United States Environmental Protection Agency

Office of Solid Waste and Emergency Response

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EPA

Establishing Work Zones at Uncontrolled Hazardous Waste Sites

Office of Emergency and Remedial Response
Emergency Response Division MS-101

Quick Reference Fact Sheet

Under the authority of section 126 of the Superfund Amendments and Reauthorization Act of 1986 (SARA), the U.S. Environmental Protection Agency (EPA) and the U.S. Occupational Safety and Health Administration (OSHA) promulgated identical health and safety standards to protect workers engaged in hazardous waste operations and emergency response. The OSHA regulations became effective on March 6, 1990 and are codified at 29 CFR 1910.120 (54 FR 9294, March 6, 1989); the EPA regulations also became fully effective on March 6, 1990 and are codified at 40 CFR 311 (54 FR 26654, June 23, 1989). The EPA regulations incorporate the OSHA standards by reference.

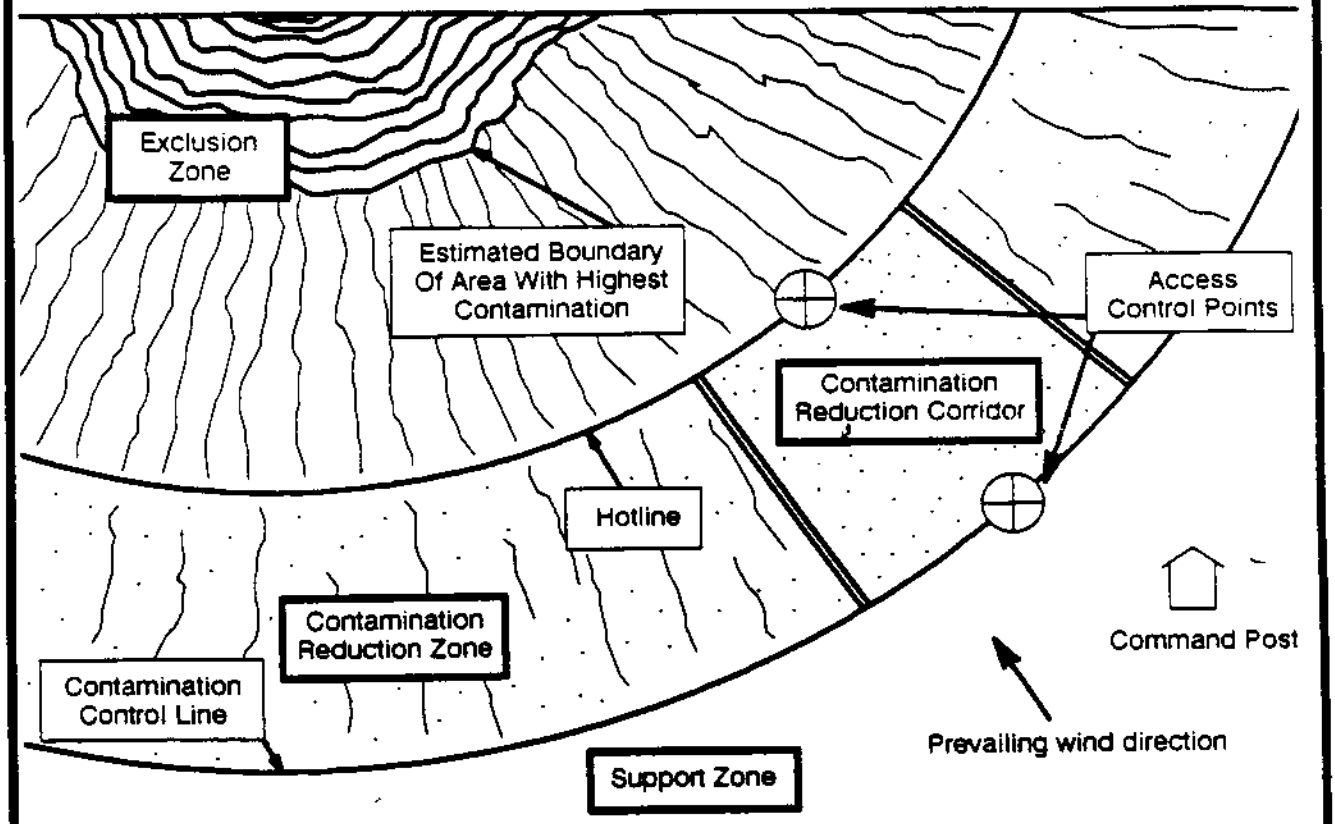
Although the two sets of standards contain identical *substantive* provisions, EPA and OSHA address different *audiences*. In states *without* an OSHA-approved program, federal OSHA standards protect all private and federal employees engaged in hazardous waste operations and emergency response; the EPA worker protection standards protect all state and local government employees. In states *with* an OSHA-approved program, the state program covers all private, state, and local government employees; OSHA covers federal employees in those states. Another Fact Sheet, *Hazardous Waste Operations and Emergency Response: Uncontrolled Hazardous Waste Sites and RCRA Corrective Action* (OSWER Publication No. 9285.2-08FS), provides a general overview of the worker protection standards as they apply to operations conducted at uncontrolled hazardous waste sites.

