Sample # YYMMDD-AAA-nn	Time On	Time Off	Total Time (mins.)	Pre-Sample Flow Rate (LPM)	Post-Sample Flow Rate (LPM)	Average Flow Rate (LPM)	Sample Volume (Liters)	Analytical Result	TWA

Descriptive Data: (Engineering controls or PPE used, work activities, sample interferences, etc.)

Respirator used? (Y/N) ___ Type Respirator: _____ Smoker? (Y/N) _____ #/day ____	

Signature: _____ Date: _____

Memorandum of Agreement
Chain of Custody
Industrial Hygiene Monitoring

Personnel working on the Tennessee Valley Authority (TVA) Kingston Coal Ash Recovery Project are potentially subjected to Stressors of Potential Concern (SOPC) when performing in the clean-up activities, whether chemical or physical stressors. This agreement applies to those personnel with whom the Jacobs Engineering Group Inc. (Jacobs) Health, Safety, and Environmental protection services perform monitoring. The intent of this document is to clarify and attain buy-in of both persons being monitored and their supervisors. The monitoring can be in the form of air sampling, noise dosimetry, etc.

This monitoring is for the benefit of the employee and TVA. This monitoring is a scientific study to measure any potential exposures to the employee. The results of this study will be prepared for inclusion into medical records and if necessary, part of an epidemiological review of exposure history. The employee and employer should receive a copy of the results approximately two to three weeks after laboratory results are received by Jacobs.

The monitored employee and their supervisors agree to the following:

- The monitored employee and supervisor understand that the employee shall have complete control of the equipment for the full period of integrated monitoring and shall not allow others to take custody until the employee releases custody to the Site Industrial Hygienist or Industrial Hygiene (IH) Technician.
- The monitored employee will coordinate with their supervisor and IH Technician, and report they will be on site for the full duration of their shift prior to the beginning of the monitoring period.
- The monitored employee and supervisor will identify to the IH Technician the shift length prior to the beginning of the monitoring period.
- The monitored employee and supervisor will act responsibly in identifying the employee's ability to remain on site for the full day through lunch (pausing for lunch in an approved lunch location on site), or will equally identify and coordinate with the IH Technician at the beginning of the monitoring period the exact times for lunch break (start and stop times) so the IH Technician may recover control of any instruments and monitoring times (custody guaranteed).
- The monitored employee and supervisor understand the employee shall not lose control of, nor place the IH monitoring equipment out of his reach during the full shift period for the day unless control is agreed upon and given to an approved IH Technician (this document serves as a custodial record for any potential U.S. Environmental Protection Agency audit).
- The monitored employee and supervisor understand the employee shall not tamper with, vandalize, lose, nor destroy the instrument(s) without expecting to reimburse the owner of the instruments (some cost over $1,000.00 U.S.).
- The monitored employee and supervisor understand the employee shall not tamper with the collection device (filter and cassette, microphone, etc.) as the responsibility of laboratory analysis costs will most likely be shifted to the employee, despite the result not providing any relative, scientific and usable results for identifying the potential exposures to the employee.
- The monitored employee and supervisor understand the reasoning behind this scientific study, or will ask the Site Lead Industrial Hygienist or designee prior to the beginning of the monitoring period.
- The monitored employee and supervisor understand and agree in addition to the IH representative possibly riding with the employee to make adequate observations, but will also be available for an end-of-day close-out interview to capture timelines for tasks throughout the day's performance.

The below understand failure to comply with any of the items listed above will cause a report to be sent to the site managers and their chain of command.

Employee Printed Name	Employee Signature	Date

Supervisor Printed Name	Supervisor Signature	Date

Job Safety Analysis Worksheet

Number:	**Job:**		**Date:**
Page of	**Supervisor:**	**Plant / Facility:**	**Analysis By:**
Skills Required:		**Reviewed By:**	**Approved By:**
Required Personal Protective Equipment:			
Tools and Equipment Required:			
Job Preparation:			
Hazardous Materials:		**Special Requirements:**	

Number	Sequence of Basic Job Steps	Potential Accidents or Hazards	Recommended Safe Job Procedures
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

1. Struck By (**SB**)
2. Struck Against (**SA**)
3. Contact By (**CB**)
4. Contact With (**CW**)
5. Caught On (**CO**)
6. Caught In (**CI**)
7. Caught Between (**CBT**)
8. Foot Level Fall (**FLF**)
9. Fall to Below (**FB**)
10. Overexertion (**OE**)
11. Exposure (**E**)

FORM 060

Job Safety Analysis (JSA) Surveillance

Date: _____ Location: _____

Initiator: _____

Supervisor: _____

Job Description: _____

JSA TASK (check all that apply)

- ☐ Pre-Construction Walkdown _____
- ☐ Project Hazard Analysis Walkdown _____
- ☐ Project Assessment/Audit _____
- ☐ Project-Specific Task (define) _____

JSA PRE-TASK CONSIDERATIONS

- ☐ Physical/Access Limitations _____
- ☐ Asset Care Rep. Notified _____
- ☐ Fatigue/Stress _____
- ☐ Fit for Task _____
- ☐ Time Restrictions _____
- ☐ Trained for Task Hazard/Controls _____
- ☐ Other (list additional considerations) _____

TRAVEL TO LOCATION

(check all that apply and list action to eliminate or control)

- ☐ Travel Route _____
- ☐ Weather Conditions _____
- ☐ Vehicle Check/Familiarity _____

PERSONAL PROTECTIVE EQUIPMENT

- ☐ Hard hat
- ☐ Safety glasses with side shields
- ☐ Safety toe footwear
- ☐ Hearing protection
- ☐ High visibility vest
- ☐ Gloves, Type: _____
- ☐ Other (list project/task required PPE) _____

TASK HAZARDS

(check all that apply and list action to eliminate or control)

- ☐ Confined Spaces _____
- ☐ Trench/Excavation* _____
- ☐ Material Handling _____
- ☐ Hot Work Activities _____
- ☐ Energized Work Activities* _____
- ☐ Biological (vegetation, animals, etc.) _____
- ☐ Temperature Extremes _____
- ☐ Noise _____
- ☐ Chemical Exposure _____
- ☐ Ergonomics _____
- ☐ Elevated Work* (ladders, scaffolding, >6 ft) _____
- ☐ Overhead Work _____
- ☐ Weather _____
- ☐ Natural/Site Conditions _____
- ☐ Slips, Trips, Falls _____
- ☐ Heavy Equipment (cranes, forklifts, vehicles) _____
- ☐ Lockout/Tagout/Tryout* _____
- ☐ Small Tool Use _____
- ☐ Pinch Points _____
- ☐ Rotating Equipment _____
- ☐ Adjacent Work/Processes _____

*Training required

EMERGENCY INFORMATION

Emergency Evacuation Assembly Point _____

Safety Eyewash & Shower Location _____

Fire Pull Station _____

Security Number _____

Operations Contact/Number _____

Kingston Ash Recovery Project

LIFT PLAN

FIGURE 1: LIFT LOAD AND CAPACITY CALCULATIONS		
Lift Description:		
A. Weight of Load (Equipment) – Live Load		
1. Load/Equipment Condition ☐ New ☐ Used		
2. Weight of Load/Equipment Empty		Lbs.
3. Weight of Attachments		Lbs.
a. Platforms and Ladders		Lbs.
b. Piping and Accessories		Lbs.
c. Liquids Inside		Lbs.
d. Dirt and Debris		Lbs.
e. Internal Trays or Liners		Lbs.
f. Other		Lbs.
4. Total Amount of Load/Equipment Weight (A2 thru A3f)		Lbs.

B. Total Lifted Weight (Load and/or equipment + rigging + main crane deductions)					
1. Load and/or equipment weight plus contingency*		%	7. Wt. Jib Erected		Lb
2. Amount of Equipment Weight		Lb	7a. Wt. of Jib Stowed		Lb
3. Weight of Headache Ball		Lb	8. Wt. of Jib Headache Ball		Lb
4. Weight of Main Block		Lb	9. Wt. of Cable (Load Fall)		Lb
5. Weight of Spreader Bar		Lb	10. Auxiliary Boom Head		Lb
6. Weight of Slings and Shackles		Lb	11. Other:		Lb
*Use 100% plus some percentage (example +10%) to multiply times number in A4 to allow for contingency to compute B2.					
TOTAL LIFTED WEIGHT (Sum B2 thru B11)		Lbs.			
Source of Load Weight (A2) (Name Plate, Drawings, Calculated, Weighed, etc.):					
Weights and Calculations By:			Date:		
Weights and Calculations Verified By:			Date:		

FIGURE 1: LIFT LOAD AND CAPACITY CALCULATIONS				
C. Capacities of the (Main) Crane				
1. Make and Model of Crane:				
2. Counter Weight Size:		Type of Boom:		
3. Lifting Arrangement				
a. Max. Radius During Lift			Ft.	
b. Length of Boom			Ft.	
c. Angle of Boom at Pick			Deg.	
d. Angle of Boom at Set			Deg.	
e. Rated Capacity Under Most Severe Conditions				
1) Over Rear			Lbs.	
2) Over Front			Lbs.	
3) Over Side			Lbs.	
f. Rated Capacity for Lift Radius, Crane Configuration, and Orientation (over front, side or….)				Lbs.
4. Jib				
a. Is the Jib to be used? ☐ Yes ☐ No				
b. Length of Jib			Ft.	
c. Jib Angle			Deg.	
d. Rated Jib Capacity for Lift Radius, Crane Configuration, and Orientation (over front, side, or…)				Lbs.
5. Load Line/Fall Cable				
a. Is Main Block to be used? ☐ Yes ☐ No				
b. Number of Parts of Cable			#	
c. Size of Cable			Ø Inches	
d. Maximum Capacity for Lift Radius, Crane Configuration, and Orientation (over front, side, or ….)				Lbs.
D. Percent of Cranes Capacity (>85% requires High Hazard Lift Approvals)				
Total Lifted Weight X 100 ÷ Rated Capacity =				%
E. Size of Slings				
1. Sling Selection				
a. Type of Arrangement			(Spreader, Vertical Slings, etc.)	
b. Number of Slings to Hook		Ø Capacity		Lbs.
c. Sling Size			Ø	
d. Sling Length			Ft.	
e. Sling Capacity (At angle used)			Lbs.	
f. Number of Slings to Load			#	
g. Total Rigging capacity (e X f)				Lbs.
Comments:				
Sketch of rigging arrangement available? ☐ Yes ☐ No If Yes, see Page ( )				
End of Standard Lift Plan Paperwork				

FIGURE 1: LIFT LOAD AND CAPACITY CALCULATIONS		
F. Total Lifted Weight to be lifted by Tailing Crane		
1. Percent of Total Equipment/Material Weight (Generally 50+% based on CG and movement during up righting)		%
2. Amount of Equipment Weight (A4 x F1)		Lbs.
3. Weight of Headache Ball		Lbs.
4. Weight of Block		Lbs.
5. Weight of Lifting Bar		Lbs.
6. Weight of Slings and Shackles		Lbs.
7. Weight of Jib Erected		Lbs.
8. Weight of Jib Headache Ball		Lbs.
9. Weight of Cable Load (Load Fall)		Lbs.
10. Auxiliary Boom Head		Lbs.
11. Other		
12. Total Weight of Load/Equipment lifted by tailing crane (F2 through F11)		Lbs.
Source of Load Weight (Name Plate, Drawings, Calculated, Weighed):		
Weights Verified By:	(Printed Name)	(Signature)
G. Capacities for Tailing Crane Based on Configuration		
1. Make and Model of Crane:		
2. Counter Weight Size: Type of Boom:		
3. Lifting Arrangement		
a. Max. Radius During Lift		Ft.
b. Length of Boom		Ft.
c. Angle of Boom at Pick		Deg.
d. Angle of Boom at Set		Deg.
e. Rated Capacity Under Most Severe Conditions		
1) Over Rear		Lbs.
2) Over Front		Lbs.
3) Over Side		Lbs.
f. f. Rated Capacity for Lift Radius, Crane Configuration, and Orientation (over front, side or…)		Lbs.
4. Jib		
Is the Jib to be used? ☐ Yes ☐ No		
a. Length of Jib		Ft.
b. Jib Angle		Ft.
c. Rated Jib Capacity for Lift Radius, Crane Configuration, and Orientation (over, front, side, or…)		Lbs.
5. Cable		
a. Number of Parts		
b. Size of Cable		Inch
c. Maximum Capacity		Lbs.

FIGURE 1: LIFT LOAD AND CAPACITY CALCULATIONS				
H. Percent of Cranes Capacity Tailing Crane				
Total Lifted Weight X 100 ÷ Rated Capacity =				%
I. Size of Slings for Tailing Crane				
1. Sling Selection				
a. Type of Arrangement:				
b. Number of Slings to Hook		Ø Capacity		Lbs.
c. Sling Size				Ø
d. Sling Length				Ft.
e. Sling Capacity (at angle used)				Lbs.
f. Number of Slings to Load				#
g. Total Rigging Capacity (e X f)				Lbs.
J. Soil Bearing Analysis				
1. Soil bearing capacity main crane				
2. Required ground bearing pressure main crane				
3. Soil bearing capacity tailing crane				
4. Required bearing capacity tailing crane				
K. Note Any Rotation of Load at Final Set Location				
Comments:				
Sketch of rigging arrangement available? ☐ Yes ☐ No If Yes, see Page ( )				
L. Reviewed by (additional reviews required for high hazard lifts, see Figure 2):				
Contractor Construction Manager:				
Lift Supervisor:				
Rigging Supervisor :				
Crane Operator:				
Jacobs Construction Manager:				

FIGURE 2: HIGH HAZARD LIFT PERMIT		
A. Lift Identification		
Job Number:	Location:	
Lift Supervisor Name:		
Date of Lift:		Time:
Lift Description:		
B. Approvals (Signatures Required)		
Site Construction Manager:		
	(Signature)	(Date)
Project Manager:		
	(Signature)	(Date)
Lift Supervisor:		
	(Signature)	(Date)
Rigging Superintendent:		
	(Signature)	(Date)
Crane Coordinator:		
	(Signature)	(Date)
Operator(s):		
	(Signature)	(Date)
Engineering:		
	(Signature)	(Date)
If Engineering Designs are Used		
Other:		
	(Signature)	(Date)

C. Attachments (Insert Page Numbers)	Page Number(s)
1. Operator Certifications	
2. Capacity Certificates and Inspection Reports for all Lifting Equipment	
3. Inspection Reports for all Rigging Equipment	
4. Insurance Certificates	
5. Applicable capacity charts and chart notes for lifting equipment	
6. Load and Capacity Calculations	
7. Rigging Diagram(s)	
8. Lift Geometry and Free Body Diagram(s)	
9. Other	
10. Other	

FIGURE 3: PRE-LIFT CHECKLIST		
1. Crane operator meets company qualification requirements?		☐ Yes ☐ No
2. Lift calculations and rigging plan completed?		☐ Yes ☐ No
3. Are lift equipment swing & travel requirements & clearances known?		☐ Yes ☐ No
4. Are all required approvals/permits signed?		☐ Yes ☐ No
5. Crane inspections up to date (Annual/Monthly/Daily)?		☐ Yes ☐ No
6. Weather conditions and wind speed acceptable?		☐ Yes ☐ No
7. Has the stability of the ground been assured by soil bearing analysis?		☐ Yes ☐ No
8. Location and size of underground facilities are known?		☐ Yes ☐ No
9. Matting and/or outrigger pads inspected and approved?		☐ Yes ☐ No
10. Electrical equipment and power lines at required distance?		☐ Yes ☐ No
11. Rigging Inspected for defects?		☐ Yes ☐ No
12. Engineered lifting lugs fabricated and installed correctly?		☐ Yes ☐ No
13. Connecting/disconnecting means been developed?		☐ Yes ☐ No
14. Have the safety precautions been reviewed?		☐ Yes ☐ No
15. Is survey equipment required?		☐ Yes ☐ No
16. Lift Hold Point of ≥_____lbs communicated to crew?		☐ Yes ☐ No
17. Signal person(s) assigned?		☐ Yes ☐ No
18. Safe Plan of Action (SPA) Completed?		☐ Yes ☐ No
19. Pre-Lift Meeting/Task Safety Awareness Meeting (TSA) held?		☐ Yes ☐ No
20. Hoist area & load path cleared of non-essential personnel?		☐ Yes ☐ No
21. Crane set up per the lift plan (radius, configuration, etc)?		☐ Yes ☐ No
22. Rigging equipment and tag line(s) installed per plan?		☐ Yes ☐ No
Completed By:		
(Printed Name)	(Signature)	(Date)

Kingston Ash Recovery Project

PPE DOWNGRADE RATIONALE

Exposure Group/Crew: _____ Date: _____

ITEM	CURRENT	PROPOSED
Suit		
Respirator		
Cartridge		
Cartridge Change-out Frequency		
Gloves	1.	1.
	2.	2.
	3.	3.
Boots		
Other		

Rationale for Change:

Condition Causing Suspension of Downgrade:

Approvals:

