



# Work Plan

Created: June 2011, Updated: 12/10/2012, 08/02/2013, 09/23/2013, Version 3.0

Page 1 of 2

<b>Task:</b>	Remote Opening and Management of Unknown Chemical Containers		
<b>Site Name:</b>	Knoxville College	<b>Estimated State Date:</b>	June 23, 2014
<b>Activity Hazard Analysis #</b>	KnoxvilleCollege001	<b>Estimated Task Duration:</b>	1 Week
<b>Personnel Needed:</b>	1 – Project Manager 2 – Equipment Operators 2 – Laborers 1 – Safety Officer 2 – Air Monitoring Support (START) 1 – Technical Specialist (Chemist)	<b>Specialized Equipment Needed:</b>	1 – Crush Box 1 – Excavator 1 – Skid Steer 1 – Lull 1 – Rotating Drum Grapppler 1 – 3000 gallon water truck Vermiculite Neutralizing Media
<b>Summary of Work:</b>	<p>Unknown chemical containers will be moved to an outside area and remotely opened and crushed in an 8’x8’x8’ welded stainless steel crush box. The chemicals will be solidified and mixed with inert absorbent and neutralizing materials. Solidified material will be containerized into drums and containers for disposal. Composite samples of the material will be sent to a laboratory for RCRA hazardous waste determination.</p> <p>Multiple air monitoring stations will be established and monitor for the expected contaminants. Stations will be located at the Pad site and at multiple up and down wind locations. Monitors will be connected to EPA’s remote web-based data collection and alert capabilities (using EPA’s VIPER system):</p> <ol style="list-style-type: none"> <li>1. DataRAM Particulate Monitors</li> <li>2. Area RAE Monitors (Oxygen, Explosive Gas, Volatile Organic Compounds, Carbon Monoxide, Hydrogen Sulfide, Hydrogen Cyanide Gas)</li> <li>3. MultiRAE Air Monitors (Oxygen, Explosive Gas, Volatile Organic Compounds, Carbon Monoxide, Hydrogen Sulfide, Gamma Radiation)</li> <li>4. Acid Gas Monitors</li> </ol>		
<b>Steps:</b>	<ol style="list-style-type: none"> <li>1. <b>Preliminary Recon and Site Prep.</b> The area that has been chosen is protected and downwind/downhill from the support zone. The Vacant Martin Luther King Towers will protect the adjacent neighbor in the unlikely event of an uncontrolled reaction. See site map for the location of the Pad and air monitoring stations. Construct a DECON and staging area. Establish a water supply for DECON and neutralization operations. Position excavator and crush box loading area up wind of crush box. Locate the water source/truck in DECON. Locate an ABC Fire extinguisher in close proximity to the remote opening site.</li> <li>2. <b>Preparing and securing the Crush Box.</b> The crush box is an 8’x’8x8’ welded stainless steel container. Grade and level the area. Secured the box by excavating approximately 4’ and partially bury. Fill the bottom of the box with vermiculite. Stage a pile of soil next to the crush box to be used to smother a fire if necessary. Stage bags</li> </ol>		



# Work Plan

Created: June 2011, Updated: 12/10/2012, 08/02/2013, 09/23/2013, Version 3.0

Page 2 of 2

of vermiculite and appropriate neutralized agent.

3. **Container Handling and Movement.** Remote Open/Crush solids separately from the liquids. Load the chemical containers into a steel 55-gallon drum. Using a skid steer with a rotating drum grapppler slowly load the containers into the crush box.
4. **Remote opening/crushing the unknown chemical bottles.** Using the excavator bucket, crush the bottles and to solidify/mix with the vermiculite. Attendant should apply water to suppress any vapors, cool any reactions or use the ABC fire extinguisher as needed. The goal would be to use the water fog to contain the vapors inside of the Crush Box. Stage soil by the box and use to suffocate a fire that the ABC extinguisher cannot handle.
5. **Adding additional vermiculite/solidifier and neutralizing agent (as necessary).** Additional vermiculite may be needed to completely solidify the liquids. Materials that continue to produce vapor will need to be pH'ed and neutralized as appropriate.
6. **Consolidation of solidified material into shipping containers.** After the materials is sufficiently solidified, mixed and neutralized (as appropriate) remove the materials from the crush box and containerize into appropriate shipping containers.
7. **Composite Sample for HAZWASTE Determination.** After the materials are sufficiently solidified and mixed, obtain a composite sample for waste determination following standard sampling procedures.
8. **DECON of Equipment.** Completely decontaminate all equipment and supplies. Containerize and dispose DECON media and any materials/equipment that cannot be decontaminated.
9. **Site Restoration.** Restore area to previous state. Fill in any holes and replant grass seed if needed.