The purpose of this Fact Sheet is to summarize the procedures and requirements for establishing and maintaining work zones, including Support Zones, at hazardous waste sites. This Fact Sheet is divided into five parts. The first provides definitions for the work zones that are commonly designated at hazardous waste sites. The second describes the data collection requirements for the initial site characterization. Part 3 discusses evaluation of site data and other considerations in work zone selection. Part 4 describes methods for ensuring the integrity of Support Zones during remedial or removal actions. The final part of this Fact Sheet provides additional references and contacts for further information.

PART 1: INTRODUCTION TO WORK ZONES

The worker protection standards at 29 CFR 1910.120(b) require that employers with employees engaged in hazardous waste operations at uncontrolled hazardous waste sites develop and implement a written health and safety program for their employees. The purpose of this program is to identify, evaluate, and control safety and health hazards, and provide for emergency response during hazardous waste operations. As part of the overall health and safety program, 29 CFR 1910.120(d) specifies that appropriate site control procedures must be implemented before clean-up work begins, to minimize employee exposure to hazardous substances. One of the basic elements of a site control program is the delineation of work zones. This delineation specifies the type of operations that will occur in each zone, the degree of hazard at different locations within the site, and the areas at the site that should be avoided by unauthorized or unprotected employees.

EXHIBIT 1
Illustration of Typical Work Zones



Note: Area dimensions not to scale. Distances between points may vary.

EPA's *Standard Operating Safety Guides* describes the process for establishing and maintaining work zones. Although a site may be divided into as many zones as necessary to ensure minimal employee exposure to hazardous substances, the three most frequently identified zones are the Exclusion Zone, the Contamination Reduction Zone (CRZ), and the Support Zone. The purpose of establishing the zones is to (1) reduce the accidental spread of hazardous substances by workers or equipment from the contaminated areas to the clean areas; (2) confine work activities to the appropriate areas, thereby minimizing the likelihood of accidental exposure; and (3) facilitate the location and evacuation of personnel in case of an emergency. Movement of personnel and equipment among these zones is minimized and restricted to specific access control points to prevent cross-contamination from contaminated areas to clean areas. A representation of the three most commonly designated work zones is found in **Exhibit 1**. A description of each zone is provided below.

Exclusion Zone

The Exclusion Zone is the area where contamination does or could occur and the greatest potential for exposure exists. In order to separate the Exclusion Zone from the rest of the site, the outer boundary of the Exclusion Zone, known as the Hotline, should be clearly marked. Access of personnel and equipment to and from the Exclusion Zone should be restricted by access control points on the zone's periphery. *All persons who enter the Exclusion Zone should wear the appropriate level of personal protective equipment (PPE) for the degree and types of hazards at the site.*

The Exclusion Zone also may be subdivided into different areas of contamination, based on the known or expected type and degree of hazard or the incompatibility of waste streams. If the Exclusion Zone is subdivided in this manner, additional demarcations and access control points may be necessary.

Contamination Reduction Zone

As the transition area between the contaminated area and the clean area, the CRZ is the area in which decontamination procedures take place. This zone is designed to reduce the probability that the Support Zone will become contaminated or affected by other site hazards. Due to both distance and decontamination procedures, the degree of contamination in the CRZ generally will decrease as one moves from the Hotline to the Support Zone.