Crew Superintendent: _____

Site Manager: _____

Program Health and Safety Manager: _____

Kingston Ash Recovery Project

SAFETY COACHING VISIT CHECKLIST

Location:	Date of observation:	Time:
Type of work being observed:	Number of people observed:	
Equipment being worked on:	Name of Safety Coaching Visit Coach:	
Pre-job briefing held? ☐ Yes ☐ No		
Two minute rule used? ☐ Yes ☐ No	Eyes on Path Used? ☐ Yes ☐ No	

CATEGORY A			CATEGORY C			CATEGORY E		
Adequacy of PPE			**Are Reactions of People Appropriate**			**Procedures**		
	Safe	At Risk		Safe	At Risk		Safe	At Risk
Eyes and face	☐	☐	Adjusting PPE	☐	☐	Standard practice adequate	☐	☐
Ears	☐	☐	Changing positions	☐	☐	Standard practice established	☐	☐
Head	☐	☐	Rearranging jobs	☐	☐	Standard practice maintained	☐	☐
Hands and arms	☐	☐	Stopping job	☐	☐	Electrical clearance proper	☐	☐
Feet and legs	☐	☐	Attaching grounds	☐	☐	Fire watch adequate	☐	☐
Respiratory system	☐	☐	Exposure to moving equipment	☐	☐	Crew properly briefed	☐	☐
Trunk	☐	☐	Changing tools	☐	☐	Clearance boundaries	☐	☐
Arc slash	☐	☐	Hurrying	☐	☐			

CATEGORY B			CATEGORY D			CATEGORY F		
Positions of People			**Tools & Equipment**			**Orderliness**		
	Safe	At Risk		Safe	At Risk		Safe	At Risk
Struck By	☐	☐	Right for job	☐	☐	Standards established	☐	☐
Off balance	☐	☐	Used correctly	☐	☐	Standards understood	☐	☐
Caught between	☐	☐	Carried or stored properly	☐	☐	Passageways clear	☐	☐
Falling	☐	☐	Serviceable	☐	☐	Tools & materials organized	☐	☐
Riding on equipment	☐	☐	Seat belt in use	☐	☐	Stairs unobstructed	☐	☐
Electrical contact	☐	☐	Barricades or warning lights	☐	☐	Housekeeping appearance adequate	☐	☐
Chemical exposure	☐	☐	Checks restraints used	☐	☐	FME standards maintained	☐	☐
Overexertion	☐	☐	Inspection color code present	☐	☐	Walking surfaces clear	☐	☐
Repetitive motion	☐	☐	Mobile equipment	☐	☐			

SUMMARY OF OBSERVATIONS

Category A

Category B

Category C

Category D

Category E

Category F

General Recommendations

KINGSTON ASH RECOVERY PROJECT

SAFETY OBSERVATION REPORT

SOR No.:	Date:	Time:	Location:	Contractor:

Observation:

Describe Immediate Corrective Action:

Describe Action to Prevent Recurrence:

Observer:

Printed Name _____ Signature _____

Category:

- ☐ Biological
- ☐ Electrical
- ☐ Ergonomics
- ☐ Facilities
- ☐ Fall From Elevation
- ☐ Good Work Practices
- ☐ Housekeeping
- ☐ PPE
- ☐ Slips, Trips, & Falls
- ☐ Spills/Releases
- ☐ Tools & Equipment
- ☐ Vehicle
- ☐ Weather
- ☐ Work Practice
- ☐ Other

Description of Corrective Action:

Supervisor/Manager:

Printed Name _____ Signature _____ Date Completed _____

Copy:

Jacobs Project Manager _____ Contractor SSHO _____ Other _____

☐ Closed? FORM 061-Rev. 4

Safety Observation Report (SOR)

Date: _____ Time: _____ AM / PM

Observer: _____

Supervisor: _____

Observed Company: _____

L□□□□□□□□:

☐ Site Road
☐ Office Trailer
☐ Sampling House
☐ Berkshire House
☐ Lakeshore Drive
☐ Gupton Farm
☐ Sluice Trench
☐ Ponds
☐ Other: _____

☐ Embayment
☐ Lateral Expansion
☐ Dredge Cell / Central
☐ Perimeter Wall Stabilization
☐ Batch Plant
☐ Ball Field
☐ Material Access Point
☐ South Access Point
Dikes: ☐ C ☐ D ☐ T-2

O□□□□□□□□□□:

☐ Unsafe Act ☐ Safe Act ☐ Unsafe Condition ☐ Safe Condition

Description (continue on back if needed): _____

_____

_____

_____

Action taken or to prevent recurrence: _____

_____

_____

☐ Housekeeping
☐ Fall Protection
☐ Scaffolds, Ladders, Stairways
☐ Slips, Trips, Falls
☐ Personal Protective Equipment
☐ Vehicles, Mobile Equipment
☐ Heavy Equipment
☐ Tools and Equipment

☐ Material Handling
☐ Utilities
☐ Weather
☐ Work Practices
☐ Electrical
☐ Ergonomics, Repetitive Stress
☐ Biological
☐ Other

SOR Tips

Personal Protective Equipment
– PPE: Head, face, hands, hearing, feet, clothing

Positions of People
– Ergonomics/Repetitive Stress: Configuration, layout

Reactions of People
– Slips, Trips, Falls: Walkways, illumination, alertness

Tools & Equipment
– Heavy Equipment: Backup alarms, spotters, training
– Tools and Equipment: Selection, use and maintenance
– Vehicles, Mobile Equipment: Inspection, operation, maintenance

Procedures
– Fall Protection: Railings, tie-offs, anchorage, PPE, inspection
– Biological: Poisonous plants, spiders, insects, snakes, rodents
– Material Handling: Hoisting, rigging, proper use, inspection
– Scaffolds, Ladders, Stairways: Inspect, tag, position, tie-off
– Utilities: Electrical hazards, potable water
– Weather: Lightning, heat, cold, rain, tornado
– Work Practices: Body position, cheaters, pinch points, proper tools
– Electrical: Verify energy control steps, GFCI, cords, LO/TO

Orderliness
– Housekeeping: Trash, tripping hazards, cords, material storage, access, egress

Other: _____

_____

_____

_____

_____

_____

Kingston Ash Recovery Project

SITE TAILGATE MEETING

Conducted By: _____ Date: _____ Time: _____

Location: _____

Type of Work: _____

HEALTH AND SAFETY TOPICS PRESENTED

PPE/Equipment:

_____

Chemical Hazards: _____

_____

Physical Hazards: _____

Emergency Procedures:

_____

Emergency Response

Hospital/Clinic: _____

Address: _____

Special Equipment: _____

Evacuation Route: _____

_____

General Discussion Information:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

ATTENDEES

Date: _____

Printed Name	Company	Signature

TVA TAKE TWO

Two Minute Hazard Identification

Filled out by: _____

Date: _____

WO Number (if applicable): _____

- **Orient your thinking to the task at hand.**
- **Consider any abnormal conditions that might influence the task.**
- **Look for any potential hazards to personnel or hindrances to the task.**

Explanation of task:

_____

_____

_____

_____

What are the hazards involved with the particular task or in the immediate area?

_____

_____

_____

_____

What am I going to do to mitigate those hazards?

_____

_____

_____

_____

Do I feel that this task can be performed safety?

☐ **Yes. I feel that I can safety perform this task.**

☐ **No. I am unsure that all hazards are recognized and mitigated, and I request additional support.**

_____

_____

_____

_____

_____

Name of employee(s) assigned this task Foreman/Supervisor concurrence that risks have been controlled if "No" was checked above.

_____

Reminders

- **Complete a "Take Two" card for every assigned job.**
- **Any employee has the right to stop a job and ask for help to control risks.**
- **Submit the completed card with the Work Package upon completion of the job.**

Kingston Ash Recovery Project

VISITOR ORIENTATION

Date: _____

Visitor Name: _____ Company: _____

Escort Name: _____ Company: _____

Purpose of Visit: _____

_____

Topics Discussed:

1. Escort required at all times.
2. Emergency response numbers.
3. Ammonia awareness.
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

Signatures:

_____ _____ _____

Visitor Escort

_____

HSE Representative

Kingston Ash Recovery Project

WET BULB GLOBE THERMOMETER (WBGT) READINGS

Instrument: Metrosonics hs-32 Serial Number: MCI100023 Cal Due Date: _____

Monitored By: _____ Date: _____

LOCATION/GRID	NOTIFICATION (1st, 2nd, 3rd, etc.)	TIME	WBGTO	GLOBE	WET	DRY

Kingston Ash Recovery Project

WORK ZONE CLASSIFICATION CHANGE NOTICE

Change Date: _____ Change Duration: _____

Area(s) Impacted: _____

_____

Description of Change (Attach Drawing): _____

_____

Justification: _____

_____

Submitted By: _____

Category:

- ☐ 1. Exclusion Zone to Contamination Reduction Zone
- ☐ 2. Exclusion Zone to Support Zone
- ☐ 3. Contamination Reduction Zone to Exclusion Zone
- ☐ 4. Contamination Reduction Zone to Support Zone
- ☐ 5. Support Zone to Exclusion Zone
- ☐ 6. Support Zone to Contamination Reduction Zone
- ☐ Other: _____

Adjustments to Decontamination Areas or Entry Control Points

- ☐ Are Not Needed
- ☐ Are Needed (describe below)

Indicate how impacted personnel will be notified:

Approvals:

Construction Manager: _____

Program Health and Safety Manager: _____

Program Manager (for change types 5 and 6 only): _____

EPA Remedial Project Manager: _____

APPENDIX E

~~ACTIVITY HAZARD ANALYSIS~~

MADE OBSOLETE BY REVISION 06

APPENDIX F
EMERGENCY RESPONSE AND CONTINGENCY PLAN

F1 – MAN OVERBOARD DRILL

All Captains will practice this procedure initially as a tabletop drill. Once the sequence and responsibilities are established an actual drill will be held on the water.

Be advised that in cold weather rescues, time is of the utmost importance.

When a person falls into the water – the first person to see him will maintain visual contact while alerting the ship's Captain to the person's location (if the person spotting the man overboard can maintain visual contact reach the nearest Type 4 PFD (life ring/cushion) and summon the Captain. The person spotting the man overboard will continually point out the location of the man overboard; if other personnel are available they will be summoned to help toss the life ring/cushion and notify the Captain. All work onboard the vessel will immediately cease when a "man overboard situation" exists.

The Captain will turn the screws (propellers) of the boat away from the location of the man overboard and will attempt to stay within 50 feet of the overboard person. The Captain will alert the Site Safety and Health Officer (SSHO) immediately, about the man overboard situation and keep the SSHO posted as to the person's condition as the rescue progresses. A man overboard may be a medical emergency and the SSHO/Emergency Coordinator may need to summon EMS to the dock/rally point or in extreme injury cases to the location of the boat (per the Site Safety and Health Plan Emergency Response and Contingency Plan).

Personnel tossing the life ring/cushion must remember to try to aim accurately for the person in the water so they only have to swim a minimum distance. Personnel tossing the life ring/cushion must also remember to secure the end of the rope so they can pull the overboard person back to the watercraft.

When personnel are retrieving the overboard individual they must remember that person will be heavy and may be a dead weight. Personnel will perform team lifting when available and will exercise caution so they are not also a man overboard.

Only as a last resort will other personnel jump into the water and these people will only do this if they have donned appropriate survival gear and have a second life ring/cushion that has a line secured to the watercraft.

Once the overboard person is rescued the boat will immediately proceed to the Emergency Evacuation Rally Point dock. Simultaneously the overboard person's condition will be monitored and the person will be treated for shock/hypothermia.

Upon arrival at the dock, the overboard person will immediately be transported to the paramedic station or the waiting ambulance.

F2 – PHONE TREE FOR EMERGENCY NOTIFICATION

Project Notification[1] – HSE Personnel to Call		
Name	**Organization**	**Number**
Kathryn Nash	TVA – GM	423-290-7820
Jack Howard	Jacobs – PM	865-399-7971
Tom Bock	Jacobs – HSE Manager	865-466-5771
Appropriate CM	Jacobs	
TVA Police	TVAP	800-824-3861 800-632-3631
Jacobs CM to Call		
Appropriate Jacobs Project Mgr.		
Michelle Cagley (If environmental)	TVA – Environmental	865-696-5038
SOS (If environ. or derailment)	TVA – Kingston Plant	865-717-2119
Jacobs HSE Manager to Call		
TVA Sr. Manager	On Weekend Duty	See Weekly Board or email
Jacobs PM Personnel to Call		
Appropriate TVA TCM		
Medical Support Contacts		
Paramedics	TVA	865-755-2556
Plant Nurse *(Mon – Thu; 0600 – 1600)*	TVA	865-717-2589
TVA Police	TVA	800-824-3861
Fire Response Contacts		
Roane County Fire[2,3]	Roane County	911

Notes:

1. Provide initial medical care and initiate emergency control activities prior to making project notifications.
2. If an outside EMS or fire response is required, it will be essential to contact TVA police with your location so they can provide escort to the responding unit.
3. TVA has a dedicated fire brigade for in-plant response. For activities occurring out on site, Roane County Fire (911) will provide primary response.

F3 – WATER EXTRACTION POINT DESCRIPTIONS

(Listed from North to South)

Water Extraction Point (WEP) Number	Description	Address	Latitude	Longitude
WEP-01	Walnut Hill Boat Ramp. Between ERM 10 and 11.	325 Hickory Road Harriman, TN 37748	35N 56.635	84W 32.421
WEP-02	RSI boat ramp – ERM 3.	189 Lakeshore Drive Harriman, TN 37748	35N 55.017	84W 30.140
WE-03	Skimmer Wall at the Kingston Ash Recovery Site. Exclusion Zone entry required via SAP (South Access Point).	Enter Kingston Ash Recovery Site via Swan Pond Road. Site roads to SAP entry.	35N 54.289	84W 30.217
WEP-04	Plant intake headwall near the filter plant. This area is outside of the designated Exclusion Zones.	Enter plant via primary emergency entrance	35N 54.041	84W 31.062
WEP-05	South dock at plant. This area is outside of the designated Exclusion Zones.	Enter plant via primary emergency entrance	35N 53.698	84W 31.355
WEP-06	Ladd's Landing boat ramp. Located offsite in a public area. Between CRM 4 and 5.	1477 N. Kentucky St. Kingston, TN 37763	35N 53.163	84W 29.518
WEP-07	Pier 58. Located offsite in a public area. Between CRM 0 and 1.	506 S. Kentucky St. Kingston, TN 37763	35N 52.031	84W 31.319
WEP-08	Caney Creek. Located offsite in a public area. Between TRM-562 and 563.	835 Caney Creek Rd. Harriman, TN 37748	35N 51.336	84W 36.033
WEP-09	Blue Springs Marina. Located offsite in public area. Between TRM 547 and 548.	3952 River Road Ten Mile, TN 37880	35N 44.095	84W 40.058

Notes:

CRM = Clinch River Mile
ERM = Emory River Mile
TRM = Tennessee River Mile
VECP = vehicle entry control point

F4 – SEVERE WEATHER PROCEDURES

SPECIAL MARINE CONSIDERATIONS

Gale Force Winds (34 to 47 knots or 39 to 54 mph)

No field work is to proceed during gale forced wind events. In addition, all areas will cease work a minimum of 30 minutes before the storm arrives. Any specific equipment or high-risk equipment (i.e., cranes, derricks) which may need special attention or which may be impacted by lower wind speeds, will be detailed on the Activity Hazard Analysis. All equipment will be lashed to the deck or placed in the storage area and all unnecessary boats and barges will be docked or removed from the water.

Use of any 12 to 16 foot aluminum-hulled tender boat during small craft advisories or greater warnings (18 to 33 knots or 20 to 38 mph) will not be allowed.

River Velocities

When Emory River flows reach 5,000 cubic feet per second (cfs) at the U.S. Coast Guard (USGS) station at Oakdale, Tennessee, site crews conducting river operations shall perform an evaluation of the specific river conditions at their work location, size of craft or vessel being used, and operational/task requirements to determine if safe conditions exist to continue operations.

When river flows reach 10,000 cfs at the USGS station at Oakdale, only emergency river operations related to rescue are permitted. All other personnel shall be restricted from river access.

Fog/Heavy Rain

If visibility is decreased to less than 10 feet, all boat movement must stop with the exception of emergency situations. During boat operations in fog/heavy rain with visibility greater than 10 feet, operation speed must be maintained to an appropriate level given the amount of visibility.

Should it be determined by the TVA/Jacobs personnel and the Captain that the weather conditions being encountered on the watercraft are dangerous and are worsening, all operations will cease, all equipment will be lashed to the deck or placed in the storage area, and all personnel will be transported to shore.

GENERAL MARINE CONSIDERATIONS

All vessels and personnel will maintain radio and cellular telephone communications/contact with the field offices. Radio communication/contact will occur via the site UHF radios and VHF marine radios. The channels to be used must be coordinated in advance and noted on the task-specific SWP.

National Weather Service (NWS) local weather forecasts will be monitored daily by Jacobs and contractor personnel for predicted inclement weather. Local weather forecasts will be discussed at the daily health and safety meeting.

All on-water personnel shall be aware of the forecast and keep an “eye to the sky”. Unpredicted storms may also occur without warning. The SSHO will also monitor NWS local Doppler radar as required and vessel Captains will monitor marine forecasts on the NWS radio frequencies.