Activity Hazard Analysis		AHA#: KnoxvilleCollege001	Competent Person: ERRS, EPA and START HAZMAT Technicians																															
<b>Job Task:</b>	Remote Opening and Management of Unknown Chemical Containers	<b>Task Description:</b>	Moving unknown chemical containers to an outside area and remotely opening/crushing. Solidification and mixing of unknown chemicals with inert absorbent and neutralizing materials. Composite sampling for hazardous waste determination. Containerizing solidified materials into drums and containers for disposal																															
<b>Personal Protective Equipment:</b>	Level B – Tychem SL (Saranex) or equivalent suits, Chemical Protective Booties, Chemical Protective Gloves, Cut Resistant Gloves, Hard Hat, SCBA or SAR	<b>Air Monitor Equipment:</b>	Particulate Monitors, AreaRAE Monitors (O2, LEL, CO, H2S, VOC), Acid Gas Monitor (SPM), MultiRAE Monitors (O2, LEL, CO, H2S, VOC, Gamma Radiation, HCN).																															
<b>Hazard Types (HT)</b>		<b>Hazardous Substances:</b>	Unknown, flammable, corrosive, air reactive and toxic chemicals in small containers.																															
1. Toxic Chemicals 2. Flammable Chemicals 3. Corrosive Chemicals 4. Environmental 5. Explosion (Chemical Reaction) 6. Explosion (Over Pressurization) 7. Mechanical/Vibration 8. Electrical (Shock, Short Circuit) 9. Electrical (Fire) 10. Electrical (Static, ESD) 11. Electrical (Loss or Power) 12. Ergonomic (Overexertion) 13. Ergonomic (Human Error)		<b>Critical to Safety (CTS) Ranking:</b>	<b>Medium</b>																															
14. Vibration 15. Fall (Slips/Trips) 16. Fall (To a Different Level) 17. Excavation (Collapse) 18. Fire, Heat, Thermal, Cold 19. Noise 20. Radiation (Ionizing/Non-ionizing) 21. Visibility 22. Weather 23. Caught (In, On, Between) 24. Struck (by, against) 25. Workplace Violence		<b>Risk Estimation Matrix</b> <table border="1"> <thead> <tr> <th rowspan="2">Probability of Occurrence of Harm</th> <th colspan="4">SEVERITY OF HARM</th> </tr> <tr> <th>Catastrophic</th> <th>Serious</th> <th>Moderate</th> <th>Minor</th> </tr> </thead> <tbody> <tr> <td>Very Likely</td> <td>Extreme</td> <td>High</td> <td>High</td> <td>Medium</td> </tr> <tr> <td>Likely</td> <td>High</td> <td>High</td> <td>Medium</td> <td>Low</td> </tr> <tr> <td>Unlikely</td> <td>Medium</td> <td>Medium</td> <td>Low</td> <td>Negligible</td> </tr> <tr> <td>Remote</td> <td>Low</td> <td>Low</td> <td>Negligible</td> <td>Negligible</td> </tr> </tbody> </table>				Probability of Occurrence of Harm	SEVERITY OF HARM				Catastrophic	Serious	Moderate	Minor	Very Likely	Extreme	High	High	Medium	Likely	High	High	Medium	Low	Unlikely	Medium	Medium	Low	Negligible	Remote	Low	Low	Negligible	Negligible
Probability of Occurrence of Harm	SEVERITY OF HARM																																	
	Catastrophic	Serious	Moderate	Minor																														
Very Likely	Extreme	High	High	Medium																														
Likely	High	High	Medium	Low																														
Unlikely	Medium	Medium	Low	Negligible																														
Remote	Low	Low	Negligible	Negligible																														
*High – CTS tasks should receive engineering controls prior to assigning administrative or PPE controls.																																		
Step #	Procedures	Potential Hazards	HT	CTS	Recommended Safe Practice																													
1	<b>Preliminary Recon and Site Prep</b>	Motor Vehicle Accidents, Weather and Visibility-Related Incidents; Slips, Trips, and Falls; Ergonomic injuries from moving heavy containers or equipment;	4,7,8,12, 13,14, 15, 17, 18, 19, 21, 22, 23, 24	<b>Low</b>	Be alert for unforeseen hazards or changing conditions; Use Buddy System; Assure that all personnel and contractors adhere to HASP requirements; Do not conduct this operation if there are imminent storms or severe weather.																													