Support Zone

The Support Zone is defined as the uncontaminated area where workers should not be exposed to hazardous conditions. Any potentially contaminated clothing, equipment, and samples must remain outside of the Support Zone until decontaminated. The Support Zone is the appropriate location for the command post, medical station, equipment and supply center, field laboratory, and any other administrative or support functions that are necessary to keep site operations running efficiently. Because the Support Zone is free from contamination, personnel working within it may wear normal work clothes, and access to and from the area is not restricted for authorized site personnel. Such personnel, however, should receive instruction in the proper evacuation procedures in case of a hazardous substance emergency.

PART 2: SITE CHARACTERIZATION -- DATA COLLECTION

To establish a Support Zone, the specific hazards and the degree of potential employee exposure at the site must be considered. The site characterization, as specified in 29 CFR 1910.120(c), is the basis for developing the site health and safety plan (HASP), and provides information needed to identify site hazards, select proper PPE, and implement safe work practices. Site characterization generally proceeds in three phases:

- Prior to site entry, an off-site characterization, including data gathering and perimeter reconnaissance.
- An on-site survey.
- Ongoing monitoring to provide a continuous source of information about site conditions.

Off-site characterization and the on-site survey are discussed below. Ongoing monitoring is discussed in Part 4 of this Fact Sheet, Ensuring Integrity of Work Zones.

Data-Gathering Prior to Initial Site Entry

The initial stages of site characterization must be accomplished off-site, so as not to endanger the health and safety of workers. For example, at new uncontrolled hazardous sites, or at those sites with areas that have not been evaluated, the range of potential hazards and exposure risks is unknown. As much information as possible should be obtained during off-site characterization to evaluate the hazards and institute preliminary controls for protecting initial entry personnel. Once the off-site characterization is completed and the appropriate information is obtained, the information is used to develop an initial draft of the site-specific HASP. (For more information on developing a HASP, refer to the fact sheet *Hazardous Waste Operations and Emergency Response: Uncontrolled Hazardous Waste Sites and RCRA Corrective Action*, OSWER Publication No. 9285.2-08FS, 1991.)

29 CFR 1910.120(c)(i) through (c)(viii) identifies the generic information that must be considered and evaluated before designated personnel enter a site. These requirements are listed in **Exhibit 2**, along with resources that can be useful for obtaining the required information. These information sources include general background documents (e.g., area maps), site records, interviews with persons who have knowledge about the site, and perimeter reconnaissance.

Interview/Records Research. Records of the site or interviews with persons who have knowledge of the site can provide useful information about the potential hazards at a site.

EXHIBIT 2
Information Required Prior to Site Entry
29 CFR 1910.120(c)(4)

Regulatory Requirements:	Sources of Information					
	General Background References	Records/Interviews		Perimeter Reconnaissance		Site Manager Assessment
		Site-Specific	Interviews	Visual	Sampling	
Location, Size of Site (c)(4)(i)	✓	✓		✓	✓	
Description of Job or Activity to be Performed (c)(4)(ii)						✓
Activity Duration (c)(4)(iii)						✓
Site Topography and Accessibility (c)(4)(iv)	✓	✓		✓	✓	
Safety and Health Hazards at Site (c)(4)(v)	✓	✓	✓	✓	✓	
Pathways for Hazardous Substance Dispersion (c)(4)(vi)		✓		✓	✓	
Status of Response Teams (c)(4)(vii)						✓
Hazardous Substances and Health Hazards (c)(4)(viii)	✓	✓	✓	✓	✓	

Examples of records that may be useful are found in **Exhibit 3**.

Perimeter Reconnaissance. In addition to the interview/records research, data-gathering at the site perimeter may help in identifying site hazards and determining the appropriate level of PPE for the initial site entry. Many of the activities that occur during perimeter reconnaissance, including making visual observations, monitoring atmospheric concentrations of airborne pollutants, and collecting soil samples, are similar to the activities that occur during the initial site entry. Perimeter reconnaissance activities, however, are generally not as extensive or specific as the activities undertaken during the on-site survey. To determine the scope and level of effort for the perimeter reconnaissance, the information from the interview/records research should be evaluated. Historical data on chemicals stored at the site, for example, may help to identify the appropriate air monitoring techniques for the perimeter reconnaissance.

Initial Site Entry and Data Collection

The goal of the on-site survey is to gather the additional information needed to identify the risks and hazards presented by the site, so that the work zones can be established and the appropriate controls, PPE, and medical monitoring program can be selected for the tasks that will be performed at the site. Risks that should be considered are specified in 29 CFR Part 1910.120 (c)(7) and are listed in **Exhibit 4**.