F5 – MARINE EMERGENCY EQUIPMENT

1.0 GENERAL EQUIPMENT REQUIREMENTS

1.1 Fire

All watercraft having gasoline or liquid petroleum gas power plants or equipment in cabins, compartments, or confined spaces, shall be equipped with a built-in automatic carbon dioxide or other equally effective type of fire extinguishing system.

Each watercraft shall carry fire extinguishers (for use in gasoline, oil, and grease fires) approved by Underwriters Laboratories. Each fire extinguisher shall be inspected by the owner/operator monthly to ensure that it is sufficiently charged and that the nozzles are free and clear. Discharged fire extinguishers shall be replaced or recharged immediately. Extinguisher requirements are summarized in Table F5-1.

Table F5-1: Extinguisher Requirements

Length of Watercraft	Extinguisher Type	Minimum Number Required
26 feet or less	1-A:10-B:C	1
26 feet or more	1-A:10-B:C	2

1.2 Alarms Emergency Signaling Devices

General alarm systems shall be installed and maintained on all vessels where it is possible for either a passenger or crewman to be out of sight or hearing from any other person. Where general alarm systems are used they shall be operated from the primary electrical system with standby batteries on trickle charge, which will automatically furnish the required energy during an electrical system failure.

A sufficient number of signaling devices shall be placed on each deck so that they can be distinctly heard above the normal background noise at any point on the deck. All signaling devices shall be so interconnected that actuation can occur from at least one strategic point on each deck. All watercraft shall carry at least one air horn or similar sound-signaling device.

All watercraft shall carry a selection of pyrotechnic and non-pyrotechnic visual distress signals. Pyrotechnic visual distress signals include red flares, orange smoke, and aerial red meteor or parachute flares. Pyrotechnic visual distress signals shall not be used past the expiration date stamped on them. Non-pyrotechnic visual distress signals include an orange distress flag and a flashlight or other electric distress light. No single signaling device is ideal under all conditions and for all purposes.

Smoke and carbon monoxide alarms are required for all living quarters of a vessel; smoke alarms, if wired, should use the same electrical system as that of the electrical alarms.

1.3 Emergency Tools, Controls and Equipment

Vessels which do not have an enclosed operator control area or adequate railings require a dead-man switch be attached to the boat operator in the event they are ejected from the boat while it is in motion.

All powered watercraft shall carry a tool kit sufficient for the watercraft operator to troubleshoot common mechanical problems such as fouled spark plugs, flooded carburetor, electrical shorts, etc. Watercraft operated in remote areas shall also carry appropriate spare parts (propellers, shear pins, patch kits, air pumps, etc.). The tool kit shall be maintained by the watercraft operator, and expended supplies shall be replaced immediately.

Axes or other emergency cutting equipment shall be provided in accessible positions on all towing vessels for freeing lines in an emergency.

All controls requiring operation in cases of emergency - such as boiler stops, safety valves, power switches, fuel valves, alarms, and fire extinguishing systems - shall be located so that they are protected against accidental operation but are readily accessible in an emergency.

Each prime mover (engine, turbine, motor) driving a dredge pump shall be capable of being stopped by controls remote from the prime mover locations.

A shutoff valve shall be installed at the engine end of the fuel line unless the length of the supply pipe is 6 feet (1.8 m) or less. Arrangement shall be made for operating this valve from outside the house bulkheads, at or above the weather deck on the vessel.

A shutoff valve shall be installed at the fuel tank connection; arrangements shall be made for operating this valve from outside the compartment in which the tank is located and from outside the engine compartment and outside the house bulkheads at or above the weather deck of the vessel.

1.4 Emergency Escape

All doors shall be capable of being opened from either side and provided with positive means to secure them in both the open and closed position.

Escape hatches and emergency exits shall be marked on both sides with letters, at least 1 inch (2.5 cm) high, stating “EMERGENCY EXIT - KEEP CLEAR.”

Where appropriate, vessels should have watertight compartments readily identified and properly maintained in a watertight condition (i.e., sealable doors in place and fully functional) and all penetrations maintained in a watertight condition.

1.5 Fuel, Oil, and Lubricants

Fuel and lubricant containers and tanks shall be diked or curbed to contain the tank contents in case of leakage in accordance with Naval Facilities Command DM-22, Petroleum Fuel Facilities. In lieu of a dike or curb, other means complying with U.S. Coast Guard (USCG) requirements in 46 CFR Parts 64, Marine Portable Tanks, and 98.30, Handling and Storage of Portable Tanks, may be used.

Fuel oil transfers for floating plant shall be in accordance with the provisions of USCG regulations, 46 CFR and 33 CFR Parts 155 and/or 156. For un-inspected vessels, USCG regulations in 33 CFR 156.120 and 33 CFR 155.320 for fuel coupling devices and fuel oil discharge containment apply. Venting fuel tanks is necessary when using the couplings prescribed by 33 CFR 156.120(1) or (2).

2.0 LIFESAVING SKIFFS

At least one lifesaving skiff (a powered johnboat or other smaller boat used in emergencies) shall be immediately available at locations where employees are working over or adjacent to water (based on an assessment by the Site Safety and Health Officer [SSHO]).

2.1 Readiness Requirements

It is not required to have a single dedicated boat or operator standing by for emergency rescue, however a lifesaving skiff must be “immediately available”.

The Occupational Safety and Health Administration (OSHA) has established the following criteria for determining when a lifesaving skiff is to be considered as being immediately available:

- The skiff must be in the water or capable of being quickly launched by one person.
- Personnel trained in launching and operating the skiff shall be readily available during working hours. Lifesaving personnel shall perform a lifesaving drill before the initiation of work at the site and periodically thereafter as specified by the SSHO.
- When the operator is on break another operator must be designated to provide the requisite coverage while employees are above water.
- The designated operator must either man the skiff at all times or remain in the immediate area such that the operator can quickly reach the skiff and get underway.
- The skiff operator may be assigned other tasks provided the tasks do not interfere with the operator's ability to quickly reach the skiff and get underway.
- The communication system, such as a two-way radio, must be used to inform the skiff operator of an emergency and to inform the operator where the skiff is needed.
- The skiff must be equipped with both a motor and oars as a secondary means of propulsion.

2.2 Equipment Requirements

Those craft which are recognized as lifesaving skiffs are required to be maintained as such which include the following equipment:

- Spotlight for night operations.
- Four oars (two if the skiff is motor powered).
- Oarlocks attached to gunwales or the oars.
- One ball-pointed boat hook.
- One life ring with at least 70 feet (21 meters) of 3/8 (1 centimeter) solid braid polypropylene line, or equivalent, attached.
- Personal flotation devices (PFD) in number equaling the skiff rating for the maximum number of personnel allowed on board.
- In locations where waters are rough, swift, or where manually operated boats are not practical, a powerboat suitable for the waters shall be provided and equipped for lifesaving.
- Skiffs shall have flotation tanks or buoyant material capable of floating the boat and its equipment and the crew.
- On vessels (e.g., skiffs) without permanently mounted navigation lights, portable battery-operated navigation lights will be available and used for night operations.

- According to OSHA's directive relative to the number of skiffs required and the appropriate maximum response time, the following factors must be evaluated:

  - The number of work locations where there is a danger of falling into water;
  - The distance to each of those locations;
  - Water temperature;
  - Currents; and
  - Other hazards such as, but not limited to, rapids, dams, and water intakes.

In addition to the preceding, the employer is required to comply with all other applicable standards including, but not limited to, the requirement that the injured employee is promptly treated by medical personnel or an employee certified in First Aid. This could mean that medical treatment might have to begin in the lifesaving skiff.

3.0 FLOTATION DEVICES

3.1 Personal

A USCG-approved PFD shall be provided to and properly worn by all persons in the following circumstances:

- On all watercraft, including barges, floating plants, powered and non-powered vessels and boats, floating work platforms, floating pipelines, pontoons, etc.
- On structures extending over or next to water.
- Any work on or within 6 feet of the water where falling into the water is a potential hazard.
- Working alone at night where there are drowning hazards, regardless of other safeguards provided.
- Wherever there is a drowning hazard.
- PFDs are required for all marine work.

3.2 Life Rings – Watercraft

- Each watercraft shall be equipped with at least one Type IV PFD, designed to be thrown to a person in the water, and grasped and held by the user until rescued. A life ring or horseshoe buoy are two common examples of a Type IV PFD.
- All Type IV PFDs must be approved by the SSHO prior to use. Life rings (rope attachment not required) and ring buoys (rope attachment required) shall conform to the requirements of 46 CFR 160 (USCG approval) and shall have at least 70 feet (21 meters) of 3/8 inch (1 centimeter) solid braid polypropylene line, or equivalent, attached. Throw bags may be used in addition to life rings or ring buoys.
- Life rings or ring buoys shall be readily available and shall be provided as follows:

  - A minimum of one on each vessel.
  - A minimum of one on all motor boats up to 40 feet (12 meters) in length and at least two for motor boats 40 feet (12 meters) in length or longer.
  - A minimum of two on any other piece or group of floating plant up to 100 feet (30 meters) in length and one additional for each increase in length of 100 feet (30 meters) or fraction thereof.

3.3 Life Rings – Shoreline Locations

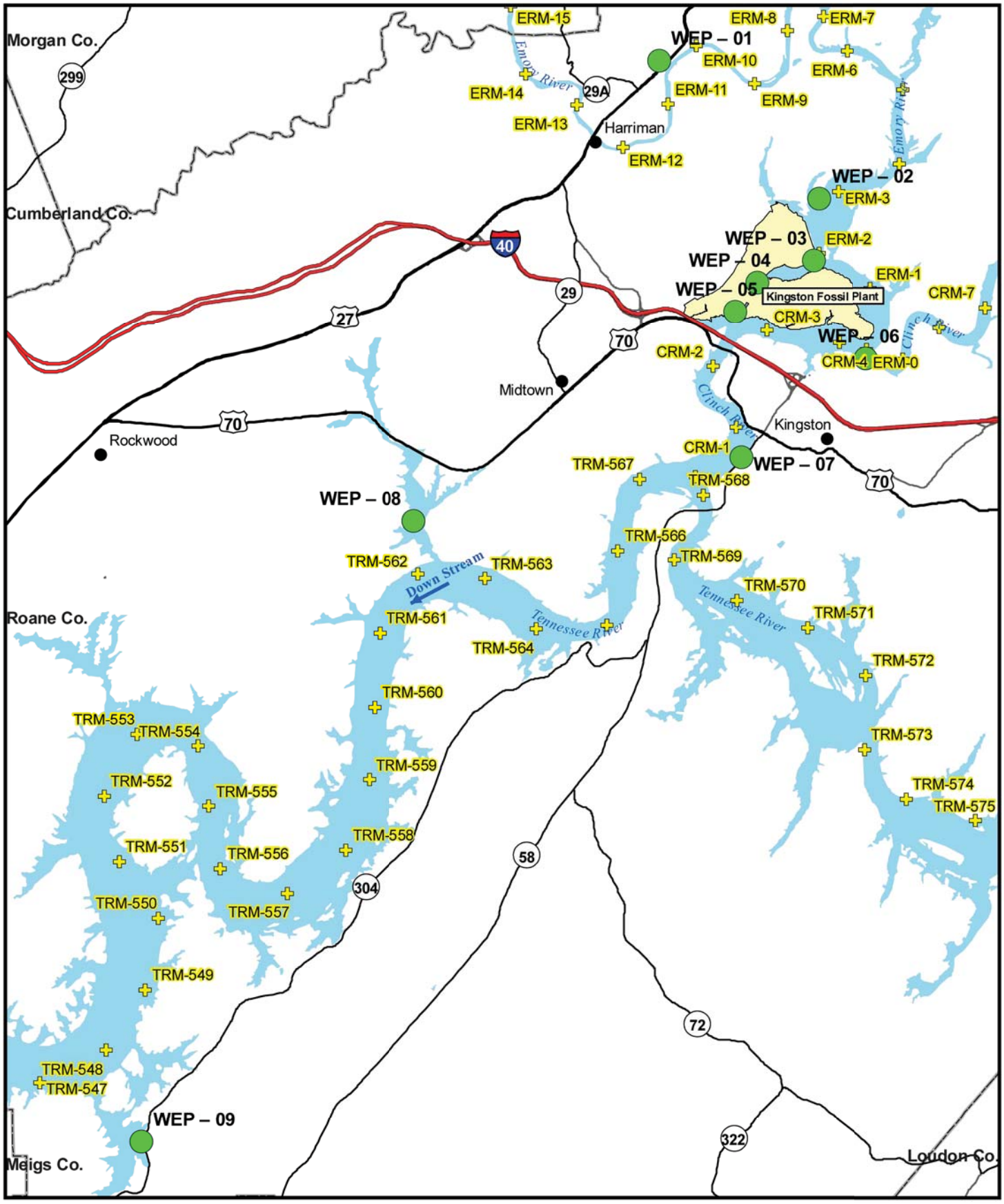
One life rings (Type IV PFD) with at least 90 feet of line, shall be provided and readily available for emergency rescue operations at intervals of not more than 200 feet (60 meters).

Examples of applicable locations include floating pipelines, walkways, wharves, piers, bulkheads, scaffolds, platforms, and similar structures extending over or immediately next to water. Table F5-2 lists the requirements for emergencies, spills, and discharges.

Table F5-2: Required Emergency, Spill, and Discharge Control Equipment and Materials

Equipment	Location
Communications	
Telephone – hardwire	Individual office trailers
Telephone – cellular	Key personnel
Two-way radios (marine)	With key site personnel
Horn	Each work crew and office
Binoculars	Health and safety office
Monitoring Equipment	
Air monitoring equipment (i.e., PID, etc.)	Health and safety office
Explosimeter/oxygen meter	Health and safety office
Dust monitor	Health and safety office
Personal Protective Equipment	
Personal floatation device	Watercraft, shoreline locations
Ring buoys with ropes	All watercraft, shoreline locations
Spill Response Equipment	
Fire extinguisher	Trailers, boats, vehicles, heavy equipment, active work zones
Turbidity curtain and absorbent boom	Deployed around specific on-water work areas
Absorbent booms and pads	Storage trailer/barges
Shovels, brooms, and squeegees	Storage trailer
Pressure washer	Storage trailer
Empty drums	Adjacent to storage trailer
First Aid	
First Aid kits	Various – trailers and work areas
Blankets	Storage trailer
Emergency eye wash	Work areas where chemicals are present, fueling stations
Dust Control	
Source of clean water	Work areas
Spray equipment	Work areas