2	<b>Preparing and securing the Crush Box</b>	Struck By/Crushed By Equipment; Slips, Trips, Falls; Excavation Hazardous Energy; Crush injuries from heavy containers; Ergonomic injuries from moving heavy containers or equipment;	4,7,8,12, 13,14, 15, 17, 18, 19, 21, 22, 23, 24	<b>Medium</b>	Wear appropriate PPE and High Visibility Vest/Jacket: Make sure Equipment Operator knows where ALL personnel are at ALL times; Remain in line-of-sight of Equipment Operators; Use Spotters when backing equipment; Control access to worksite and to excavations; Do NOT enter trenches over 5 feet deep unless properly stepped or shored; Use Hearing Protection as required; Have a utility mark-out performed in excavation area; Refer to Site-Specific HASP detailed information.
3	<b>Container Handling and Movement</b>	Unknown Chemicals; Potential for explosive or toxic atmosphere; Cuts and lacerations from broken glass; Slip, Trips and Falls; Crush injuries from heavy containers; Ergonomic injuries from moving heavy containers or equipment;	1,2,3, 4,5,6, 8,12,15, 16,18,19, 21,22,23, 24	<b>Medium</b>	Do NOT hand sample any unknown, bulging, hissing containers – use remote opening methods; Do not move containers by hand unless absolutely necessary; Keep body and extremities as far away from containers as possible – NEVER lean over container for any reason; Monitor atmosphere constantly; Do not touch containers if crystals are noted; Refer to Site-Specific HASP detailed information and air monitoring plan.
4	<b>Remote opening/crushing the unknown chemical bottles</b>	Struck By/Crushed By Equipment; Slips, Trips, Falls; Hazardous Materials; Hazardous Energy; Unknown Chemicals; Potential for explosive or toxic atmosphere; Crush injuries from heavy containers; Ergonomic injuries from moving heavy containers or equipment;	1,2,3, 4,5,6, 8,12,15, 16,18,19, 21,22,23, 24	<b>High</b>	Wear appropriate PPE and High Visibility Vest/Jacket: Make sure Equipment Operator knows where ALL personnel are at ALL times; Remain in line-of-sight of Equipment Operators; Use Spotters when backing equipment; Control access to work-area; Use proper Respiratory and Hearing Protection as required; Position the heavy equipment upwind of the crush box; Refer to Site-Specific HASP for detailed safety recommendations; Attendant should be positioned upwind out of the way of the equipment but ready to use the ABC fire extinguisher or water as necessary; routinely inspect the hydraulic lines and the brass connections for signs of damage or corrosion. Refer to Site-Specific HASP detailed information, the decontamination and air monitoring plans.