Immediately upon entering the site, entry personnel should monitor the air for immediately dangerous to life and health (IDLH) and other conditions that may cause death or serious harm (e.g., combustible or explosive atmospheres, oxygen deficiency, toxic substances) and monitor for ionizing radiation. In addition, entry personnel should visually observe for signs of actual or potential IDLH hazards or other dangerous conditions. **Exhibit 5** provides examples of visible indicators of potential IDLH hazards and other dangerous conditions.

EXHIBIT 3
Sources of Site-Specific Information

- Company records, receipts, logbooks, or ledgers that describe the activity that occurred at the site.
- Waste storage inventories and manifests or shipment papers.
- Records from state and federal pollution control regulatory and enforcement agencies, state Attorney General's Office, state occupational safety and health agencies, state Fire Marshal's office.
- Water and sewage district records.
- Previous survey, sampling, and monitoring results.
- Local fire and police department records.
- Site and aerial photos.
- Media reports (all information from the media should be verified).
- Interviews with personnel (all interview information should be verified).
- Interviews with nearby residents (note possible site-related medical problems and verify all information from interviews).
- Maps (e.g., USGS, land use, etc.).
- Meteorological data (e.g., wind direction, temperature profiles).

If IDLH hazards or other dangerous conditions are not present, or if proper precautions can be taken, the survey can continue. *At a minimum, the initial on-site survey should consist of a visual survey for potential hazards and air monitoring.*

Visual Survey. An accurate and comprehensive visual survey of the site will assist in identifying potential hazards and determining where additional information (e.g., air monitoring, sampling of soil or containers) may be needed.

EXHIBIT 4
Risks to Consider
29 CFR 1910.120 (c)(7)

Risks to consider include, but are not limited to:

- Exposure exceeding the permissible exposure limits (PELs) and published exposure levels.
- IDLH concentrations.
- Potential skin absorption and irritation.
- Potential eye irritation.
- Explosion sensitivity and flammability ranges.
- Oxygen deficiency.

EXHIBIT 5
Visible Indicators of Potential IDLH and Other Dangerous Conditions

- Large containers or tanks that must be entered.
- Enclosed spaces such as buildings or trenches that must be entered.
- Potentially explosive or flammable situations (indicated by bulging drums, effervescence, gas generation, or instrument readings).
- Extremely hazardous materials (such as cyanide, phosgene, or radiation sources).
- Visible vapor clouds.
- Areas where biological indicators (such as dead animals or vegetation) are located.

This visual survey should include the following activities:

- Noting the types of containers, impoundments, or other storage systems (e.g., paper or wood packages, barrels or drums, tanks, lagoons).
- Noting the condition of waste containers and storage systems (e.g., undamaged, rusted or corroded, leaking).
- Noting the types and quantities of material in containers (e.g., full or empty; labels indicating corrosive, explosive, flammable, radioactive, or toxic materials).
- Noting the physical condition of the materials (e.g., solid, liquid, or gas; conditions conducive to contact).
- Noting any unusual conditions (e.g., clouds, discolored liquids, oil slicks, discolored soil, free-standing liquid, stressed vegetation).
- Determining the potential pathways of exposure and dispersion (e.g., air, soil, surface water, ground water).
- Noting any indicators of potential exposure to hazardous substances (e.g., dead fish, animals, or vegetation; pools of liquids; foams or oils on liquid surfaces; deteriorating containers; discolored soils).
- Identifying natural wind barriers (e.g., buildings, hills, tanks).

The results of the visual survey may help to identify a potential location for the Support Zone, which can be confirmed through air monitoring and soil sampling.

Air Monitoring. The purpose of air monitoring is to identify and quantify airborne contaminants in order to determine the level of worker protection and identify additional medical monitoring needs in any given area of the site. Air monitoring should be used to confirm that the areas considered for the Support Zone do not contain concentrations of hazardous substances that require worker protection. The two methods that generally are available for identifying and/or quantifying airborne contaminants are (1) on-site use of direct-reading instruments and (2) laboratory analysis of air samples obtained by gas sampling bag, filter, sorbent, or wet-contaminant collection methods.