FIGURE F-1: KIF ACCESS LOCATIONS



Legend

Boat Access Site

Map Compiled: 09/02/2009

Map Filename: Boat_Access_Sites_20090831_8x11.mxd

Tennessee Valley Authority
OE&R - ER&S
Geographic Information & Engineering

FIGURE F-2: KIF ACCESS LOCATIONS NORTH OF I-40

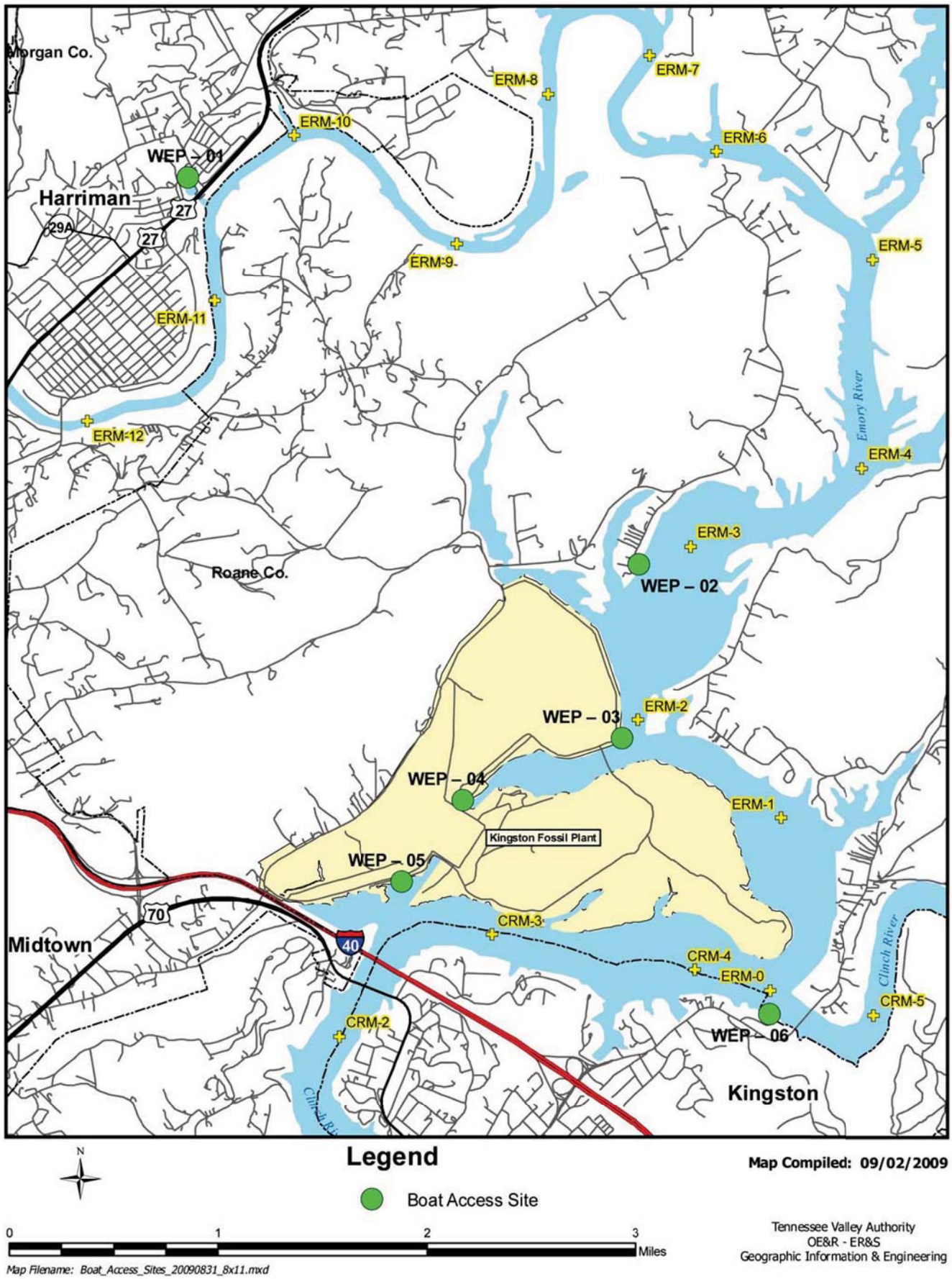
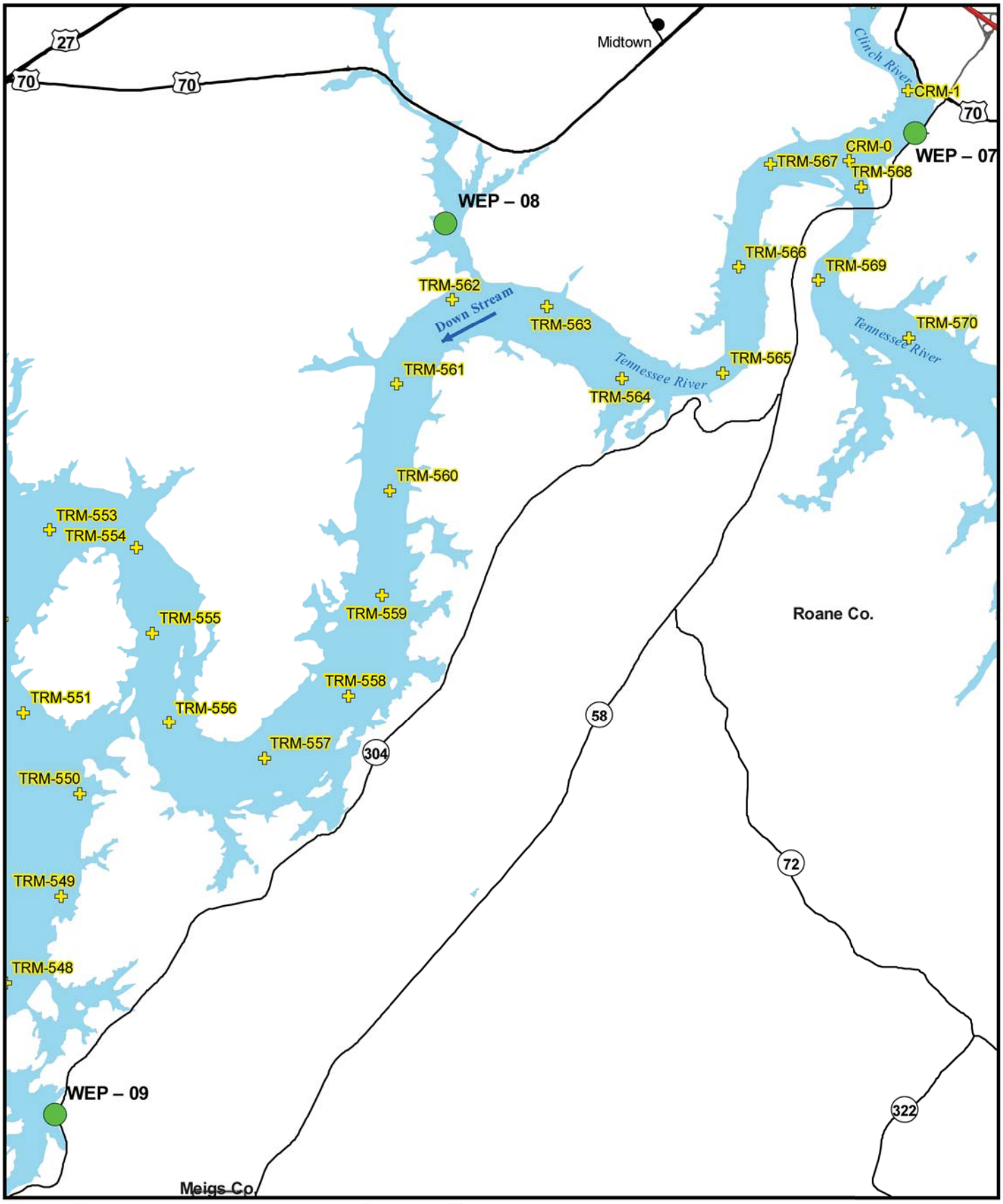


FIGURE F-3: KIF ACCESS SOUTH OF I-40



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Boat Access Site

N

0 1 2 3 Miles

Map Compiled: 09/02/2009

Map Filename: Boat_Access_Sites_20090831_8x11.mxd

Tennessee Valley Authority
OE&R - ER&S
Geographic Information & Engineering

FIGURE F-4: EMERGENCY RESPONSE SUPPORT

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KINGSTON ASH RECOVERY SITE EMERGENCY:

1. CALL 911 OR 865-354-8045.
2. DECLARE A MEDICAL EMERGENCY ON SITE RADIO CHANNEL 1 AND REQUEST ASSISTANCE TO YOUR LOCATION.
3. CALL TVA POLICE (800-824-3861) FOR MEDICAL ESCORT ASSISTANCE OR SEND A RUNNER.
4. CALL SITE PARAMEDICS (865-755-2556).
5. ENSURE THE AREA IS SAFE AND PROVIDE CARE IF TRAINED.

EMERGENCY RESPONSE EVACUATION POINTS:

1. RSI SAMPLING HOUSE
2. BERKSHIRE HOUSE
3. GEO-CON BATCH PLANT
4. TRAILER CITY (MEDIC TRAILER)
5. SOUTH ENTRY (DECON)

LEGEND:

AED LOCATION

RESCUE BOARD

RB

EMERGENCY SHELTER

DATE OF IMAGE: NOVEMBER 1, 2012

0 400 800 1600

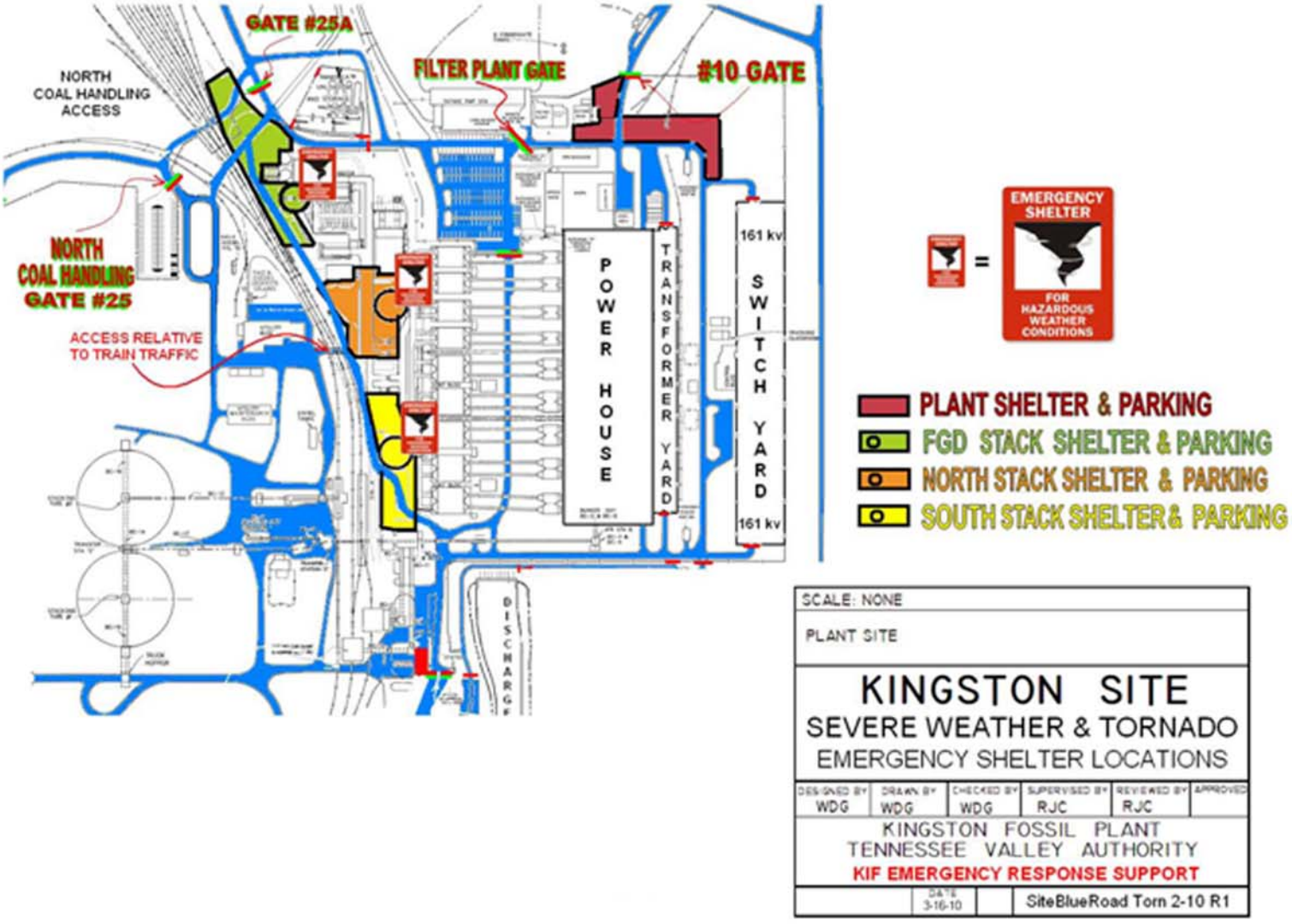
SCALE IN FEET

EMERGENCY RESPONSE SUPPORT LOCATIONS

KINGSTON ASH RECOVERY PROJECT

DATE:	PHASE:
8 Jan 2013	Site Wide Safety and Health Plan

FIGURE F-5: SEVERE WEATHER SHELTERS



APPENDIX G
TRAINING MATRIX

Appendix A

Health and Safety Training Course Matrix

Procedure Number	Course Title	ATIS Number	Frequency	Duration
402	Accident Investigation for Supervisors	00059100	Initial	2 hours
403	Aerial Lifts	00059101	Initial / 3 years	4 hours
404	All Terrain Vehicle (ATV) Safety	00059102	Initial	1 hour
405	Ammonia Awareness	00059103	Initial	1 hour
406	Boating Safety	00059104	Initial	3 hours
407	Chain Saw Safety Chain Saw Safety Refresher	00059105 00059106	Initial 2 years	32 hours 4 hours
408	Chemical Cleaning of Boilers	00059107	Initial / Annual	½ hour
409	Chemical Hygiene Orientation	00059108	Initial	2 ½ hours
410	Confined Space Entry	00059109	Initial / 5 years	3 hours
410	Confined Space Test Instruments	00059159	Initial / 5 Years	2 hours
411	Crane Safety (Mobile)	00059110	Initial / 3 years	24 hours
412	Crane Safety (Overhead)	00059111	Initial / 5 years	8 hours
413	Crane Safety (Pendant)	00059112	Initial / 3 years	1 hour
414	Defensive Driving	00059113	Initial	6 hours
415	Arc Flash Hazard Calculation & Required Protection	00059114	Initial	1 hour
415	Care & Cleaning of TVA Protective Flame Resistant Garments (Optional)	00059192	Initial	½ hour
416	Electrical Safety per OSHA 1910.269	00059115	Initial	2 hours
417	General Employee Safety Orientation Note: This course standard was titled Employee Safety Orientation, ATIS Number 00059116. The course has been revised to include employee safety orientation and personal protective equipment. See also 441	00059164	Initial	2 hours
418	Ergonomics	00059117	Initial	3 hours
419	Excavating & Trenching (Affected Person)	00059118	Initial	1 hour
420	Excavating & Trenching (Competent Person)	00059119	Initial	4 hours
421	Fall Protection Systems	00059120	Initial	1 ½ hours
422	Flagging Motor Vehicle Traffic	00059121	Initial	1 hour
423	Forklift Operations	00059122	Initial / 3 years	4 hours
424	Grounding Safety Procedures INACTIVE This course has been replaced by Temporary Protective Grounding for Generating Stations 00059213	00059123	Initial	4 hours
424	Grounding Safety Procedures - Refresher	00059189	Annual	2 hours
425	Hand & Portable Power Tools	00059124	Initial	1 hour
426	Handling & Storage of Compressed Gases / Flammable / Combustible Liquids	00059125	Initial	1 hour
427	Hazard Communication	00059126	Initial	2 hours
428	Hazard Recognition and Control	00059127	Initial	1 hour
429	Health & Safety Committee	00059128	Initial	1 hour

Procedure Number	Course Title	ATIS Number	Frequency	Duration
430	Hearing Conservation	00059129	Initial / Annual	½ hour
431	Heat Stress	00059130	Initial	1 hour
431	Heat Stress Monitor (IST Sensor Lynx)	00056163	Initial	1 hour
431	Heat Stress Monitor (Metrosonics hs-32)	00059186	Initial	1 hour
431	Heat Stress Monitor (WIBGet RSS-214)	00059187	Initial	1 hour
432	Herbicide / Pesticide Applicator	00059131	Initial	1 hour
433	Inorganic Arsenic	00059132	Initial / Annual	2 ½ hours
434	Inorganic Lead	00059133	Initial / Annual	2 ½ hours
435	Interlocking Safety Audits (INACTIVE) Replaced by Safety Coaching Visits	00059134	Initial	1 ½ hours
435	Safety Coaching Visits	00059217	Initial	1 ½ hours
436	Job Safety Analysis	00059135	Initial	3 hours
437	Ladder Safety	00059136	Initial	1 hour
438	Lockout / Tagout (FM)	00059137	Initial	2 hours
439	Machine & Equipment Safety	00059138	Initial	1 hour
440	Mercury Awareness	00059139	Initial	1 hour
441	Personal Protective Equipment See TVA Safety Procedure 417	00059140	Initial	2 hours
442	Powder Actuated Tools	00059141	Initial	1 hour
443	Radiation Boundary	00059142	Initial	1 hour
444	Radio Frequency (RF) and EMF	00059143	Initial	½ hour
445	Railroad Safety	00059144	Initial	2 hours
446	Refractory Ceramic Fibers	00059145	Initial	2 hours
447	Respiratory Protection (Non-Nuclear)	00059146	Initial / Annual	2 hours
448	Safe Rigging Principles and Requirements	00059147	Initial	16 hours
449	Rivers and Decks Skills Rivers and Decks Skills Refresher	00059148 00059149	Initial Annual	24 hours 3 hours
450	Scaffolds (Built-up & Suspended)	00059150	Initial	2 hours
451	Supervisory Safety Orientation	00059151	Initial	3 hours
452	Introduction to the TVA Safety Manual	00059152	Initial	½ hour
453	How to Use the TVA Safety Manual	00059153	Initial	½ hour
Appendix B	Block Safety Training for Supervisors (Option A) **Deleted - No Longer Available as Block Training**	00059154	As needed	8 hours
Appendix B	Block Safety Training for Employees (Option A) **Deleted - No Longer Available as Block Training**	00059155	As needed	8 hours
Appendix B	Block Safety Training for Employees (Option B) **Deleted - No Longer Available as Block Training**	00059156	As needed	4 hours
Appendix B	Block Safety Training for Employees (Option C) **Deleted - No Longer Available as Block Training**	00059157	As needed	24 hours
Appendix B	Block Safety Training for Employees (Option D) **Deleted - No Longer Available as Block Training**	00059158	As needed	16 hours
410	Confined Space Test Instruments see also at 410	00059159	Initial / 5 Years	2 hours
454	Serious Accident Investigation	00059160	Initial	8 hours
Appendix B	Block Safety Training for Employees (Option E) **Deleted - No Longer Available as Block Training**	00059161	As needed	4 hours

