REV. 2

Soil Management Work Plan

Boliden Metech Allens Avenue Facility

434 Allens Avenue
Providence,
Rhode Island

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Introduction

Vanasse Hangen Brustlin, Inc. (VHB) has been retained by Boliden Metech, Inc. (BMI) to assist in conducting environmental compliance activities at BMI's former metals reclamation facility located at 434 Allens Avenue in Providence, Rhode Island. This Soil Management Work Plan (Work Plan) outlines the technical approach for additional PCB soil cleanup activities at the Site. The approximate limits of the Site are shown on Figure 1, Site Plan.

BMI has undertaken soil remediation and cleanup verification activities to fulfill requirements of a Consent Decree (Civil Docket 89-0208-T) with the U.S. Environmental Protection Agency (USEPA) and the USEPA-approved "Scope of Work for Sampling and Analysis to Verify PCB Contamination Remediation," revised on May 16, 1994 and amended thereafter (EPA-approved SOW). Previous investigations have identified residual polychlorinated biphenyl (PCB) contamination in portions of the Site. Consistent with the requirements of the Consent Decree, this Work Plan specifically outlines procedures for the excavation, on-site management, and disposal of residual PCB contaminated soil, followed by the collection of soil cleanup verification samples from excavated areas of the Site. Consistent with the requirements of the Consent Decree, groundwater monitoring wells will be installed following soil excavation for post-remediation groundwater monitoring.

Previous Investigation Findings

BMI has undertaken investigation activities at the Site to delineate the extent of residual PCB-contaminated soil. Site investigations completed to date include four soil sampling phases. The four sampling phases were based on a sampling grid consisting of 32 minor subquadrants. Each minor subquadrant was further divided into nine "cells" (Figure 1).

First Phase: VHB observed the drilling of 259 soil borings and collected 11 concrete wipe samples at each cell with either soil, asphalt, or concrete ground cover. VHB advanced each soil boring to approximately three feet below grade and collected soil cores within individually dedicated acetate sleeves. The soil core sleeves facilitated sampling and allowed the soil samples to be segregated and composited by one-foot depth intervals (i.e., in 0-1, 1-2, and 2-3 foot depth increments).

VHB composited soil samples from each of the 32 minor subquadrants. A total of nine samples (one from each cell within each subquadrant) was composited to create the one subquadrant composite sample. All samples were collected from the first one-foot depth interval across the Site. Mitkem Corporation analyzed these composite soil or concrete wipe samples for residual PCB content. First-round results identified six "clean" (reported PCB concentration less than 10 parts per million) minor subquadrants (43 cells), 12 "hot" (PCB concentration greater than 10 parts per million) minor subquadrants (108 cells), and 14 minor subquadrants (126 cells) where residual PCB concentrations in soil were inconclusive.

Second and Third Phases: During the second phase, soil samples were collected from individual cells within identified "hot" minor subquadrants and composited soil samples from three minor subquadrants in the second one-foot depth interval (1-2 feet) in the Site's eastern portion. During the third phase, VHB prepared grab soil samples from the remaining cells suspected to be "hot" in the first one-foot depth interval. After the third phase was completed, laboratory results for PCB soil analytical results confirmed 51 "clean" cells and 41 "hot" cells. A total of 94 "clean" cells, 59 "hot" cells, and 117 inconclusive cells were identified at the Site at the completion of the third phase.

Fourth Phase: VHB prepared grab soil samples from the remaining 117 inconclusive cells in the first one-foot depth interval in the Site's western portion. Fourth round sample results confirmed 58 "clean" cells and 61 "hot" cells. A final total of 150 "clean" cells and 120 "hot" cells have been identified at the conclusion of PCB cleanup verification activities. The 120 "hot" cells are shown on Figure 1.

Remedial Action Overview

The Work Plan outlines procedures for managing (excavation, stockpiling and disposal) contaminated soil that has been identified at the Site. The volume of contaminated soil with PCB concentrations exceeding the established 10 milligrams per kilogram (mg/kg, roughly equivalent to parts per million [ppm]) PCB cleanup objective is approximately 4,200 cubic yards, roughly translating to 6,300 tons. The portions of the Site where soil excavation will occur are shown on Figure 1. Soil remediation activities conducted by BMI will occur over an approximate 10-week period, finishing before September 1997. A Site-specific Health and Safety Plan (HASP) has been prepared for the exclusive use of VHB personnel during all field activities (see Appendix B).