Direct-reading instruments may be used to rapidly detect flammable or explosive atmospheres, oxygen deficiency, certain gases and vapors, and ionizing radiation, as well as to identify changing site conditions. Because direct-reading instruments provide information at the time of sampling and allow for rapid decision-making, they are the primary tools of initial site characterization. All direct-reading instruments, however, have inherent constraints in their ability to detect hazards. Direct-reading instruments detect and/or measure only specific classes of chemicals and are usually not designed to detect airborne concentrations below 1 ppm. In addition, many of the direct-reading instruments that have been designed to detect one particular substance also detect other substances and, consequently, may give false readings. *Direct-reading instruments must be operated, and their data interpreted, by qualified individuals using properly calibrated instruments and relying on chemical response curves.* Additional monitoring should be conducted at any location where a positive instrument response occurs.

Exhibit 6 lists several direct-reading instruments and the conditions and/or substances they measure. Additional information concerning direct-reading instruments is available in the references.

Because direct-reading instruments are available for only a few specific substances and are rarely sensitive enough to detect low concentrations of hazardous substances that may nonetheless present health risks, air samples must also be collected and analyzed in a laboratory.

Exhibit 7 lists some sample collection and analytical methods that are appropriate for certain types of substances that are likely to be encountered at hazardous waste sites. Additional information concerning air sampling and monitoring is available in the references listed in Part 5 of this Fact Sheet.

Other Information. At some sites, air monitoring, the visual survey, and consideration of activities that will be occurring at the site will be

EXHIBIT 6
Some Direct-reading
Air Monitoring Instruments

Instrument	Hazard Monitored
Combustible Gas Indicator (CGI)	Combustible gases and vapors
Flame Ionization Detector (FID) with Gas Chromatography Option	Many organic gases and vapors
Gamma Radiation Survey Instrument	Gamma radiation
Portable Infrared (IR) Spectrophotometer	Many gases and vapors
Ultraviolet (UV) Photoionization Detector (PID)	Many organic and some inorganic gases and vapors
Direct-reading Colorimetric Indicator Tube	Specific gases and vapors
Oxygen Meter	Oxygen (O_2)

EXHIBIT 7
Some Air Sampling
Collection Methods

Substance	Collection Device
Anions: Bromide Chloride Fluoride Nitrate Phosphate Sulfate	Prewashed silica gel tube
Aliphatic or aromatic amines	Silica gel
Asbestos Metals Particulates	Mixed cellulose ester filter (MCEF)
High MW hydrocarbons Organophosphorus compounds Selected pesticides	Tenax/Chromosorb
Organics	Charcoal tube
PCBs	Glass fiber filter and florisil tube
Pesticides	13mm glass fiber filter/chromosorb 102 tube PUF/filter

adequate to determine the appropriate level of PPE, to establish additional medical monitoring needs, and to define work zones. For many sites, however, consideration of planned site activities may reveal the need for more extensive environmental sampling. Analysis of surface soil and soil borings may be required if site workers are expected to be exposed to surface and subsurface soil that may be contaminated. Ground water or surface water sampling may be necessary if site workers are likely to be exposed via these media.

To determine whether additional monitoring is required to designate work zones, the results of the air monitoring survey and visual characterization of site hazards and contaminants should be reviewed and potential pathways of contaminant dispersion should be evaluated. If there is any question that contaminants may have migrated into the area considered for the Support Zone, both air and surface soil samples should be collected and compared with on-site and off-site background samples.

Soil sampling can be simple or complex, depending on site conditions. Sampling plan designs routinely fall into the following categories: judgmental random, stratified random, systematic, and search. Prior to beginning any sampling activities, it is imperative that the purpose of the effort and ultimate use of the acquired data be established. Strategies should be selected based on the information required. Certain target

contaminants may warrant special considerations. For example, when sampling for the extent of contamination of a dioxin site, tiered sampling and designed grid-laying approaches should be considered to achieve the 95 percent confidence level. Additional information concerning soil sampling is available in the references listed in Part 5 of this Fact Sheet.

PART 3: SITE CHARACTERIZATION -- SELECTION OF WORK ZONES

After the off-site and on-site data collection are complete, the collected information is used to establish work zones. In addition, the HASP is revised to address the specific on-site hazards.