5	<b>Adding additional vermiculite/solidifier and neutralizing agent (as necessary)</b>	Struck By/Crushed By Equipment; Slips, Trips, Falls; Hazardous Materials; Hazardous Energy; Unknown Chemicals; Potential for explosive or toxic atmosphere; Crush injuries from heavy containers; Ergonomic injuries from moving heavy containers or equipment;	1,2,3, 4,5,6, 8,12,15, 16,18,19, 21,22,23, 24	Medium	Make sure Equipment Operator knows where ALL personnel are at ALL times; Remain in line-of-sight of Equipment Operators; Use Spotters when backing equipment; Control access to worksite and to excavations; Use barricades or other forms of protection around active excavations; Wear appropriate PPE and High Visibility Vest/Jacket; Use proper Respiratory and Hearing Protection as required; Do not lean over the crush box while adding materials. Use skid steer or excavator to load the material if possible. Refer to Site-Specific HASP detailed information and decontamination and air monitoring plan; Use remote sampling/monitoring techniques.
6	<b>Consolidation of solidified material into shipping containers</b>	Struck By/Crushed By Equipment; Slips, Trips, Falls; Excavation Cave-In or Fall; Hazardous Materials; Hazardous Energy; Unknown Chemicals; Potential for explosive or toxic atmosphere; Crush injuries from heavy containers; Ergonomic injuries from moving heavy containers or equipment.	1,2,3, 4,5,6, 8,12,15, 16,18,19, 21,22,23, 24	Medium	Make sure Equipment Operator knows where ALL personnel are at ALL times; Remain in line-of-sight of Equipment Operators; Use Spotters when backing equipment; Control access to worksite and to excavations; Use barricades or other forms of protection around active excavations; Wear appropriate PPE and High Visibility Vest/Jacket; Use proper Respiratory and Hearing Protection as required; Refer to Site-Specific HASP detailed information and decontamination and air monitoring plan.
7	<b>Composite Sample for HAZWASTE Determination</b>	Hazardous Materials; Hazardous Energy; Unknown Chemicals; Potential for explosive or toxic atmosphere; Ergonomic injuries from moving containers or equipment.	1,2,3, 4,5,6, 8,12,15, 16,18,19, 21,22,23, 24	Medium	Wear appropriate PPE and High Visibility Vest/Jacket; Use proper Respiratory and Hearing Protection as required; Refer to Site-Specific HASP detailed information and decontamination and air monitoring plan; Use remote sampling techniques
8	<b>DECON of Equipment</b>	Struck By/Crushed By Equipment; Slips, Trips, Falls; Excavation Cave-In or Fall; Hazardous Materials; Hazardous Energy; Unknown Chemicals; Potential for explosive or toxic atmosphere; Crush injuries from heavy containers; Ergonomic injuries from moving heavy containers or equipment.	1,2,3, 4,5,6, 8,12,15, 16,18,19, 21,22,23, 24	Medium	Wear appropriate PPE and High Visibility Vest/Jacket: Make sure Equipment Operator knows where ALL personnel are at ALL times; Remain in line-of-sight of Equipment Operators; Use Spotters when backing equipment; Control access to worksite and to excavations; Use barricades or other forms of protection around active excavations; Use proper Respiratory and Hearing Protection as required; Refer to Site-Specific HASP detailed information, and the decontamination and air monitoring plans.

9	<b>Site Restoration</b>	Struck By/Crushed By Equipment; Slips, Trips, Falls; Excavation Hazardous Energy; Crush injuries from heavy containers; Ergonomic injuries from moving heavy containers or equipment;	4,7,8,12, 13,14, 15, 17, 18, 19, 21, 22, 23, 24	<b>Low</b>	Wear appropriate PPE and High Visibility Vest/Jacket: Make sure Equipment Operator knows where ALL personnel are at ALL times; Remain in line-of-sight of Equipment Operators; Use Spotters when backing equipment; Control access to worksite and to excavations; Use barricades or other forms of protection around active excavations; Use proper Hearing Protection as required; Refer to Site-Specific HASP detailed information.
---	-------------------------	--	---	------------	--