VHB will collect representative samples from the stockpiled soil and provide the soil stockpile characterization samples to BMI for laboratory PCB analysis. Additional laboratory testing may be necessary to meet operating permit requirements of the TSCA landfill will be conducted as necessary. VHB will use a soil GeoProbe to collect representative soil stockpile characterization samples for laboratory analysis in accordance with the EPA-approved SOW. Following soil remediation, groundwater

monitoring wells will be installed at eight selected locations and groundwater samples will be collected to assess PCB concentrations in groundwater. Procedures outlined in Section 3.7 and Section 3.8 of the EPA-approved SOW will be followed for well installation and groundwater sampling.

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Remedial Action Evaluation Criteria

In accordance with the provisions of the Consent Decree and EPA-approved SOW, this Work Plan establishes remedial objectives for the project as follows:

Site Soil and Groundwater Cleanup Objectives

The PCB soil cleanup objective is 10 mg/kg, as defined by the EPA-approved SOW. An action level for testing and remediation of any groundwater PCB contamination will be mutually agreed upon by BMI and EPA based on results of groundwater sample analysis. Unfiltered groundwater samples will be submitted for laboratory PCB analysis.

Quality Assurance/Quality Control

Quality assurance and quality control (QA/QC) procedures for field sampling activities and analytical laboratory procedures are detailed in the EPA-approved SOW. The QA/QC procedures for soil and groundwater sampling included in the EPA-approved SOW are incorporated by reference into this Work Plan. In general, soil duplicate samples, performance evaluation samples, and equipment blank samples will be submitted for analysis at a frequency of one per 20 (5%) of samples submitted for analysis.

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Soil Remediation

Roles and Responsibilities

BMI will undertake the implementation of the Work Plan to address historic releases at the Site. Successful implementation of the Work Plan will require the efforts of BMI (the Remediation Contractor) and VHB. Roles and responsibilities for BMI and VHB are outlined as follows:

- BMI will be responsible for signing as generator for all remediation wastes leaving the Site.
- BMI will be responsible for all Site work including control of the Site; all Site safety measures; and all soil excavation, management, and off-site disposal. BMI will be responsible for construction means and methods, as well as the health and safety of its employees.
- VHB will observe and document Site work related to remediation activities performed under the Work Plan by BMI. VHB will identify regulated and unregulated soil for excavation. All regulated soil will be managed in accordance with applicable federal, state, and local statutes and regulations.
- VHB will advise BMI on regulatory compliance matters, soil management issues, and other related environmental concerns.

All work conducted during the project will conform with applicable federal, state, and local regulations.

Health and Safety Plan

Pursuant to 29 CFR 1910.120, on-site personnel will be required to have 40-hour Occupational Safety and Health Administration (OSHA) training to work at hazardous waste sites. VHB has developed a site-specific health and safety plan (HASP) to cover the activities of VHB employees during the implementation of the Work Plan. In addition, BMI will prepare a separate HASP to cover the activities of BMI employees.

BMI and VHB will keep copies of their respective HASPs on-site during field activities. Periodic meetings will be held during the course of the work to review HASP procedures and discuss any HASP amendments necessary to address unanticipated Site conditions that may arise.

Pre-Excavation Activities

Contaminated soil areas to be excavated have been identified by VHB prior to excavation. Wooden stakes and flagging have been placed at the limits of cells to be excavated. Approximate stockpile locations have been identified, as shown on Figure 1. These locations are subject to change based on field actual conditions and constraints encountered at the Site.

Site Security

An existing chain-link fence surrounding the Site restricts public access and will be maintained throughout the remediation project. BMI will be responsible for maintaining Site control during the Work Plan implementation. As necessary, open excavations will be further barricaded using plastic safety fencing, barricades, and/or machinery after completing each day's excavation activities.