Data Compilation

All of the information should be compiled in a format that facilitates a decision concerning the placement of work zones. A site map can provide a useful format for compiling the collected data. The locations of all the potential hazards that were identified through the interview/records research, the perimeter reconnaissance, and the initial on-site survey should be plotted on the map. The map should indicate both the hazards that were observed and any areas that interviews or records suggest may be contaminated with hazardous wastes. In addition, all sampling results from the on-site and off-site surveys should be plotted on the map. It is important to record locations where hazardous substances were detected and locations where hazardous substances were not detected. *The absence of sampling results should not be considered evidence that an area is clean.* Information concerning exposure pathways, particularly the predominant wind direction, also should be included on the map.

Data Evaluation

After all available site characterization data have been compiled, the data are used to select a location for the Support Zone. One of the most important criteria for selection of an area for the Support Zone is that it must be located in a clean area. The Support Zone should be in an area that is known to be free of elevated (i.e. higher than background) concentrations of hazardous substances. When evaluating on-site concentrations of hazardous substances, it is important to consider the background concentrations of these substances in the area. Non-zero background concentrations of hazardous substances may be present at some sites.

SUPPORT ZONE MUST BE CLEAN

Other Considerations

The size and position of the Support Zone also may be directly affected by the size of the exclusion and contamination reduction zones. For example, the Support Zone may be constrained by the distances needed to prevent an explosion or fire from affecting personnel outside the Exclusion Zone, or the physical area required for activities in the Exclusion Zone. In addition, the Support Zone should, whenever possible, be upwind from the Exclusion Zone. The Support Zone should be located as far from the Exclusion Zone as practicable. Whenever possible, line-of-sight contact with all activities in the Exclusion Zone should be maintained. Accessibility to support services (e.g., power lines, access roads, telephones, shelter, and water) also must be considered in selecting a Support Zone. The expected duration of the removal action also will affect the placement of work zones.

It is also conceivable that the Support Zone may inadvertently become contaminated after site remediation begins, despite everyone's best efforts. For example, changes in wind speed and direction, temperature, and rainfall may result in exposures different from those experienced during the initial on-site survey. The integrity of the Support Zone should be reconfirmed during remedial activities.

PART 4: ENSURING INTEGRITY OF WORK ZONES

Several procedures can be used to ensure that the area chosen for the Support Zone remains clean during removal or remedial operations. Use of site controls will minimize the transfer of contamination to the Support Zone. In addition, periodic monitoring of the Support Zone will indicate whether changes in site activities or conditions have resulted in contamination. In the event that contamination has occurred, the boundaries of work zones should be reevaluated.

Use of Site Controls

The CRZ is designed to reduce the probability that the clean Support Zone will become contaminated or affected by other site hazards. The distance between the Exclusion and Support Zones provided by the CRZ, together with decontamination of workers and equipment, limits the physical transfer of hazardous substances into clean areas. The boundary between the Support Zone and the CRZ, called the contamination control line, separates the Support Zone from an area of possible low contamination. Access to the CRZ from the Support Zone should be through two access control points, if feasible: one for personnel and one for equipment. Persons entering the CRZ should be required to wear PPE appropriate for the degree and types of hazards they may encounter when working in this area. To reenter the Support Zone from the CRZ, workers should remove gross contamination, doff any protective clothing, leave equipment in the CRZ, and exit through the personnel access control point.

Periodic Monitoring of Support Zone

A monitoring and sampling program for the Support Zone should be established to ensure that this area remains free from contamination. Monitoring should take place on a routine basis and whenever exposure is likely to change. Situations where additional monitoring may be appropriate are specified in 29 CFR 1910.120 (h)(3) and are listed in **Exhibit 8**. Increased concentrations of hazardous substances in air, soil, or other environmental media may indicate a breakdown in site control procedures or a change in on-site conditions. In addition, site personnel should be constantly alert to changes in site conditions or the presence of any potentially dangerous situations. **Exhibit 9** lists the monitoring and sampling activities that may be conducted to ensure that the Support Zone remains clean.

Considering Additional Site Characterization Information

Additional information concerning locations of contaminated environmental media may become available during monitoring or in the later stages of site investigation and clean up, particularly for remedial actions. For example, more detailed soil sampling will occur during the site inspection (SI) and remedial investigation (RI). This additional information may indicate that areas initially considered clean are, in fact, contaminated. The location of the Support Zone should be reevaluated whenever new site characterization studies are conducted.