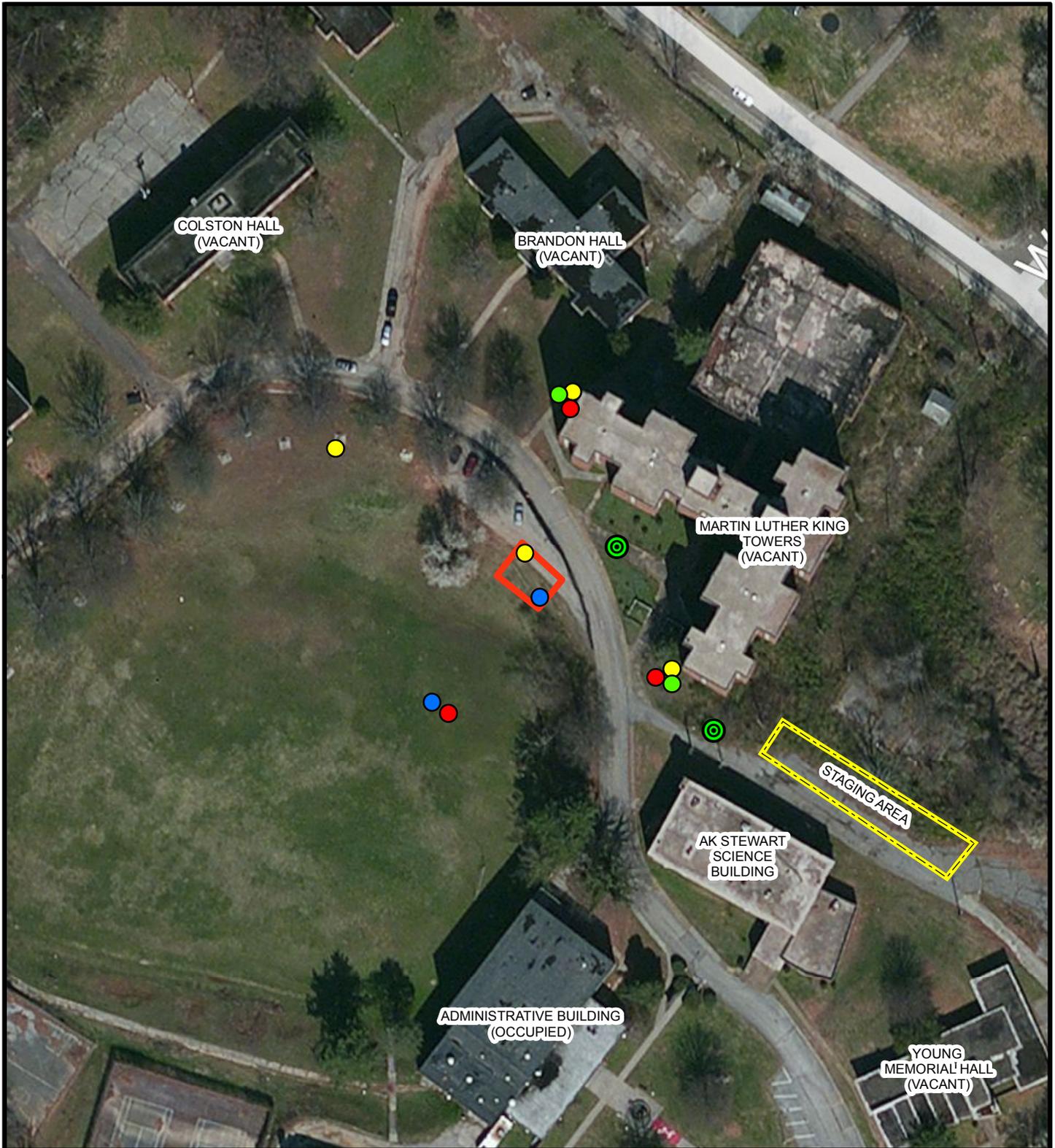
**HAZARDS – NOTE ALL POTENTIAL HAZARDS ASSOCIATED WITH THE JOB (CHECK ALL THAT APPLY)**