Procedure Number	Course Title	ATIS Number	Frequency	Duration
Appendix B	Block Safety Training for Employees (Option F) **Deleted - No Longer Available as Block Training**	00059162	As needed	8 hours
431	Heat Stress Monitor (IST Sensor Lynx) see also at 431	00059163	Initial	1 hour
455	OSHA Construction Safety Training	00059165	Initial	10 hours
	OSHA General Industry Safety Training	00059166	Initial	10 hours
411	0-20 Ton Hydraulic Telescoping Boom Crane	00059167	Initial / 3 years	Skills
411	21-90 Ton Hydraulic Telescoping Boom Crane	00059168	Initial / 3 years	Skills
411	91 Ton & Larger Hydraulic Telescoping Boom Crane	00059169	Initial / 3 years	Skills
411	Crawler Mounted Hydraulic Crane	00059170	Initial / 3 years	Skills
411	Commercial Truck Mounted Hydraulic Crane	00059171	Initial / 3 years	Skills
411	Articulating Boom Hydraulic Crane	00059172	Initial / 3 years	Skills
411	Fixed Boom Truck Mounted Friction Crane	00059173	Initial / 3 years	Skills
411	Fixed Boom Truck Mounted Friction Crane with Tower Attachment	00059174	Initial / 3 years	Skills
411	Fixed Boom Crawler Mounted Friction Crane	00059175	Initial / 3 years	Skills
411	Fixed Boom Crawler Mounted Hydraulic Crane	00059176	Initial / 3 years	Skills
411	Fixed Boom Crawler Mounted Friction Crane with Tower Attachment	00059177	Initial / 3 years	Skills
411	Fixed Boom Crawler Mounted Hydraulic Crane with Tower Attachment	00059178	Initial / 3 years	Skills
411	Fixed Boom Crawler Mounted Friction Crane with Ringer Attachment	00059179	Initial / 3 years	Skills
411	Fixed Boom Crawler Mounted Hydraulic Crane with Ringer Attachment	00059180	Initial / 3 years	Skills
411	Fixed Boom Crawler Mounted Friction Crane with Luffer Attachment	00059181	Initial / 3 years	Skills
411	Fixed Boom Crawler Mounted Hydraulic Crane with Luffer Attachment	00059182	Initial / 3 years	Skills
411	Mobile Crane Field Coordinator	00059183	Initial / 3 years	Skills
411	Mobile Crane Skills Evaluator	00059184	Initial / 3 years	Skills
411	Mobile Crane Annual Inspector	00059185	Initial / 3 years	Skills
431	Heat Stress Monitor (Metrosonics hs-32) see also at 431	00059186	Initial	1 hour
431	Heat Stress Monitor (WIBGet RSS-214) see also at 431	00059187	Initial	1 hour
456	Formaldehyde Awareness	00059188	Initial / Annual	½ hour
424	Grounding Safety Procedures – Refresher see also at 424	00059189	Annual	2 hours
	Plan Jobs Safely	00059190	Initial	3 hours
457	Recording, Reporting and Classifying Occupational Injuries and Illnesses	00059191	Initial	1 hour
415	Care & Cleaning of TVA Protective Flame Resistant Garments (Optional) see also at 415	00059192	Initial	1 hour
458	Safety Orientation for Staff Augmented Contractors	00059193	Initial	1 hour
459	Clearance Procedure (Responsible / Qualified Employee)	00059194	Initial / Annual	8 hours
459	Clearance Procedure (Primary Authorized Employee)	00059195	Initial / Annual	4 hours
459	Clearance Procedure (Authorized Employee)	00059196	Initial / Annual	1 hour
	High Hazard Lifts	00059197	Initial	1 hour

Appendix B	Block Safety Training for Employees (Option G)	00059198	As needed	4 hours
Procedure Number	**Course Title**	**ATIS Number**	**Frequency**	**Duration**
459	Clearance Procedure (Affected Employee)	00059199	Initial / Annual	1 hour
403	Articulating Boom Aerial Lift Platforms	00059200	Initial / 3 years	Skills
403	Extendable / Telescoping Boom Aerial Platforms	00059201	Initial / 3 years	Skills
403	Vehicle Mounted Aerial Lifts (Bucket Truck Type) Non-insulated	00059202	Initial / 3 years	Skills
403	Scissor Lifts	00059203	Initial / 3 years	Skills
403	Insulated Aerial Devices	00059204	Initial / 3 years	Skills
460	Hexavalent Chromium	00059205	Initial / Annual	2 hours
461	Equipotential Grounding	00059206	Initial	5 hours
424	Placing & Removing Grounds in 4160 & 6900 Volt Cubicles	00059207	Initial	Skills
424	Placing & Removing Grounds on Hydroelectric & Combustion Turbines	00059208	Initial	Skills
461	Equipotential Grounding - Refresher	00059209	Initial / 2 years	4 hours
424	Placing & Removing Temporary Protective Grounding Devices in 4160 & 6900 Cubicles	00059210	Initial	Skills
424	Placing & Removing Protective Grounds on Hydro Plant Main Transformers	00059211	Initial	Skills
461	Transmission Line Equipotential Work Zone	00059212	Initial / 2 years	Skills
424	Temporary Protective Grounding for Generating Stations	00059213	Initial	4 hours
407	Chain Saw Safety	00059214		
448	Rigging Lab	00059215	Optional	8 hours
461	Placing and Removing Protective Grounds on Substation Breaker	00059216		Skills
435	Safety Coaching Visits	00059217	Initial	1 ½ hours
448	Safe Rigging Principles and Requirements Refresher	00059218	Annual	4 hours
448	Advanced Rigger Training	00059219	Initial	

APPENDIX H
MARINE OPERATION REQUIREMENTS

MARINE OPERATION REQUIREMENTS
TVA FLY ASH DREDGE AND ON-WATER ACTIVITIES

1 FLOAT PLAN

1.1 Completed every day before going boating.

1.2 File with company Point of Contact (POC) on land.

1.3 Means of communication between boat and POC.

1.4 Keep copies in HSE records.

2 WATERCRAFT OPERATIONS

2.1 The sections of water we will be working are under jurisdiction of the U.S. Coast Guard (USCG). As such, all equipment and operating personnel will meet or exceed USCG requirements for safety equipment.

2.2 Issue a Notice to Mariners to USCG Marine Safety Office.

2.3 Operators demonstrate they are experienced and knowledgeable in operating watercraft or will be required to complete the TVA Boating Safety course ATIS Number 00059104 or demonstrate equivalent knowledge.

2.4 Pilots license may be required depending on craft operated.

3 WEATHER CONDITIONS

3.1 Evaluate weather before venturing out on boat. The following weather conditions may be encountered:

3.1.1 Gale Force Winds (34 to 47 knots or 39 to 54 mph) – No field work is to proceed during gale forced wind events. In addition, all areas will cease work a minimum of one half-hour before the storm arrives. Any specific equipment or high-risk equipment (i.e., cranes, derricks) which may need special attention or which may be impacted by lower wind speeds, will be detailed on the Activity Hazard Analysis (AHA). All equipment will be lashed to the deck or placed in the storage area and all unnecessary boats and barges will be docked or removed from the water.

3.1.2 High Winds – Use of any 12 to 16 foot aluminum-hulled tender boat during small craft advisories or greater warnings (18 to 33 knots or 20 to 38 mph) will not be allowed.

3.1.3 River Velocities – When Emory River flows reach 5,000 cubic feet per second at the USGS station at Oakdale, TN, site crews conducting river operations shall perform an evaluation of the specific river conditions at their work location, size of craft or vessel being used, and operational/task requirements to determine if safe conditions exist to continue operations. When river flows reach 10,000 cubic feet per second at the USGS station at Oakdale, only emergency river operations related to rescue are permitted. All other personnel shall be restricted from river access.

3.1.4 Fog / Heavy Rain – If visibility is decreased to less than 10 feet, all boat movement must stop with the exception of emergency situations. During boat operations in fog / heavy rain with visibility greater than 10 feet, operation speed must be maintained to an appropriate level given the amount of visibility.

3.2 Vessels to be available to tow stranded vessels against current and winds.

3.3 Cold Water Operations.

3.3.1 Due to decreased water and air temperatures and the recommendations of USCG, a minimum of flotation coveralls or flotation bibs / jackets are required for all high risk employees working on the water during the winter months (December thru March) or when water temperatures are below 50 degrees Fahrenheit.

3.3.2 High risk refers to the risk of going overboard combined with likelihood of extended periods of time in exposure conditions, either in or out of the water. This can be attributed to a number of factors including likelihood of being rescued promptly and proximity to shelter or medical treatment upon exiting the water.

3.3.3 Examples of high risk groups include:

- Sample personnel
- On-water surveying personnel
- Night shift deckhands
- Personnel operating watercraft alone

3.3.4 Cold water survival gear is encouraged for all other personnel working on the water during winter months.

3.3.5 Means for emergency contact that is reliable for water-based activities must be maintained by all personnel that perform activities physically separate from the main site. The means of communication must facilitate cold water rescue activities and ensure prompt aid for those potentially suffering from hypothermia.

3.3.6 In the instance that cell phones are intended to be used for emergency communication of high risk crews, they must maintain the phones on their person and be protected from submersion.

4 EMERGENCY RESPONSE

4.1 See Emergency Response and Contingency Plan.

4.2 Rescue drills or man overboard drills to be completed per the guidance outlined in Appendix F, Document F1 – Man Overboard Drill.

5 SAFETY RULES

5.1 All barges and floating watercraft moored overnight must display lighting and be sufficiently illuminated.

5.2 Vessels expected to function in emergency response must be equipped with at least one spotlight.

5.3 Cables and lines that cross waterways must be clearly marked.

5.4 All watercraft to carry at least one air horn or similar sound signaling device.

5.5 All watercraft are to carry fire extinguishers. Each watercraft shall carry fire extinguishers (for use in gasoline, oil and grease fires) approved by the Underwriters Laboratories. Each fire extinguisher shall be inspected by the owner/operator monthly to ensure that it is sufficiently charged and that the nozzles are free and clear. Discharged fire extinguishers shall be replaced or recharged immediately.

5.5.1 Requirements per boat length:

- 26 feet or more in length = 2 extinguishers
- < 26 feet = 1 extinguisher

5.5.2 All watercraft having gasoline or liquid petroleum gas power plants, or equipment in cabins, compartments, or confined spaces, shall be equipped with a built-in automatic CO_2 or other equally effective type of fire extinguishing system.

5.6 Personal Flotation Devices (PFD):

5.6.1 USCG-approved PFD are to be provided and properly worn by each person onboard.

5.6.2 Type I, III, or V PFDs shall be worn. Most Type III and V are not as effective as Type I in turning an unconscious wearer face-up, but are less bulky and restrictive.

5.6.3 See Attachment H-1 for Type V inspection and testing frequency.

5.7 Life rings with at least 90 feet or line shall be provided and available at an interval of not more than 200 feet immediately next to water.

6 PIPELINE

6.1 Pipeline both submerged and floating is to be marked as such, along entire length.

7 LIFESAVING SKIFF

7.1 At least one lifesaving skiff (powered john boat or other smaller boat) shall be immediately available where employees are working adjacent to water. Required equipment for rescue skiff:

7.1.1 Four oars (two if skiff is motor powered).

7.1.2 Oarlocks attached to gun-whales.

7.1.3 One ball-pointed ball hook.

7.1.4 One life ring with at least 70 feet of solid braid polypropylene line.

7.1.5 PFDs in number equaling the maximum number of personnel on board.

7.1.6 Lighting on skiff.

8 STANDING UP

8.1 Employees should not stand up in boat when starting the motor. In boats 16 feet or less, occupants should not stand up or move around when boat is underway.

9 SECONDARY MEANS OF PROPULSION

9.1 Always carry a secondary means of propulsion.

10 TWO-MAN RULE

10.1 At least two people are required to be in the boat when on open water. Two people are also required for boating activities occurring from sundown to sunrise.

10.2 Any exceptions to the two-man rule require approval from the immediate supervisor. Restrictions, controls and means of effective communication must be addressed in the related AHA.

11 PERMITS

11.1 For dock work, hot work permits are needed for all open flame and welding activities.

12 EQUIPMENT REQUIREMENTS

12.1 All watercraft shall carry at least one air horn or similar sound-signaling device.

12.2 Rescue vessels to be used at night must be equipped with an adequate spotlight

12.3 Each vessel used outside of the closed section of river must carry laminated maps and descriptions of designated emergency water extraction points

12.4 Each watercraft operated at night shall be equipped with navigation lights and these lights shall be utilized at all times when operating between sunset and sunrise.

12.5 Navigational lighting shall be in compliance with USCG and the U.S. Army Corps of Engineers requirements.

12.6 Watercraft shall be operated at reduced speeds at night and when visibility is reduced.

12.7 All watercraft shall carry a selection of pyrotechnic and non-pyrotechnic visual distress signals.

12.7.1 Pyrotechnic visual distress signals include red flares, orange smoke, and aerial red meteor or parachute flares.

12.7.2 Non-pyrotechnic visual distress signals include an orange distress flag and a flashlight or other electric distress light.

12.7.3 No single signaling device is ideal under all conditions and for all purposes. Pyrotechnic visual distress signals shall not be used past the expiration date stamped on them.

12.8 All powered watercraft shall carry a tool kit sufficient for the watercraft operator to troubleshoot common mechanical problems such as fouled spark plugs, flooded carburetor, electrical shorts, etc. Watercraft operated in remote areas shall also carry appropriate spare parts (propellers, shear pins, patch kits, air pumps, etc.). The tool kit shall be maintained by the watercraft operator and expended supplies shall be replaced immediately.

12.9 Fenders shall be provided to prevent damage and sparking and to provide safe areas for workers exposed to pinching situations caused by floating equipment.

12.10 Axes or other emergency cutting equipment shall be provided in accessible positions on all towing vessels for freeing lines in an emergency.

12.11 A signal device shall be provided on all vessels to give signals required by the navigation rules applicable to the waters on which the vessel is operated.

12.12 All controls requiring operation in cases of emergency - such as boiler stops, safety valves, power switches, fuel valves, alarms, and fire extinguishing systems shall be located so that they are protected against accidental operation but are readily accessible in an emergency.

12.13 Electric lights used on or around gasoline and oil barges or other marine locations where a fire or explosion hazard exists shall be explosion-proof.

12.14 General alarm systems shall be installed and maintained on all vessels where it is possible for either a passenger or crewman to be out of sight or hearing from any other person.

12.14.1 Where general alarm systems are used they shall be operated from the primary electrical system with standby batteries on trickle charge, that will automatically furnish the required energy during an electrical system failure.

12.14.2 A sufficient number of signaling devices shall be placed on each deck so that they can be distinctly heard above the normal background noise at any point on the deck.

12.14.3 All signaling devices shall be so interconnected that actuation can occur from at least one strategic point on each deck.

12.15 Smoke alarms are required for all living quarters of a vessel; smoke alarms, if wired, should use the same electrical system as that of the electrical alarms.

12.16 All doors shall be capable of being opened from either side and provided with positive means to secure them in both the open and closed position.

12.17 Escape hatches and emergency exits shall be marked on both sides with letters, at least 1-inch (2.5 cm) high, stating “EMERGENCY EXIT - KEEP CLEAR.”

12.18 Each prime mover (engine, turbine, motor) driving a dredge pump shall be capable of being stopped by controls remote from the prime mover locations.

12.19 Shore power receptacles shall have a grounding conductor to prevent potential difference between the shore and the vessel.

12.20 Circuits with GFCI protection shall be provided in grounded 120 or 240 volt systems in toilet/shower spaces, galley, machinery spaces, weather deck, exterior, or near any sinks.

12.21 Where appropriate, vessels should have watertight compartments readily identified and properly maintained in a watertight condition (i.e., sealable doors in place and fully functional) and all penetrations maintained in a watertight condition.

12.22 Gauge glasses or try cocks shall not be installed on fuel tanks or lines unless they meet the requirements of 46 CFR 58.50-10.

12.23 A shutoff valve shall be installed at the fuel tank connection: arrangement shall be made for operating this valve from outside the compartment in which the tank is located and from outside the engine compartment and outside the house bulkheads at or above the weather deck of the vessel.

12.24 A shutoff valve shall be installed at the engine end of the fuel line unless the length of the supply pipe is 6 feet (1.8 m) or less. Arrangement shall be made for operating this valve from outside the house bulkheads, at or above the weather deck on the vessel.

12.25 All carburetors on gasoline engines shall be equipped with a backfire trap or flame arrestor.

12.26 All carburetors except down draft type shall be provided with a drip pan, with flame screen, which is continuously emptied by suction from the intake manifold or by a waste tank.

12.27 Fuel and lubricant containers and tanks shall be diked or curbed to contain the tank contents in case of leakage in accordance with NAVFAC DM-22, *Petroleum Fuel Facilities*. In lieu of a dike or curb, other means complying with USCG requirements in 46 CFR Parts 64, *Marine Portable Tanks* and 98.30, *Handling and Storage of Portable Tanks*, may be used.

12.28 Fuel oil transfers for floating plant shall be in accordance with the provisions of USCG regulations, 46 CFR and 33 CFR Parts 155 and/or 156. For uninspected vessels, USCG regulations in 33 CFR 156.120 and 33 CFR 155.320 for fuel coupling devices and fuel oil discharge containment apply. Venting fuel tanks is necessary when using the couplings prescribed by 33 CFR 156.120(1) or (2).