EXHIBIT 8
Conducting Additional Monitoring
29 CFR 1910.120 (h)(3)

Situations that require consideration of the possibility that exposures have risen are:

- When work begins on a different portion of the site.
- When contaminants other than those previously identified are being handled.
- When a different type of operation is initiated (e.g., drum opening as opposed to exploratory well drilling).
- When employees are handling leaking drums or containers or working in areas with obvious liquid contamination (e.g., a spill or lagoon).

EXHIBIT 9
Periodic Support Zone
Monitoring Activities

- Air monitoring using direct-reading instruments.
- Collecting air samples for particulate, gas, or vapor analysis.
- Analysis of soil samples from heavily trafficked areas.
- Occasional swipe tests in trailers and other areas used by personnel.

PART 5: CONSULTATION AND REFERENCES

For more information regarding work zones, the following references may be consulted.

Federal Regulations

- OSHA Regulations (particularly 29 CFR 1910 and 1926)
- EPA Regulation 40 CFR 311

Guidance Documents

The following publications explain site operating procedures and guidelines, including safety procedures for decontamination, considerations for establishing work zones, and sampling and monitoring programs:

- *EPA Standard Operating Safety Guides*; U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Environmental Response Team, OSWER Directive 9285.1-01C, 1988.
- *Field Standard Operating Procedures for Establishing Work Zones F.S.O.P. 6*; U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, OSWER Directive 9285.2-04, 1985.
- *Field Standard Operating Procedures for Air Surveillance F.S.O.P. 8*; U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, OSWER Directive 9285.2-03, 1985.
- *Environmental Response Team (ERT) Standard Operating Procedures, Soil Sampling SOP # 2012*, U.S. Environmental Protection Agency, Environmental Response Team, 1988.
- *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*; NIOSH/OSHA/USCG/EPA, DHHS (NIOSH) Publication Number 85-115, GPO No. 017-033-00419-6, 1985.

The following publication provides step-by-step guidance for assessing preliminary evaluations, health and safety plans, and off-site emergency response plans:

- *EPA Health and Safety Audit Guidelines*; U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Emergency Response Division, EPA-540/G-89/010, OSWER Directive 9285.8-02, 1989.

The following publications provide general information concerning the development of a specific health and safety program for workers at hazardous waste sites:

- *EPA Standard Operating Safety Guides*; U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Environmental Response Team, OSWER Directive 9285.1-01C, 1988.
- *Field Standard Operating Procedures for Site Safety Plan F.S.O.P. 9*; U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, OSWER Directive 9285.2-05, 1985.
- *Generic Site Safety Plan*; U.S. Environmental Protection Agency, OSWER Directive 9285.8-01.
- *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*; NIOSH/OSHA/USCG/EPA, DHHS (NIOSH) Publication Number 85-115, GPO No. 017-033-00419-6, 1985.

The following two volumes entitled *Characterization of Hazardous Waste Sites - A Methods Manual* address issues related to characterization of hazardous waste sites, from preliminary data gathering to sampling and analysis:

- *Volume I - Site Investigations*; U.S. Environmental Protection Agency, Office of Research and Development, Environmental Monitoring Systems Laboratory, Las Vegas, NV, EPA-600/4-84/075, 1985.
- *Volume II - Available Sampling Methods, Second Edition*; U.S. Environmental Protection Agency, Office of Research and Development, Environmental Monitoring Systems Laboratory, Las Vegas, NV, EPA-600/4-84/076, 1984.

The following publication provides information on sampling design and associated statistical methods for determining contaminant concentrations:

- *Methods for Evaluating the Attainment of Cleanup Standards, Volume I: Soil and Solid Media*; U.S. Environmental Protection Agency, Office of Policy, Planning, and Evaluation, EPA-230/02-89-042. 1989.

The following publication provides guidance for using portable instruments for assessing airborne pollutants arising from hazardous waste:

- *Draft International Document on Guide to Portable Instruments for Assessing Airborne Pollutants Arising from Hazardous Wastes*; U.S. National Working Group (NWG-4 OIML) Pilot Secretariat PS-17: "Measurement of Pollution" Reporting Secretariat RS-5: "Measurement of Hazardous Waste Pollution." ISBN: 0-936712-75-9.

The following four volumes collectively entitled *Procedures for Conducting Air Pathway Analyses for Superfund Applications* address a variety of issues relevant to the air impacts at Superfund sites:

- *Volume I: Application of Air Pathway Analyses for Superfund Applications*; U.S. Environmental Protection Agency, EPA-450/1-89-001, 1989. NTIS PB90 113374/AS.