Physical					Biological								
General	<input checked="" type="checkbox"/>	thermal stress	<input checked="" type="checkbox"/>	Cold	<input checked="" type="checkbox"/>	noise	Agriculture	<input type="checkbox"/>	CAFO	<input type="checkbox"/>	Fish	<input type="checkbox"/>	farm animals
	<input checked="" type="checkbox"/>	Explosion	<input checked="" type="checkbox"/>	fire	<input checked="" type="checkbox"/>	weather	Animals	<input type="checkbox"/>	dogs	<input type="checkbox"/>	feral animals	<input type="checkbox"/>	Snakes
	<input checked="" type="checkbox"/>	Fatigue	<input type="checkbox"/>	violence	<input checked="" type="checkbox"/>	illness/injury	Insects	<input type="checkbox"/>	spiders	<input checked="" type="checkbox"/>	mosquitoes	<input checked="" type="checkbox"/>	wasp/hornet
Radiation	<input checked="" type="checkbox"/>	Ionizing	<input type="checkbox"/>	microwave	<input type="checkbox"/>	light		<input checked="" type="checkbox"/>	Bees				
Vehicles	<input checked="" type="checkbox"/>	Traffic	<input checked="" type="checkbox"/>	heavy equip	<input checked="" type="checkbox"/>	forklift	Pathogens	<input type="checkbox"/>	bloodborne	<input type="checkbox"/>	Sewage	<input type="checkbox"/>	med/lab
	<input type="checkbox"/>	Helicopter	<input type="checkbox"/>	small aircraft	<input checked="" type="checkbox"/>	boat	Other Biological	<input checked="" type="checkbox"/>	poisonous plants, domestic animals, scorpions, chemistry laboratories with abandoned chemicals				
Boat Ops	<input type="checkbox"/>	sediment sampling	<input type="checkbox"/>	rapid water	<input checked="" type="checkbox"/>	open water							
	<input type="checkbox"/>	Diving	<input type="checkbox"/>	Electrofishing									
Industrial	<input type="checkbox"/>	comp gas	<input checked="" type="checkbox"/>	electricity	<input type="checkbox"/>	Confined space	Containers	<input checked="" type="checkbox"/>	ammonia	<input checked="" type="checkbox"/>	Chlorine	<input checked="" type="checkbox"/>	Other
	<input checked="" type="checkbox"/>	Equip	<input checked="" type="checkbox"/>	moving parts			VOCs	<input checked="" type="checkbox"/>	solvents	<input checked="" type="checkbox"/>	Fuel	<input checked="" type="checkbox"/>	Oils
Overhead	<input type="checkbox"/>	Obstruction	<input type="checkbox"/>	falling objects			Wastes	<input type="checkbox"/>	sewer	<input type="checkbox"/>	Landfill	<input checked="" type="checkbox"/>	smoke/dust/fume
Elevation	<input type="checkbox"/>	Roof	<input type="checkbox"/>	scaffold	<input type="checkbox"/>	ladder		<input checked="" type="checkbox"/>	metals	<input type="checkbox"/>	PCBs	<input type="checkbox"/>	paints/surfacing
	<input type="checkbox"/>	Stairs	<input type="checkbox"/>	Catwalk			Particulates	<input checked="" type="checkbox"/>	fibers	<input checked="" type="checkbox"/>	Diesel	<input checked="" type="checkbox"/>	asbestos
Slips/trips	<input checked="" type="checkbox"/>	Terrain	<input checked="" type="checkbox"/>	debris	<input checked="" type="checkbox"/>	slippery	Sampling	<input checked="" type="checkbox"/>	acids	<input checked="" type="checkbox"/>	Bases		
	<input checked="" type="checkbox"/>	Trench	<input type="checkbox"/>	pits/holes			Other Chemicals:	<input checked="" type="checkbox"/>	VOCs, SVOCs, pesticides, herbicides, radionuclide,				

Other Physical Hazards:

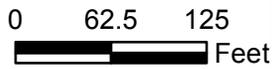
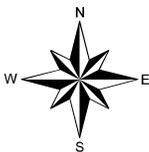
PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIRED (CHECK ALL THAT APPLY)					OTHER REQUIRED SAFETY EQUIPMENT / TRAINING							
Feet:	<input checked="" type="checkbox"/>	safety boots	<input checked="" type="checkbox"/>	steel-toe boots	<input checked="" type="checkbox"/>	shank	<input checked="" type="checkbox"/>	Dosimetry	<input checked="" type="checkbox"/>	communication	<input checked="" type="checkbox"/>	Decon
	<input type="checkbox"/>	rubber boots	<input type="checkbox"/>	waders	<input type="checkbox"/>	Other:	<input checked="" type="checkbox"/>	first aid kit	<input checked="" type="checkbox"/>	fire extinguish	<input type="checkbox"/>	Flares
Gloves:	<input checked="" type="checkbox"/>	Leather	<input type="checkbox"/>	cotton	<input checked="" type="checkbox"/>	cut-resistant	<input type="checkbox"/>	chains/studs	<input checked="" type="checkbox"/>	eye wash/shower		
	<input checked="" type="checkbox"/>	chemical resist	<input checked="" type="checkbox"/>	disposable								
Body:	<input checked="" type="checkbox"/>	safety vest	<input type="checkbox"/>	pdf	<input type="checkbox"/>	harness	<input type="checkbox"/>	24 hr HAZWOPER	<input checked="" type="checkbox"/>	40 hr HAZWOPER	<input checked="" type="checkbox"/>	HAZWOPER Annual Refresher
	<input type="checkbox"/>	Tyvek	<input checked="" type="checkbox"/>	sarnex-tyvek	<input checked="" type="checkbox"/>	coveralls	<input checked="" type="checkbox"/>	Defensive driving	<input checked="" type="checkbox"/>	Radiation Safety	<input checked="" type="checkbox"/>	Boating Operation Training
Eyes:	<input checked="" type="checkbox"/>	safety glasses	<input checked="" type="checkbox"/>	sunglasses	<input type="checkbox"/>	goggles	<input checked="" type="checkbox"/>	TLD Program	<input checked="" type="checkbox"/>	RPP Program	<input checked="" type="checkbox"/>	Medical Surveillance
Head	<input checked="" type="checkbox"/>	hard hat	<input checked="" type="checkbox"/>	hearing protection	<input checked="" type="checkbox"/>	respirator	<input checked="" type="checkbox"/>	1 <sup>st</sup> Aid/CPR	<input type="checkbox"/>	Other:		