Source Removal and Stockpile Management

Source Removal

Procedures to be followed during soil excavation activities include the following:

- Contaminated soil will be excavated, loaded, and transported to temporary stockpile locations (see Figure 1).
- At BMI's discretion during excavation activities, dust suppression will be implemented to prevent fugitive dust emissions which include misting excavation areas, travel routes and soil stockpiles. If fugitive dust emissions can not be controlled, excavation activities will cease until Site conditions are improved. Dust control methods are discussed in more detail in the next section.
- To minimize the chance of contaminating clean areas of the Site, equipment travel routes will either traverse over identified contaminated soil areas or identified clean areas. Trucks passing through contaminated areas to non-contaminated areas will not be permitted unless decontamination of the tires, mudflaps, and undercarriage occurs. Traffic patterns will be mutually agreed

upon by VHB and BMI prior to the commencement of Site work. If traffic patterns require passing over a clean cell(s) repeatedly, the cell(s) will be cleaned of debris, if necessary, following the completion of activities within that area of the Site. Equipment decontamination shall include but not be limited to the removal of excess soil from truck tires, mudflaps, and undercarriage.

Dust Control

Engineering controls will be implemented during various phases of the work to prevent fugitive dust emissions. Tarpaulins, water trucks and misting devices will be used during excavation of contaminated soil, along truck travel routes, within stockpile locations, and during loading of soil for transport. No visual fugitive dust emissions will be permitted throughout these phases of the work. If dust emissions within the work zone and cannot be controlled by misting, considerations will be given to upgrading worker personnel protection to include the use of air purifying respirator with particulate filter cartridges. Under no circumstances will fugitive dust emissions be permitted outside of the facility limits.

Soil Stockpile Management

All excavated soil will be placed in temporary stockpiles for disposal parameter characterization prior to shipment. Approximate stockpile locations on existing asphalt and concrete pads are shown on Figure 1. Stockpiles will be placed within the Site. Procedures to be followed during soil stockpiling activities include the following:

- All temporary soil stockpiles will be placed on a double layer of 6-mil polyethylene sheeting. As Site conditions permit, excavated soil will be placed in individual stockpiles. Approximately nine 500 cubic yard soil stockpiles are anticipated. At BMI's discretion at the end of each work day, each stockpile will be covered with reinforced tarpaulin covers which will not rip, tear, or be displaced during adverse weather conditions. Covers will be overlapped in such a manner as to prevent infiltration of precipitation. Covers will be properly anchored at the base of the stockpile.
- If stockpiles are not covered during working hours, stockpiles will be periodically wetted as necessary to prevent fugitive dusts, at BMI's discretion.
- Soil stockpiles will be characterized by collecting one representative sample which is composited from GeoProbe continuous soil cores advanced at four locations within each stockpile. The composite soil sample collected from each stockpile will be split and placed in two, 5-gallon unused buckets. The soil collected from the stockpiles will be transferred to BMI under chain-of-custody

protocols. Appropriate analyses required by the receiving facility (a TSCA landfill) will be performed BMI.

- Following receipt of laboratory results, soil stockpiles will be loaded on to rail gondolas and/or dump trailers for transport under manifest documentation to the TSCA disposal facility. All dump trailers and gondolas loaded with contaminated soil will be properly covered to minimize fugitive dust emissions during transport.
- Following soil loading activities within stockpile areas, asphalt and concrete pads will be pressure-washed and cleaned of residual soil resulting from soil stockpiles. Pressure-wash water will be collected in USDOT-rated 55-gallon drums. Wash water will be recovered using a wet vacuum apparatus and filtered prior to collection in the 55-gallon drum. PCB analyses will be conducted on a representative water sample collected from each drum. Based upon PCB test results, rinsate will be disposed at a TSCA-permitted receiving facility, if concentrations are greater than the cleanup objective, or discharged on-site, if PCB concentrations are below the groundwater cleanup objective. All waste bag filters containing PCB-contaminated particulate matter will be disposed of at a TSCA permitted receiving facility. If warranted, asphalt and concrete wipe samples may be collected to confirm if residual PCB contamination is present.

Verification of Soil Remediation

Following soil excavation within each of the 120 identified cells, additional soil samples will be collected from each cell to verify if the established soil remediation goal has been reached. Soil samples will be collected, following the previously established protocol, using a GeoProbe equipped with a macro core soil sampler with dedicated acetate sleeves. Samples will be collected to a depth of one foot below the current grade within each cleaned cell.

Decontamination protocols of sampling equipment will follow the same procedures as followed during initial subsurface investigations conducted by VHB. Soil samples collected in 4 ounce jars, labeled, and placed in a cooler prior to submission to a Rhode Island DEM-certified environmental laboratory.