ATTACHMENT H-1
Type V Personal Flotation Device Inspection and Testing Frequency [1]

1. Inspect before each use:

    a. Inflation Mechanism Status Indicators
    b. CO_2 cylinder cap

2. Inspect at beginning of each season and every 2 months afterwards during use:

    a. Inflatable chamber for leaks
    b. PFD for rips, tears, and puncture
    c. CO_2 cylinder for damage

3. Inspect at beginning of every season:

    a. Automatic Inflation system
    b. Function test of oral valve

4. Test at beginning of every season:

    a. Automatic inflation
    b. Manual inflation
    c. Oral inflation

[1] Owner's manual for Model 1339 and 1341 Type V PFD by Coleman Company, Inc.

APPENDIX I
FIGURES

FIGURE 1: AIR MONITORING LOGIC

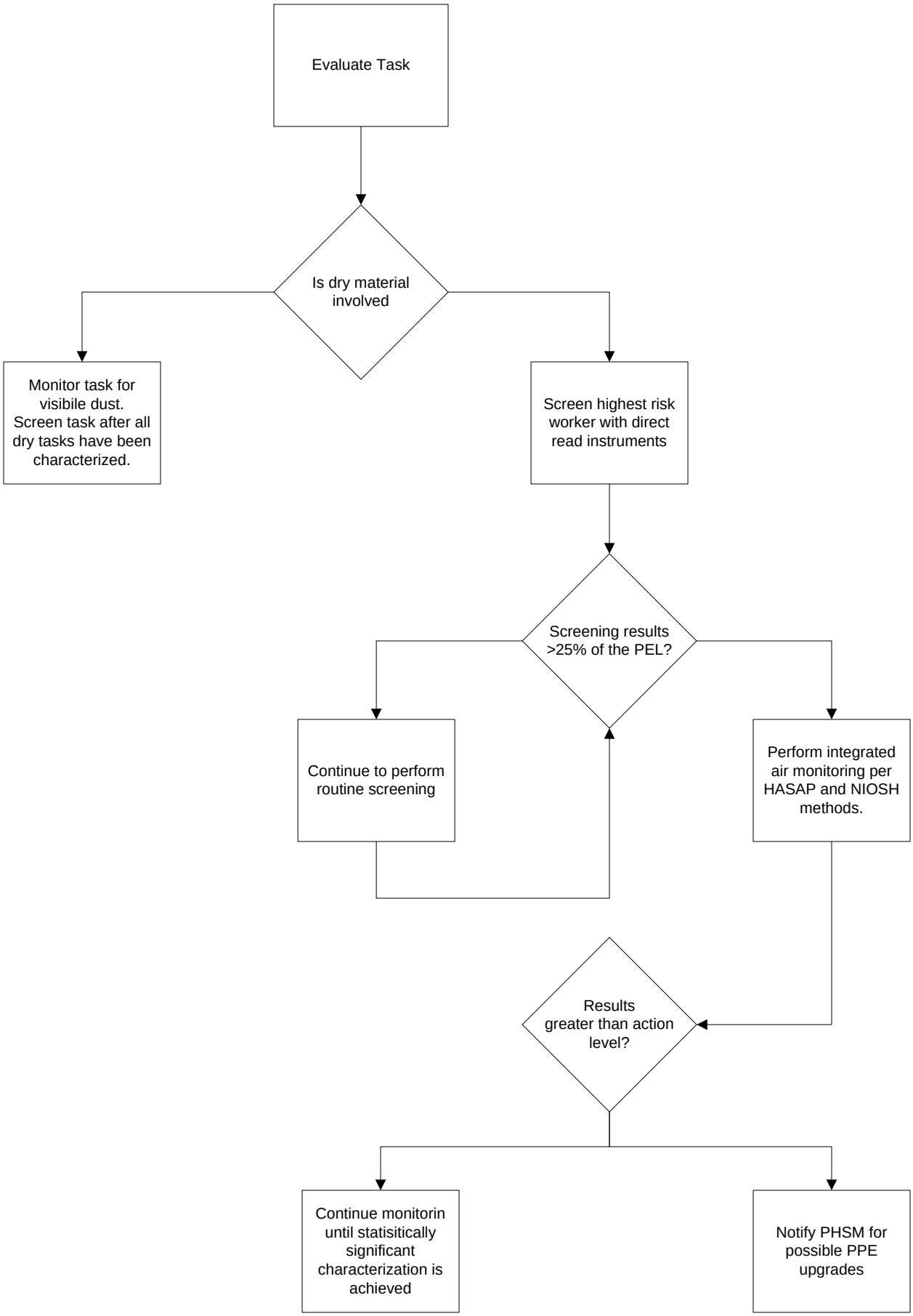


FIGURE 2: CONTAMINATION, EXCLUSION, AND SUPPORT ZONES

LEGEND:

CRZ = CONTAMINATION REDUCTION ZONE
EZ = EXCLUSION ZONE
SZ = SUPPORT ZONE

CRZ/SZ BREAK AREA
CRZ VEHICULAR
CRZ PERSONNEL

DATE OF AERIAL:
11-29-12

0 500 1000 2000
SCALE IN FEET

CONTAMINATION, EXCLUSION, AND SUPPORT ZONES

KINGSTON ASH RECOVERY PROJECT

DATE:	PHASE:
9 Jan 2013	Infrastructure

I:\0002 ENGINEERING\Civil\Drawing\Exclusion Zone Map.dwg Jan 09,2013 - bperatro

FIGURE 3: TYPICAL WORK AREA LAYOUT

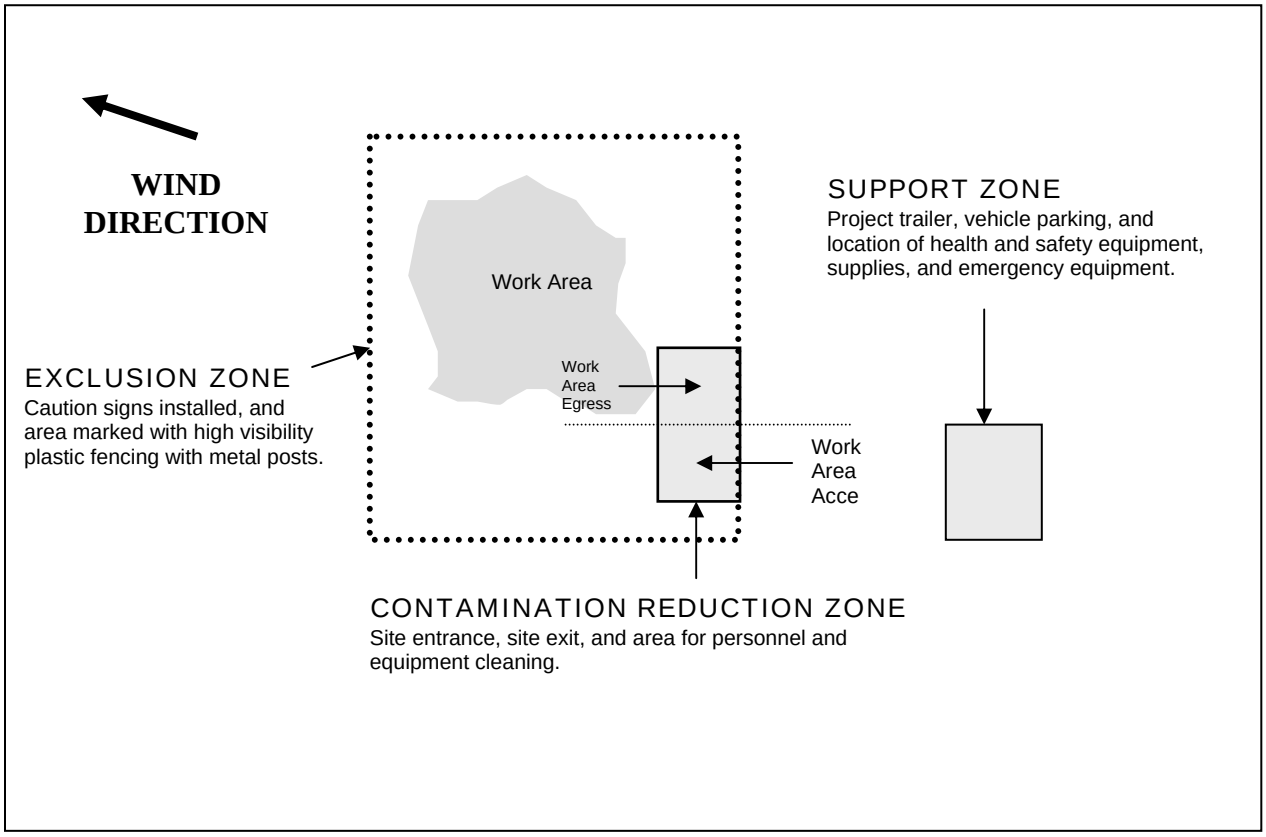
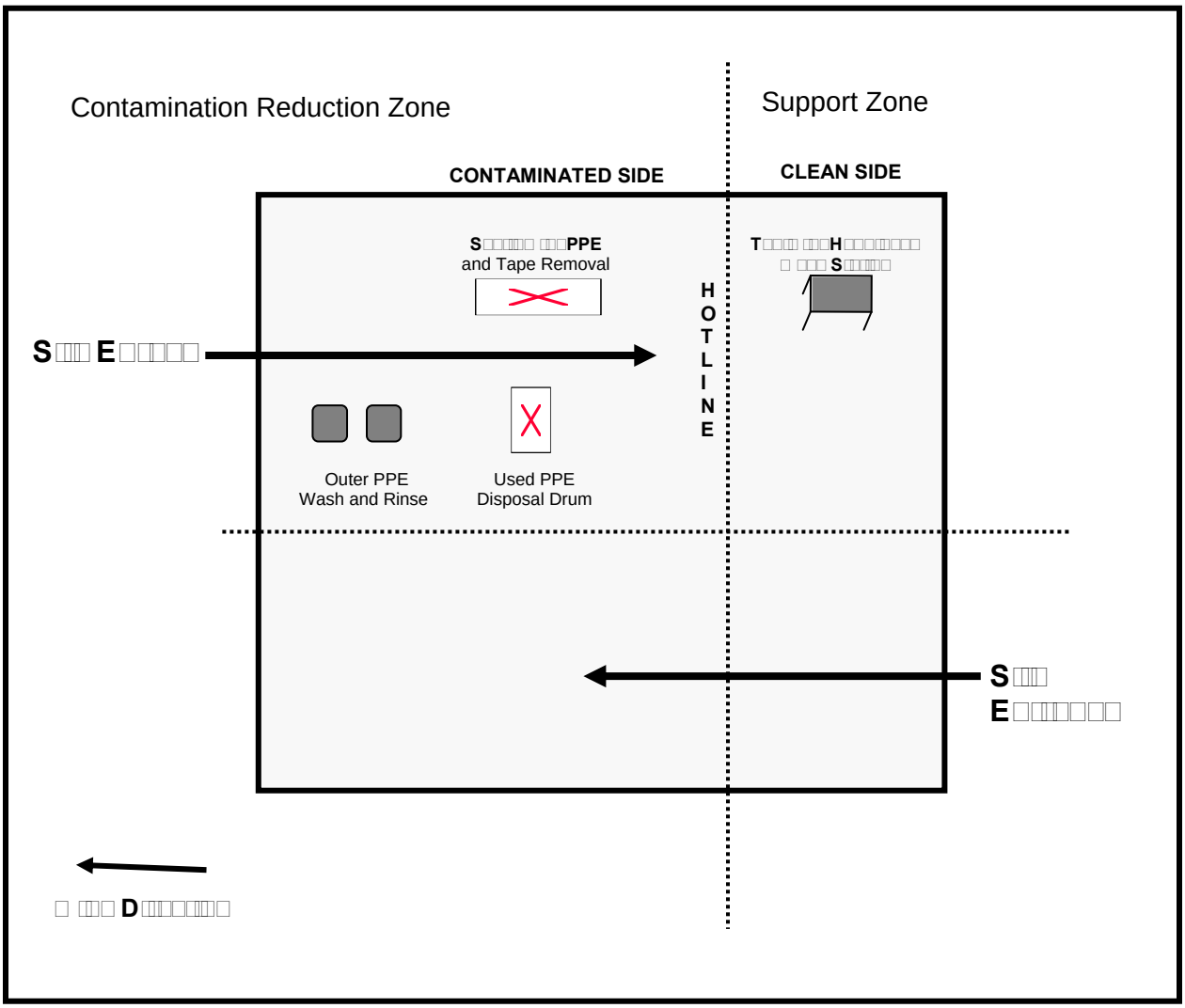


FIGURE 4: TYPICAL DECONTAMINATION AREA LAYOUT



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APPENDIX J

~~RESPONSE TO EPA COMMENTS~~

MADE OBSOLETE BY REVISION 06

APPENDIX K
INDUSTRIAL HYGIENE MONITORING PLAN

APPENDIX K

INDUSTRIAL HYGIENE MONITORING PLAN
R1 April, 2012

SITE WIDE SAFETY AND HEALTH PLAN

For the

TVA KINGSTON FOSSIL PLANT

ASH RELEASE RESPONSE

TABLE OF CONTENTS

LIST OF TABLES

ATTACHMENTS

1.0 INTRODUCTION

1.1 BACKGROUND

This Industrial Hygiene Monitoring Plan (IHMP) has been developed as Appendix K to the TVA Kingston Fossil Plant (KIF) Site Wide Safety and Health Plan (SWSHP). The intent of this IHMP is to fully develop, discuss, and apply the monitoring strategy associated with relevant sections of the SWSHP. In the event the SWSHP is updated, this IHMP will be reviewed and updated as necessary.

The preliminary IHMP entitled "Kingston Fossil Plant Coal Ash Recovery Site Industrial Hygiene Monitoring Plan" was prepared by EnSafe Inc. and was submitted on January 21, 2009 as an amendment to the Ash Recovery Site Safety Plan. The purpose of the preliminary IHMP was to outline the EnSafe air monitoring activities during the project. This plan revises and updates the preliminary IHMP and any subsequent plans submitted in draft or final form by EnSafe. Portions of the EnSafe IHMP have been referenced and utilized within this document.

Industrial hygiene (IH) activities began on December 30, 2008 with air monitoring being performed for fly ash and its constituents. Standard methods commonly employed by TVA and EnSafe for evaluating exposures to fly ash constituents during fossil boiler outages or day-to-day production or maintenance activities were implemented during the early phase of the project.

1.2 GENERAL INDUSTRIAL HYGIENE OBJECTIVES

Evaluation and control of health related exposures on the Kingston Ash Recovery Project site are key to ensuring and maintaining the health of the site work force, particularly as the project duration creates the potential for chronic exposures to become relevant.

In addition to worker protection, a properly developed and executed Industrial Hygiene Program will provide a repository of historical information for future use.

The principal objectives of the plan are as follows:

- Identify specific responsibilities for site Health, Safety, and Environment (HSE) staff and operations management with regard to Industrial Hygiene Program support.
- Identify the various Similar Exposure Groups (SEG) to be monitored onsite with the intent of drawing group level conclusions with regard to health exposures and controls.
- Specify the target stressors (chemical, physical, biological) that will require routine monitoring for each SEG.
- Identify specific action levels to trigger mitigation or programmatic development activities. These may include field controls, work techniques, training, medical monitoring, or utilization of personal protective equipment.
- Document the monitoring protocols for the site including frequency, specific analytes to be monitored for, and the sample methods to be employed.
- Establish a means to create and distribute proper IH documentation to TVA management, operational management, TVA contractors, and individual workers.

1.3 KEY INDUSTRIAL HYGIENE PERSONNEL AND RESPONSIBILITIES

General site safety and health responsibilities are established under Job Descriptions of the Kingston Ash Recovery Project Management Plan. This section is included as it specifically relates to executing the onsite IH Program.

1.3.1 Jacobs Site HSE Manager

The HSE Manager will be the key liaison between TVA / Jacobs Engineering Group Inc., (Jacobs) management and those technical specialists performing IH activities onsite. The HSE Manager's responsibilities include: providing summary and transmittal reports as necessary, provides recommendations for control strategies as related to occupational health exposures, development of site-wide guidance, issuance of sample notification letters, ensuring proper training and skill sets are present in site IH personnel, and reporting in relation to IH findings.

1.3.2 Jacobs Site Industrial Hygiene Lead Technologist

The IH Lead Technologist will be responsible for:

- Executing the general monitoring strategy outlined in this plan with guidance from the HSE Manager.
- Keep the Jacobs Site HSE Manager apprised of findings on a daily basis.
- Consulting with Jacobs' Certified Industrial Hygienist (CIH) staff when difficulties or anomalous findings are identified.
- Maintaining and calibrating IH equipment per manufacturer's requirements.
- Proper handling of samples including chain-of-custody (CoC).
- Completing exposure monitoring paperwork on a daily basis.
- Observing workers being monitored and documenting relevant information.

1.3.3 Jacobs Industrial Hygiene Manager

The IH Manager is responsible for assisting in the development of this IHMP general IH monitoring strategies, evaluation of exposures, and providing recommendations for control strategies when necessary.

1.3.4 Data Management and Quality Assurance Team

The onsite Data Management Team and Quality Assurance (QA) Team assist the IH Program with respect to laboratory coordination, laboratory data management, data validation, QA, and data storage in EQuIS® in accordance with Section 6.3 of this plan.