**Comments:** Personnel may be potentially exposed to a wide variety of hazardous materials during oversight of emergency response and removal projects at SUPERFUND sites. Chemicals are numerous and include, but are not limited to, VOCs, SVOCs, pesticides, herbicides, solvents, fuel, radionuclide, metals, and acids/bases. Although personnel are not conducting the remedial actions themselves, they are in close proximity to contractors conducting the work and have the potential to encounter the hazardous constituents. Personnel are routinely exposed to hazardous noise; however, exact sound levels are not known at this time. Further analysis is required. Sources of hazardous noise include various industrial equipment, such as drill rigs, backhoes, and various construction equipment. Personnel are required to wear earplugs and/or muffs while working around hazardous noise sources. Employees engage in field activities during all types of weather conditions, to include extreme heat and cold. Thermal stress is a viable hazard; therefore personnel must ensure adequate hydration and appropriate field gear is worn while engaging in field activities. In addition, field activities are conducted on various terrain and in remote locations where pits, holes, and trenches are encountered. Personnel need to be cognizant of their surroundings and take evasive actions to avoid contact with such hazards. Due to the nature of abandoned hazardous waste sites, potential fire and/or explosions hazards are probable. Personnel are usually accompanied by either a State Representative, site owner or responsible party who are knowledgeable about site conditions. Personnel may climb structures, greater than 4 feet above ground surface, to observe potential deficiencies. Personnel climb stairways with appropriate handrails and walkways. Personnel must inspect stairways/walkways to ensure structural integrity and/or question site personnel regarding structural stability prior to climbing. Personnel may climb step ladders or extension ladders to inspect equipment or conduct sampling. Employees must pay attention to proper ladder selection and electrical shock precautions. Personnel may encounter ionizing radiation, above background levels, while at various facilities. EPA employees will be enrolled in the Regional TLD program and assigned a radiation badge for use during these types of facility inspections. Radiation Safety Training is required. Although rare, employees may be exposed to a variety of electrical components.



**LEGEND**

-  Approximate Staging Area Boundary
-  Approximate Crushing Area (Hot Zone)
-  Single Point Monitor (SPM) - Acid Gas Monitor
-  AreaRAE - Multi Gas Monitor (CO, VOC, H2S, LEL, O2, HCN\*)
-  DataRAM 4000 - Particulate Monitor
-  MultiRAE Pro - Mobile Multi Threat Monitor (CO, VOC, H2S, LEL, GAMMA, O2)
-  VIPER Gateway



\* - The AreaRAE inside the Hot Zone will be set up to monitor for HCN.  
SOURCE: BING MAPS HYBRID, 2011-2012

KNOXVILLE COLLEGE  
AK STEVENS SCIENCE BUILDING  
901 KNOXVILLE COLLEGE DR.  
KNOXVILLE, TENNESSEE

FIGURE 1  
PROPOSED AIR MONITORING DEVICE LOCATIONS  
UNKNOWN CHEMICAL CRUSHING OPERATIONS