Any stainless steel bowls and mixing spoons used during sampling will be decontaminated after each sample is collected. Decontamination rinsate will be discharged on-site. BMI will be responsible for the appropriate management and disposal of any investigation-derived waste.

Compliance soil samples and QA/QC samples will be collected in each of the 120 cells. Twelve duplicate soil samples and 6 performance evaluation samples will be submitted for QA/QC purposes. Verbal/fax analytical results will be received from the lab and

VHB will make recommendations for further excavation/assessment of contaminated areas, as warranted.

Filling or regarding of excavated areas will not occur until laboratory results have been received. The results will be evaluated to determine if the target PCB concentration of 10 ppm in soil has been reached.

Proposed Project Schedule

Implementation of the proposed Work Plan will begin immediately upon receipt of final USEPA approval to proceed. Field activities associated with the Work Plan will begin approximately 2 to 4 weeks thereafter. It is anticipated that field activities for on-site soil removal will occur over an approximate 10 week period. Data analysis and report preparation will occur over a 6-week period.

Unforeseen conditions beyond VHB's or BMI's control may cause adjustments to the proposed project schedule. We will inform USEPA of such conditions in a timely manner should they arise.

Contingency Planning Provisions

If an imminent hazard condition is identified during the project, VHB and BMI will upgrade personal protective equipment and increase work zone monitoring as provided in the HASP, temporarily suspend Work Plan activities immediately, and initiate appropriate response actions. Further measures will be taken, as warranted, based upon Site conditions.

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Post-Remediation Groundwater Monitoring

Eight groundwater monitor wells will be installed at the Site following soil remediation. The wells will be installed within inferred upgradient and downgradient locations of the Site.

Groundwater Monitoring Well Installation

Hollow stem auger drilling techniques will be used to install 2-inch diameter Schedule 40 PVC wells with 4-inch diameter lockable steel casings. Drill augers will be steam-cleaned between wells to prevent cross-contamination. The wells will be constructed as outlined and diagrammed in Section 3.7 of EPA-approved SOW. The original locations of groundwater wells have been modified from Section 3.7 of the SOW to better characterize groundwater quality based on current PCB soil data. Each well will be screened above and below the apparent water table, taking in account tidal fluctuations. The annular space around the screen and 2-feet above the screen will be packed with Ottawa sand. A bentonite surface seal will be placed in the annular space above the Ottawa sand. The remainder of the annular space will be backfilled with natural soil.

The wells will be developed by pumping the wells with a submersible groundwater pump. VHB will collect all purged groundwater in USDOT-rated 55-gallon drums. PCB analyses will be conducted on a representative water sample collected from each drum. Based upon PCB test results, purged groundwater will be disposed at a TSCA-permitted receiving facility, if concentrations are greater than the cleanup objective, or discharged on-site if PCB concentrations are below the groundwater cleanup objective. BMI will be responsible for management and disposal of contaminated water resulting from investigation activities.

Groundwater Sampling

The wells will not be sampled for at least 48-hours after well development. Groundwater samples will be collected using a low-flow submersible centrifugal or bladder pump constructed of stainless steel. The pump will be equipped with

dedicated teflon or teflon lined polyethylene tubing. Groundwater samples will be collected in accordance to the USEPA Region 1 Low Stress (low flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells, dated July 30, 1996. The pump will be decontaminated between wells. QA/QC duplicate and equipment rinsate samples will be collected in accordance with the EPA-approved SOW.

Groundwater samples will be submitted to the analytical laboratory in laboratory prepared glass jars with teflon lined caps. Groundwater samples and QA/QC samples will be analyzed for PCBs using EPA 8080 protocols.

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Project Close-Out

Soil Remediation Closure Report

Following the completion of all soil remediation activities and receipt of all analytical results, a report summarizing soil remediation activities, sampling procedures, laboratory analytical protocol, data evaluation procedures, and project findings will be prepared. The soil remediation report will include a Site plan showing existing and former structures, sampling grid, sampling locations, monitoring well locations, and fence and property lines for the Site. The report will identify where soil excavation activities have taken place, tabulate residual soil PCB concentrations that remain across the Site, and interpret available project data. All correspondence shall be reviewed by BMI pursuant to EPA notification and acceptance. Following submission of the closure report, a meeting will be scheduled with VHB, BMI, and USEPA to discuss the final closure of the project.