2.0 INDUSTRIAL HYGIENE PROCESS OVERVIEW

2.1 IDENTIFY SIMILAR EXPOSURE GROUPS

The collaboration of TVA Safety and IH staff, EnSafe, and Jacobs have established SEGs for differing categories of employees with potentially or expected similar exposures from work conducted at the Kingston Ash Recovery Project site. Segregation into SEGs is a function primarily of equipment-specific positional assignments or site responsibilities. As sampling is performed, task assignments will be noted on sample notes and recorded in the sample records/database used, but may also be dependent on activities. In the event results are elevated, task level controls will be implemented for that task.

Table 2-1 contains a listing of SEGs presently identified for the Kingston Ash Recovery Project operations. As activities change or are added to the site, additional exposure groups may be added as necessary.

Table 2-1
Similar Exposure Groups Identified at Kingston Ash Recovery Project Site
(with activity/task subsets)

Site-Wide Staff Support	**On-Water Operator**	**Teamster**
Field Staff	Boat Operator	Artic Dump Truck Operator
Mgmt / Admin (Office Staff)	Dredge Boat Operator	Dump Truck Operator
Misc.	Dredge Shore Operator	Fuel Truck Driver
Sample Technician	Tugboat Operator	Vacuum Truck Operator
Security	Vacuum Barge Operator	Water Truck Operator
On-Land Operator	**On-Water Laborer**	**Railcar Loadout Laborer**
Amphib Excavator Operator	Boat Laborer	Loadout Laborer (Railcar)
Booster Pump Operator	Deck Hand	Polymer
Buggy Operator	Dredge Laborer	Railcar Loading - Closer
Clam Bucket Operator	Fuel Boat Crew	Railcar Loading - Liner
Crane Operator		
Dozer Operator	**Mechanic**	**Railcar Loadout Operator**
Excavator Operator	Heavy Equipment Mechanic	Railcar Loading - Dozer
Forklift Operator	Equipment Mechnanic, Heavy	Railcar Loading - Excavator
Fuel Truck Operator	Equipment Mechanic	
Grader Operator		**On-Land Laborer**
Lime Application/Mixing	**Filter Press Operations**	Decon Laborer
Pump Operator	Filter Press	Decon Laborer (vacuum)
Scraper Pan Operator	Filter Press Foreman	Equipment Decon Detail
Shoreline Operator (river ops)	Filter Press Operator	Flagger
Track Dump Operator		General Laborers
	Perimeter Wall Crew	Rail Maintenance Laborer
Drill Crew	BP_Forklift Operator	River Ops - Shore Laborer
	BP_Gen Laborer	Water Truck Laborer
Hydroseed Crew	BP_Mixing Operator	
	SW_Dozer Ops	
Southern Shores	SW_Excavator	
	SW_Gen Laborer	

2.2 EVALUATE

Periodic monitoring and sampling schedules will be based on the severity of potential exposures to recognized health hazards and possibly other factors such as number of personnel exposed and frequency of task performances, etc. This will be periodically reviewed and sample priorities updated as warranted.

The Site IH Lead Technologist, in collaboration with TVA and Jacobs CIH staff, will conduct a Health Hazard Analysis of existing and new SEGs identified on the site using Form 124 (Attachment 1), Sample Health Hazard Evaluation by Exposure Group. Table 2-2 will be used to initially evaluate the potential for exposures to exist. Existing data will be used to evaluate exposures based on SEGs. Where existing data is not available, an objective exposure determination will be made which may include the use of calculations, direct read monitoring and integrated monitoring. This process will continue for each SEG and each recognized health hazard until adequate exposure characterization has been completed.

The qualitative exposure assessment captured by Table 2-2 includes an evaluation of potential chemical exposures via inhalation, ingestion, and dermal contact and/or absorption. The assessments also include the potential exposures to noise and radiation and other potential physical hazards. The predominant exposure determinants and events such as frequency, magnitude, and variability of exposure and tasks, route of exposure, potentials for acute or chronic exposures or frequently repeated tasks and exposures along with the adequacy and potential for failure of engineering and work practice controls are considered as a part of the qualitative exposure assessment.

As new processes and tasks are identified on the Kingston site, the potential hazards will be included in the associated work package and job safety analysis. The new processes will either be captured within the monitoring plan for existing SEGs or new SEGs will be created. The Jacobs IH staff will determine new strategies, as appropriate, to evaluate new potential exposures. If the qualitative exposure assessment indicates a minor, or no risk of exposure, no further action is required.

2.3 DOCUMENT CONTROL, REPORTING, AND NOTIFICATION

Independent of routine reporting, electronic and paper files will be kept for project documentation purposes. This information will be properly controlled and handled via the project Document Control process and includes CoCs, raw and interpreted lab data, exposure calculations, copies of distributed reports, copy of field notes, copies of calibration records, and other information relevant to the onsite IIH Program. All records must be maintained by TVA and associated employers for a minimum of 30 years.

Various reports and notification activities will occur as a result of IH activities at the site. The following is a summary of the reports and their frequency.

2.3.1 Worker Notification

Employees will be notified of the results of all sampling regardless of levels recorded. For personal exposure monitoring, this will generally consist of specific notification letters. Employee notification letters for TVA staff will be provided by Jacobs for distribution by TVA Safety staff. Jacobs will distribute letters to the employer of subcontracted personnel. The

employer will distribute to the subcontracted personnel. A signed copy of the notification letter will be returned to document control by the employer.

2.3.2 Site-Wide Notification

In the event results dictate the need to notify SEGs or the entire site, Jacobs will develop the notification announcement and distribute via email, postings, and other announcements as necessary.

2.3.3 Daily Reporting

Relevant IH information will be verbally shared during the Health and Safety daily meeting. Included will be general discussion of IH activities and any notable observations.

2.3.4 Monthly Reports

Formal monthly reports of IH activities performed onsite include interpreted results summary, general conclusions about exposure levels (ELs), any identified areas of concern, and actions required or taken to resolve these concerns.

This report will be generated by the Jacobs Site HSE Manager, or their designee, and will be reviewed by the Jacobs IH Manager prior to distribution. Due to the lag time in receiving lab results, the report will be issued no later than the end of the following month for the previous month barring any unexpected delays such as data validation (e.g., end of July for June results).

2.4 VERIFY UPPER CONFIDENCE LIMITS AND MANAGE FURTHER MONITORING

When integrated monitoring is performed, a statistically significant sample of workers will be selected for exposure monitoring per the direction of the Site IH Manager, recommended National Institute of Occupational Safety and Health (NIOSH) sample methods, and other recognized industry standards. Nearby areas or employees may be monitored if it is suspected there is a dispersed impact of the contaminants of concern, however, these personnel will not count toward the statistical significance of the task workers monitored.

An evaluation of all exposure groups will be performed to determine exposure potential for recognized stressors. If data gaps exist, additional monitoring will be performed until all SEGs have been adequately characterized. Once an exposure group is adequately characterized, ELs will be statistically evaluated. If data sets are large enough, parametric statistics will be utilized using the 95^{th} percentile Upper Confidence Limit (UCL). For small data sets, Bayesian statistics will be utilized to determine with 95% confidence which exposure bands (per Table 2-2) the associated levels fall into. Applicable ELs will be those listed in Section 4 and Table 4-2 of the SWSHP or the most recent version of applicable Federal, State, or Occupational Safety and Health Administration (OSHA) regulations or the most recent edition of the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values booklet.

Table 2-2
Summary of Exposure Monitoring Actions

If the UCL is	The Exposure is Deemed	Further Monitoring consists of
<10% of the EL	Insignificant	Verifying the process and exposure potential remain unchanged
>10% and <50% of the EL	Marginal	Quarterly integrated
>50% and <100% of the EL	Significant	Monthly integrated
>100%	Unacceptable	Routinely until controls have adequately lowered exposures

If an Action Level in Section 4 of the SWSHP is exceeded, notification will be made verbally in the daily Health and Safety meeting. A preliminary review and validation will be conducted by the Site HSE Manager or the Jacobs CIH. The activities, equipment, and conditions of the day of sampling are evaluated to determine potential contributing factor(s) to the exposure, with the goal of preventing similar situations or identifying controls to reduce exposures to below criterion levels.

Depending on the results of the preliminary review and validation, additional sampling or review may be necessary, or action items recommended for review. Exceedances indicating the need for upgrading respiratory protection will be immediately brought to the attention of the TVA and Jacobs Program Managers.

3.0 IDENTIFICATION OF MONITORING NEEDS

The need to include personnel or areas in IH monitoring programs will be based on a number of factors; however, they will be primarily based on assessing the potential exposures of routine field activities.

3.1 EXISTING PROCESS

Currently the recognized processes onsite include; ash removal from land-based release areas, ash removal from existing storage areas, ash stacking, site maintenance, equipment maintenance, drilling, field supervision, perimeter wall construction, and office activities. These processes may occur within a number of different scenarios or with different contractors; however, the relative occupational exposures and stressors are expected to be relatively consistent.

3.2 NEW PROCESS

In the event new activities are added, an evaluation will be conducted to determine if new SEGs are created from those activities. If new SEGs are added, they will be included for routine monitoring along with other SEGs. Monitoring priority will be based on potential for exposure.

3.3 WORKER COMPLAINTS

Worker complaints are to be taken seriously and will be given immediate attention for initial evaluation. Initial evaluation includes direct observation of the related tasks, reviews of existing data for similar sampling, utilization of direct read instruments, and, when appropriate, discussion with the individuals involved.

If it appears that worker complaints present valid or real potential exposures, those complaints will be addressed by conducting integrated monitoring as soon as practical.

3.4 MANAGEMENT REQUEST

Management requests will also be given priority for initial evaluation which will include direct observation of the related tasks, reviews of existing data for similar sampling, and when possible, utilization of direct read instruments.

If after initial evaluation no conclusions can be drawn about actual ELs, integrated monitoring will be conducted as soon as practical.

4.0 CHEMICAL HAZARD MONITORING METHODS

4.1 STRESSORS OF POTENTIAL CONCERN

Table 4-1 lists the potential chemical hazards currently identified for the site and the applicable NIOSH methods associated with the particular contaminate sampling and analytical methods. The NIOSH methods will be applied in conjunction with best management IH practices acknowledged by: the American Board of Industrial Hygiene (ABIH), American Industrial Hygiene Association (AIHA), ACGIH, and recommendations by AIHA certified laboratories.

Table 4-1
Recognized Sample Methods to be Utilized

Method Number	Stressors of Potential Concern	Sampling Media
NIOSH 0500	Particulates, Total	37mm MWMCE[2]
NIOSH 0600	Particulates, Respirable	37mm PVC[3]
NIOSH 7300	Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron Oxide, Lead, Magnesium, Manganese, Molybdenum, Nickel, Potassium, Selenium, Sodium, Thallium, Vanadium, Zinc Oxide	37mm MWMCE
NIOSH 7500	Silica, Amorphous; Silica, Quartz; Silica, Cristobalite; Silica, Tridymite	37mm PVC
Per CHP[1]	Radium-226, Radium-228, Thorium-228, Thorium-230, Thorium-232, Thorium-234, Uranium-234, Uranium-235, Uranium-238	37mm MWMCE
NA	Misc. indoor air quality concerns (Office Trailers)	Varies

Notes:
[1] Per CHP – as coordinated by TVA Certified Health Physicist
[2]MWMCE – matched weight mixed cellulose ester
[3]PVC – polyvinyl chloride

4.2 EVALUATION METHODS TO BE USED

Potential inhalation hazards to those Stressors of Potential Concern (SOPC) listed in Table 4-1 will be evaluated through proper sampling techniques and review.

To initially determine potential exposures, the Site Industrial Hygienist will first review prior documented data collected by TVA and EnSafe. An evaluation will be performed to determine if adequate characterization has been achieved for each SEG or if data gaps exist.

If data gaps appear to exist, an objective evaluation will be done utilizing when possible the following sequence:

1. Calculations or exposure modeling
2. Direct reading evaluations
3. Integrated monitoring techniques

If methods 1 or 2 provide information that, with conservative assumptions, can verify or “prove” no exposures, the evaluation will be properly documented and will stop at that point. If this

cannot be achieved, integrated monitoring will be performed and data collected until adequate conclusions can be drawn.

All integrated monitoring will be performed using recognized industry methods, primarily NIOSH Sample and Analytical Methods as guidelines. As a general rule, area or environmental samples will not be used to evaluate worker exposures as significant variability may exist between the stationary monitor and the mobile worker and their breathing zone. Area monitoring may be used to evaluate the general effectiveness of controls samples and the potential impact of downwind / offsite receptors.

Field quality control (QC) will require a minimum of one field blank for every 10 primary personal or area samples submitted for laboratory analysis. Field blank media will be selected randomly from the same lot as primary sample media. Field blanks will accompany primary samples onsite and during shipment to and from the laboratory.

4.3 FREQUENCY OF EXPOSURE MONITORING

Personnel identified by SEGs will be repeatedly monitored as needed to ensure potential inhalation hazards are controlled below Action Levels. Not all SEGs will be sampled with the same frequency, dependant on determining site factors, but all SEGs should be periodically re-evaluated to verify work activities have remained unchanged and data previously collected is still representative of current exposures. This should be done semi-annually for all active SEGs and documented in the monthly IH report. The actual sampling strategy for a specific day is determined or approved by the Site HSE Manager, project CIH, or designee.

Initially, frequency of exposure monitoring will be based upon the exposure risk rating identified for a given SEG. Once an SEG has been adequately characterized, additional verification monitoring will be based on Table 2-2.

4.4 EXPOSURE LIMITS

4.4.1 Sequential Analysis

A sequential analysis approach may be utilized for sample analysis strategy with the primary goals being optimizing data collection and increasing efficiency. The following option is provided as an example only; if other analytes or chemicals of concern are identified, other sequences may be employed for sample strategy.

Total particulate and metals samples: Samples are collected and initially analyzed for total particulate. If total particulate concentrations are at or above 0.5 milligrams per cubic meter, additional analysis is conducted for arsenic and cadmium provided they have adequate sample volume to record concentrations low enough to be meaningful.

If a lag in results is unacceptable due to project needs, the sequential analysis can be bypassed to allow analysis of all chemicals of concern simultaneously.

4.4.2 Action Levels

Action Levels for the site are typically not regulatory levels; however, several SOPCs have specific OSHA-defined Action Levels. If an OSHA Action Level does not exist, TVA generally

uses one-half of the time-adjusted Permissible Exposure Level (PEL) (Brief and Scala Method). Applicable action levels will be those listed in Section 4 and Table 4.2 of the SWSHP.

TVA is a Federal entity and is therefore governed by Federal OSHA PEL's. In addition, there are several contracting partners onsite that are required to follow the Tennessee (TN)-OSHA PEL's. The PEL's that will be mandated for compliance will be most conservative of either TN or Federal OSHA.

The Threshold Limit Valuesfound in ACGIH and/or the Recommended Exposure Limits found in NIOSH will be typically used as a lower level indicator to provide an early warning of potential exposure risks. These indications will provide an opportunity for initiating further reviews, performing an evaluation and implementing subsequent controls that will aid in maintaining exposures as low as reasonably achievable and maintain them to less than the established Action Levels required by law under both TN and Federal OSHA.

4.4.3 Exceedances

If an Action Level is exceeded, a preliminary review will be conducted by the Site HSE Manager; if this individual is not available, it will be conducted by the project CIH, TVA, or Site Safety staff. The activities, equipment, and conditions of the day of sampling are evaluated to determine potential contributing factors to the exposure with the goal of preventing similar situations or identifying controls to reduce exposures to below criterion levels.

Depending on the results of the preliminary review, additional sampling or review may be necessary, or action items recommended for review. Exceedances indicating the need for upgrading respiratory protection will be brought to the attention of the TVA Site Manager.

5.0 PHYSICAL HAZARD MONITORING

5.1 NOISE

There is a potential for personnel to be exposed to noise levels above the OSHA allowable maximum 8-hour Time Weighted Average during normal field operations. The Site Industrial Hygienist will first review TVA and EnSafe documentation to determine the severity of each existing noise exposure data prior to conducting sound level measurements and personal noise dosimetry on individuals in each SEG. Based upon this review and assessment, priority measuring will be conducted for those SEGs having the greatest need. Not all SEGs will require the same level of support or measurement; however, all SEGs should have or will be evaluated.

All noise sampling instruments and field calibrators will be maintained within the most current calibration cycles.

5.2 THERMAL STRESS

Heat stress monitoring equipment will typically consist of area sampling devices capable of Wet Bulb Globe Temperature measurements. Environmental heat measurements should be made as close as possible to the specific work area where the worker is exposed. Please note that for some operations (e.g., heavy equipment operations), this may require sampling inside the cab of applicable equipment. Equipment with air-conditioned cabs will generally not be sampled. Heat stress measurement equipment must have been serviced per manufacturer's specifications.

5.3 INDUSTRIAL ERGONOMICS

Numerous activities onsite present ergonomic stress and strain and the potential for personnel to suffer acute and chronic soft tissue injuries. An initial evaluation will be done of the various SEGs to determine if they fall within low, medium, or high potential for ergonomic injury.

Formal industrial ergonomic evaluations will be done for all those SEGs deemed to be at high risk for ergonomic problems. Controls will be implemented as necessary to minimize the related stressors. Once controls are implemented, a follow-up evaluation will be performed to verify they adequately address the issues identified.