- *Volume II: Estimation of Baseline Air Emissions at Superfund Sites*; U.S. Environmental Protection Agency, EPA-450/1-89-002, 1989. NTIS PB89 180053/AS.

- *Volume III: Estimation of Air Emissions from Clean-up Activities at Superfund Sites*; U.S. Environmental Protection Agency, EPA-450/1-89-003, 1989. NTIS PB89 180061/AS.

- *Volume IV: Procedures for Dispersion Modelling and Air Monitoring for Superfund Air Pathway Analysis*; U.S. Environmental Protection Agency, EPA-450/1-89-004, 1989. NTIS PB90 113382/AS.

Fact Sheets

The following fact sheet provides a summary of the federal regulations at 29 CFR 1910.120 and 40 CFR 311, as they pertain to worker protection at uncontrolled hazardous waste sites:

- *Hazardous Waste Operations and Emergency Response: Uncontrolled Hazardous Waste Sites and RCRA Corrective Action*; U.S. Environmental Protection Agency, Environmental Response Team, OSWER Publication No. 9285.2-08FS, 1991.

The following fact sheet provides a list and description of computer software, fact sheets, guidance documents and ERT training programs that pertain to the worker protection standards:

- *Hazardous Waste Operations and Emergency Response: Available Guidance:* U.S. Environmental Protection Agency, Environmental Response Team, OSWER Publication No. 9285.2-10FS, 1991.

Contact Persons or Groups

Several contact persons or groups can provide additional information on the establishment of work zones at uncontrolled hazardous waste sites. These contacts include:

- U.S. EPA's Environmental Response Team
  2890 Woodbridge Avenue
  Building 18 (MS-101)
  Edison, NJ 08837-3679
  (908) 321-6740 or (FTS) 340-6740

- U.S. Department of Labor, OSHA
  Office of Health Compliance Assistance
  200 Constitution Avenue, NW
  Washington, D.C. 20210
  (202) 523-8036 or (FTS) 523-8036

In addition, addresses and telephone numbers for EPA and OSHA regional offices are listed in **Exhibit 10**.

EXHIBIT 10
Regional Addresses and Telephone Numbers

EPA Regional Offices

- EPA Region 1
  John F. Kennedy Federal Building
  Room 2203
  Boston, MA 02203
  (617) 565-3715 or (FTS) 835-3715

- EPA Region 2
  Jacob K. Javitz Federal Building
  26 Federal Plaza
  New York, NY 10278
  (212) 264-2657 or (FTS) 264-2657

- EPA Region 3
  841 Chestnut Building
  Philadelphia, PA 19107
  (215) 597-9800 or (FTS) 597-9800

- EPA Region 4
  345 Courtland Street, NE
  Atlanta, GA 30365
  (404) 347-4727 or (FTS) 257-4727

- EPA Region 5
  230 South Dearborn Street
  Chicago, IL 60604
  (312) 353-2000 or (FTS) 353-2000

- EPA Region 6
  1445 Ross Avenue, 9th Floor
  Dallas, TX 75202
  (214) 655-6444 or (FTS) 255-6444

- EPA Region 7
  726 Minnesota Avenue
  Kansas City, KS 66115
  (913) 551-7000 or (FTS) 276-7000

- EPA Region 8
  999 18th Street, Suite 500
  Denver, CO 80202-2405
  (303) 293-1603 or (FTS) 293-1603

- EPA Region 9
  215 Fremont Street
  San Francisco, CA 94105
  (415) 556-6322 or (FTS) 556-6322

- EPA Region 10
  1200 6th Avenue
  Seattle, WA 98101
  (206) 442-1200 or (FTS) 399-1200

OSHA Regional Offices

- OSHA Region 1
  133 Portland Street, 1st Floor
  Boston, MA 02114
  (617) 565-7164 or (FTS) 835-7164

- OSHA Region 2
  201 Varick Street, Room 670
  New York, NY 10014
  (212) 337-2325 or (FTS) 660-2378

- OSHA Region 3
  Gateway Building, Suite 2100
  3535 Market Street
  Philadelphia, PA 19104
  (215) 596-1201 or (FTS) 596-1201

- OSHA Region 4
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