Those SEGs falling into medium or low-risk categories will be evaluated on an as needed basis, primarily based on worker complaints or management request.

5.4 OFFICE ERGONOMICS

Those personnel who predominantly work in an office environment (project controls, administrative personnel, IT support, communications personnel, data management, etc.) should perform an initial self assessment of their work station to verify proper ergonomic configuration. If issues are identified or require input of an industrial hygienist, work station evaluations will be performed. In either case, all self evaluations and ergonomic consultations will be recorded and maintained within the IH project files.

5.5 FREQUENCY OF EXPOSURE MONITORING

Noise and ergonomic stressors will be evaluated until proper exposure characterization for each SEG can be established. Additional monitoring will be performed if the process is known to have changed in a manner that would increase the potential for exposure.

Thermal stress will be evaluated daily during periods of time where it is likely to create heat related conditions onsite and will remain consistent with the process outlined in Sections 5.3 and 5.4 of the SWSHP.

5.6 EXPOSURE LIMITS RECOGNIZED

Exposure limits and sources of limits vary significantly for associated physical hazards. The following breaks out recognized limits for likely physical hazards to be encountered onsite.

5.6.1 Noise

All exposure limits for noise will be based on 29 CFR 1910.95 – Occupational Noise Exposure. These limits are currently 90 dBA for an 8-hour exposure with an Action Level of 85 dBA for an 8 hour exposure. With extended work shifts frequently encountered onsite, PELs for noise will be adjusted using a 5 dB doubling rate and Table G-16 of 29 CFR 1910.95.

5.6.2 Heat Stress

Limits for heat stress are established in the SWSHP, Section 5.3, and follow TVA Safety Procedure 806 for heat stress control. It is generally recognized that the ACGIH limits established for heat stress are too conservative for acclimatized workers and on which will not be used to base work / rest cycles.

5.6.3 Ergonomics

Numerous standards exist for ergonomic control; however, none are considered regulatory. When ergonomic evaluations are conducted, results will be compared to recognized industry standards including NIOSH and the ACGIH.

6.0 QUALITY CONTROL / QUALITY ASSURANCE

6.1 EQUIPMENT CALIBRATION

Sampling and calibration of pumps and dosimeters will be conducted in accordance with equipment manufacturer recommendations, or as stipulated in the applicable OSHA or NIOSH Method. Personal sampling pumps will be flow rate calibration checked before and after each day's sampling per Site Guidance Document HSE-07 Industrial Hygiene Personal Air Monitoring Procedure (Appendix A to the SWSHP).

6.2 LABORATORY QUALITY CONTROL

All samples submitted for laboratory analysis will be analyzed by a lab accredited by the AIHA or participate in the National Voluntary Lab Accreditation Program. The use of non-accredited labs may be necessary for unusual analytes (e.g., NORM); in this case, approval of a CIH is required prior to submittal. Laboratories will be required to adhere to the contractual QC requirements and will be subjected to audits by the QA Team.

6.3 DATA VALIDATION

Data validation will be performed on data from personal integrated monitoring samples. The laboratory QC samples to be reviewed will include blanks, duplicates, lab control standards, and calibration verification standards. Sample completeness and field blank/field duplicate results will also be evaluated if available.

The purpose of the validation is to ensure that the reported data is usable for its intended purposes. Samples that are not within the acceptable criteria for parameters representing sample collection, handling and analysis criteria will be identified, from which assessments can be made of data usefulness. These criteria will be developed in conjunction with the selected laboratory using guidance from the laboratory accreditation body.

The laboratory will deliver sample data packages in parallel to both the project IH Program and the project Data Management Team/QA Team. For the IH Program, the following information is required:

- Summary data package in PDF form
- An Electronic Data Deliverable (EDD).

Upon receipt of the analytical laboratory data, the Site HSE Manager or designee compiles individual reports and assesses measured values against OSHA and other applicable exposure limits. Calculations of the dataset may be performed through an IH database, spreadsheet, or other methods to facilitate documentation of the review. The Site HSE Manager or designee also reviews measured values for reasonability against known field conditions associated with the sample, measurements taken elsewhere the same day, or historical measurements for a particular work activity.

The QA Team and TVA will receive an EDD and a Level IV data package. Upon receipt of the analytical laboratory data, the QA Team validates the data and the Data Management Team stores the data in EQuIS® in accordance with the Quality Assurance Project Plan for the Tennessee Valley Authority Kingston Ash Recovery Project (TVA-KIF-QAPP) and the Data

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

If questions arise during data validation by either party, immediate communication must be made via email between the IH Team and the QA and Data Management Teams in order to ensure appropriate and parallel re-assessment of data is performed from a QA perspective. If data are required to be resubmitted by the laboratory, revised data will be sent in parallel to both the IH Program and the project Data Management Team/QA Team. All discrepancies will be reconciled prior to either dataset being considered final. Once both datasets are consistent, the data are considered final.

6.4 DATA QUALITY OBJECTIVES

The Data Quality Objective (DQO) process is a logical series of seven steps that guides investigators to a plan for IH data. The process is both flexible and repetitive, and applies to both decision-making (e.g., compliance/non-compliance with a standard) and estimation. The DQO process establishes performance and acceptance criteria that drive the plan for collecting data of sufficient quality and quantity to support the goals of the IH study(ies). The DQO process leads to efficient and effective expenditures of resources; consensus on the type, quality, and quantity of data needed to meet project goals; and full documentation of actions taken during project maturity.

The steps in the DQO process are as follows:

1. State the problem
2. Identify the goal(s) of the study
3. Identify information inputs
4. Define the study boundaries
5. Develop the analytic approach
6. Specify performance or acceptance criteria
7. Develop the plan for data acceptance

6.4.1 Problem Statement

On December 22, 2008, a coal ash release occurred at the KIF, allowing a large amount of coal ash to escape into the adjacent waters of the Emory River and surrounding land, releasing about 5.4 million cubic yards and covering about 300 acres.

The coal ash, a by-product of a coal-fired power plant, originates from coal burned in boilers for power production at the KIF. The coal, in its natural state, contains various metals that can be retained with the ash after burning. The ash itself is primarily composed of fine silica particles very similar to sand, but trace amounts of arsenic, selenium, cadmium, boron, thallium, beryllium, and other metals which occur naturally in the coal remain in the ash after coal combustion. These metals are typically bound to the ash.

In an effort to move the coal ash to its original location requires much heavy equipment capable of moving the ash. This equipment includes such items as excavators, dump trucks, dredges, scraper pans, etc. Therefore the activities require drivers, operators, and support laborers, or personnel that have the potential for exposures. Due to the potential inhalation hazards and the CERCLA designation, Hazardous Waste Operations and Emergency Response controls have been placed on the site.

6.4.2 Project Goals

The primary objectives for IH monitoring are to:

- Provide continuing confirmation that KIF-related constituents have not negatively affected the Kingston Ash Recovery Project site personnel's health by either acute (or single) or chronic (or repeated) exposures.
- Provide respiratory exposure data sufficient to substantiate efforts to minimize risk of adverse exposures are in place and effective for all individuals spanning all SEGs.
- Evaluate the effectiveness of best management practices (e.g., dust control, respiratory protection, etc.) in preventing or mitigating respiratory occupational exposures.

6.4.3 Information Inputs

The information necessary to achieve the objectives includes the following:

- Reoccurring and scheduled IH personal air monitoring.
- Analytical results of air monitoring for ash-related constituents.

6.4.4 Study Boundaries

Personal (industrial hygienic) air monitoring will be conducted on all SEGs:

- Identified as having a potential respiratory exposure to coal ash constituents.
- Supervisory requests of personnel having been evaluated by IH staff and verified as having potential exposures.

6.4.5 Analytic Approach

Coal ash contains numerous constituents that have been linked to adverse health effects in human receptors. Specific constituents of interest include silica, arsenic, selenium, beryllium among others. Analysis should be conducted by laboratories operating in accordance with the standards set forth by AIHA. Analysis should also be conducted based upon the associated methods identified by NIOSH.

6.4.6 Performance or Acceptance Criteria

The null hypothesis for personal IH air monitoring is: The percentage of coal ash constituents do not result in occupational respiratory health hazards to personnel working onsite. The alternative hypothesis is: The percentage of coal ash constituents result in occupational respiratory health hazards to personnel working onsite.

The null hypothesis for dust control is: Best Management Practices (BMPs) are completely adequate for controlling occupational exposures of ash-related contaminants during removal operations. The alternative hypothesis is: BMPs are not completely adequate for controlling occupational exposures of ash-related contaminants during removal operations.

6.4.7 Data Acceptance

Data acceptance is based on criteria established in Section 6.3.

6.5 QUALITY ASSURANCE / QUALITY CONTROL AND QUALITY ASSURANCE PROJECT PLAN (QAPP) CROSS WALK TABLES

Jacobs uses the NIOSH Analytical and Sampling Methods outlined in the *NIOSH Manual of Analytical Methods* (NMAM) in conjunction with best management IH practices acknowledged by: the ABIH, AIHA, ACGIH, and recommendations by AIHA certified laboratories to perform the air sampling conducted on the Kingston Ash Recovery Project site. NMAM is a collection of methods for sampling and analysis of contaminants in workplace air of workers who are occupationally exposed. These methods have been developed or adapted by NIOSH or its partners and have been evaluated according to established experimental protocols and performance criteria. NMAM also includes chapters on QA, sampling, portable instrumentation, etc. The methods used as described below in Table 6-1 can be found at: http://www.cdc.gov/niosh/docs/2003-154/

Table 6-1
OSHA / NIOSH Analytical and Sampling Methods and Site Guidance Documents

Method/WI Number	Method/Document Title
NIOSH 0500	Particulates not otherwise regulated, total 0500
NIOSH 0600	Particulates not otherwise regulated, respirable 0600
NIOSH 7300	Elements by ICP (nitric/perchloric acid ashing) 7300
NIOSH 7500	Silica, crystalline, by XRD (filter re-deposition) 7500
HSE-07	Industrial Hygiene Personal Air Monitoring Procedure

Table 6-2
Quality Assurance Project Plan Cross-Walk

QAPP Element	Location in SWSHP	Location in NIOSH Methods
Data Quality Objectives	Appendix K, Section 6.4, Data Quality Objectives	
IH Program Design	Appendix K, Section 2.0, Industrial Hygiene Process Overview	
Sampling Methods	Appendix K, Section 4.0, Chemical Hazard Monitoring Method; Section 2.1, Identification of Similar Exposure Groups; Table 2-1, Similar Exposure Groups Identified at the Kingston Ash Recovery Project Site	Applicable NIOSH Methods (e.g., 0500, 0600, 7300, 7500, etc.)
Sample Collection	HSE-07, Industrial Hygiene Personal Air Monitoring Procedure	
Data Review and Validation (QAPP Section 21.0 22.0)	Appendix K, Section 6.3, Data Validation	
Assessments and Response Actions (QAPP)	Appendix K, Section 2.4 Verify Upper Confidence Limits and Manage Further Monitoring; and Section 2.3 Document Control, Reporting, and Notification.	

Attachment 1

Sample Health Hazard Evaluation by Exposure Group (Form 124)

HEALTH HAZARD EVALUATION BY EXPOSURE GROUP							
Work Area:							
Exposure Group:							
Task(s):							
Contaminant or Agent	**Exposure Probability**	**Health Effect Rating**	**Uncertainty Rating**	**Risk Rating**	**Month /Year to Monitor or Monitored**	**Applicable EL and Range of Results**	**Control Strategy Implemented**

Notes:

This table to be completed using the standard approach outlined in Jacobs *HSEP 12.1, Health Hazard Evaluation*
EL = Exposure Level

Attachment 2

Kingston Ash Recovery Site Industrial Hygiene Monitoring White Paper

Kingston Ash Recovery Site Industrial Hygiene Monitoring Whitepaper

January 24, 2013

1. Introduction

Since July 2010 exposure monitoring has been performed at TVA's Kingston Ash Recovery Project site by Jacobs. The objective of this monitoring was to evaluate potential exposures associated with ongoing work activities during clean-up and recovery operations. The monitoring was initiated at the onset of the clean-up response by EnSafe, Inc. EnSafe performed industrial hygiene support activities until the responsibility for the monitoring was passed to Jacobs in July 2010.

In keeping with recognized industrial hygiene practices, similar exposure groups (SEGs) were established by Jacobs and were monitored for contaminants that could exist in the work environments given the type of tasks being performing. Jacobs also reviewed the existing EnSafe data and when possible, incorporated their information into the appropriate Jacobs SEG data set. The overall objective of establishing SEGs was to characterize the exposure for each potential workplace air contaminant they may encounter. Each SEG was assigned 1 of 4 contaminant specific exposure characterization bands based on statistical analysis of their data set using a 95% confidence limit.

The following bands were used for exposure characterization for each contaminant within each SEG:

Band 1. <10% of the exposure limit
Band 2. ≥10% and <50% of the exposure limit
Band 3. ≥50% and <100% of the exposure limit
Band 4. ≥100% of the exposure limit

Per the *Site Wide Safety and Health Plan for the TVA Kingston Fossil Plant Ash Release Response*, there were several criteria established for cessation or reduction of air monitoring. These included:

- Achieve adequate exposure group characterization, generally to the 95% confidence level. An exposure group may be considered characterized when this confidence level is reached with the data set and is not dependent on the results being below the associated permissible exposure level (PEL).
- Change in process occurs or engineering controls implemented which effectively decreases monitoring levels to less than 25% of the associated PEL.
- Completion or cessation of the associated task or removal of the associated exposure group from the exposure environment.

2. Evaluation

Currently there are 8 SEGs active at the site:

- Drill Crew
- Hydroseed Crew

- Mechanic
- On-Land Laborer
- On-Land Operator
- Perimeter Wall Crew
- Site-wide Support Staff
- Teamster

Under the current sampling approach, weekly monitoring is being performed with at least two SEGs being monitored each week. However, as the attached data summary sheet demonstrates, with the exception of Mechanic and Perimeter Wall Crew SEGs, the probabilities for the remaining six SEGs indicate exposure levels represented by Band 2 as noted above (less than 50% of the exposure limit).

With the case of the Mechanic and Perimeter Wall Crew SEGs, the data indicates a well characterized exposure. Although exposure levels are somewhat higher, the exposures for these two SEGs fall in Band 3 of the table and are still less than the exposure limit. In both of these instances a reduction of monitoring frequency to quarterly is warranted. In the first instance, the data strongly demonstrates that exposures are inconsequential and are well characterized. In the second instance, the exposure groups are adequately characterized and appropriate controls are in place to minimize exposure to personnel. The quarterly sampling will be used to verify these conclusions are still valid.

3. Conclusion

Recommend changing the current sampling frequency to quarterly for all active SEGs onsite. The intent of the quarterly sampling is to verify that no significant change in process or operation has occurred and that current data assumptions are still valid.

SEG	Sample data Timeframe:*	Probability of Exposure Against the Average Shift Adjusted OEL					
		Potential Exposure	< 10% of the EL	> 10% and < 50% of the EL	> 50% and < 100% of the EL	> 100% of the EL	Average Shift Adjusted OEL
Drill Crew	To 9/27/12	Respirable Particulate	0.5	99.5			3.59 mg/m3
	To 9/27/12	Silica <LOD as LOD		95.4	4.6		0.036 mg/m3
Hydroseed Crew	To 9/27/12	Respirable Particulate	98	2			4.86 mg/m3
	To 9/27/12	Silica <LOD as LOD		99	1		0.047 mg/m3
Mechanic	To 9/27/12	Respirable Particulate	84.8	15.2			3.26 mg/m3
	To 9/27/12	Silica <LOD as LOD		92.3	7.6	0.1	0.034 mg/m3
On-Land Laborer	To 9/27/12	Respirable Particulate	100				3.68 mg/m3
	To 9/27/12	Silica <LOD as LOD		99.9	0.1		0.036 mg/m3
On-Land Operator	To 9/27/12	Respirable Particulate	100				3.45 mg/m3
	To 9/27/12	Silica <LOD as LOD		99.7	0.3		0.034 mg/m3
Perimeter Wall Crew	To 9/27/12	Respirable Particulate		8	92		2.6 mg/m3
	To 9/27/12	Silica <LOD as LOD			100		0.026 mg/m3
Site-wide Staff Support	To 9/27/12	Respirable Particulate	99.8	0.2			3.59 mg/m3
	To 9/27/12	Silica <LOD as LOD		99.8	0.2		0.033 mg/m3
Teamster	To 9/27/12	Respirable Particulate	99.9	0.1			3.4 mg/m3
	To 9/27/12	Silica <LOD as LOD		99.7	0.3		0.035 mg/m3
		Sample Frequency:	Verify no change	Quarterly	Monthly	Routinely	

Notes:
*Data included from July 2010 until date noted.
LOD- Limit of Detection = Method Detection Limit = A statistical estimate of method/media/instrument sensitivity.
EL- Exposure Limit
OEL- Occupational Exposure limit
All Metals screening results were less than 10% of the EL

Program:
IHDataAnalyst V1.27
Respirable particulate samples run with Default CDA method:
Substitution with LOD/2 when <LOD lab result.

Silica was run with Default CDA method:
No Substitution. Use LOD when <LOD lab result.