References

Consent Decree, Civil Docket 89-0208-T with the U.S. Environmental Protection Agency (USEPA).

Scope of Work for Sampling and Analysis to Verify PCB Contamination Remediation at Boliden Metech, revised May 16, 1994.

Appendix A
Figures

Appendix B
Site-Specific Health and Safety Plan

1

VHB Site-Specific Health and Safety Plan

General Site Information

Site Name: Boliden Metech Facility
Allens Avenue
Providence, Rhode Island

VHB Project No. 05437.13

Table 1
Emergency Information and Local Resources, Former Bay State Wire

Public and Private Resources	Telephone Numbers
Providence Fire/Police/Medical Emergency	911
Rhode Island Hospital Emergency Ward	401-444-5411
Providence Gas Emergency Leak Center	800-544-4944
Narragansett Electric	401-784-4000
Providence Public Works Department	401-941-3478
Rhode Island Poison Center	401-444-5727
DIGSAFE Reporting Line	800-322-4844

Nearest Hospital: Rhode Island Hospital
593 Eddy Street
Providence, Rhode Island

Directions: From the Site take a right onto Allens Avenue (1A northbound), follow Allens Avenue to Rhodes Street, take a left onto Rhodes Street. Follow Rhodes until Eddy Street and take a right onto Eddy Street. Follow Eddy Street for .3 miles and the Hospital will be on the left, reference is made to Appendix A-1, Figure 1, entitled, Site Location Map.

Site/Hazard Overview

Site Description and History

The Site is located east of Allens Avenue in Providence, Rhode Island. The Site abuts Allens Avenue to the north, commercial property to the east and west, and the Providence waterfront to the south.

The former Boliden Metech facility recycled precious metals from computer mainframes and other solid state electronics. These recycling activities included crushing capacitors which resulted in the release of polychlorinated biphenyls (PCBs) into soil at the Site. PCB source removal and initial soil remediation activities have been completed with the intent of having removed all soil with PCB contamination greater than or equal to 50 ppm. Based onVHB's subsurface investigations, residual PCB soil contamination has been identified which exceeds the 10 ppm cleanup objective.

Table 2
Identified Site Hazards, Boliden Metech Facility, Providence, RI

Waste Type(s)		Waste Characteristics		Type/Form of Hazard	
Petroleum		**Toxic**	X	**Dust**	X
Liquid		Corrosive		Liquid	
Sludge		Ignitable		Gas	
Soil	X	Volatile		Vapors	
Unknown		Radioactive		**Contact**	X
Other		Reactive		Other	
		Unknown	X	IDLH	

Tasks

The following tasks are associated with the excavation of PCB:

- Site reconnaissance and contaminated soil delineation through staking and flagging prior to excavation;
- Soil excavation, loading, and stockpiling observation services;
- Soil sampling by advancing GeoProbe soil borings within excavated cells to verify cleanup objectives;
- Installation and sampling of groundwater monitoring wells; and
- Collection of wipe samples from concrete and building components.

Hazard Assessment

Hazards of Concern (check as many as apply):

X	**Heat Stress**		Oxygen Deficient		Radiological
	Cold Stress	X	**General Construction**		Biological
	Explosion/Flammable		Inorganic Chemicals		Noise
	Confined Space	X	**Organic Chemicals**		Volatile Compounds
	Other (Specify)		Physical Hazard	X	**Physical**

The dangers which may be attributed to these hazards are discussed below.

Physical Hazards

The greatest potential physical hazards at the Site include electric utility lines, streets which adjoin the property, rusty drums, and heavy equipment. Personnel should be aware of these physical obstacles at all times and take necessary precautions to avoid them while at the Site.

Chemical Exposures

Table 3 summarizes chemicals known or suspected to be present on the Site and associated symptoms of acute exposure to such contaminants. Since additional unsuspected hazards may exist at the Site, periodic air quality monitoring and evaluation of site conditions will be performed during all on-site activities. It is anticipated that PCB concentrations are below 50 mg/kg (ppm).

Table 3
Known Chemical Contaminants, Boliden Metech Facility, Providence, RI

Chemical Contaminants*	Potential Hazards	OSHA std.	NIOSH std.
Acetone (Used in decontamination of equipment)	headache and dizziness by ingestion inhalation by eyes, nose, & throat	1800 mg/m^3 (for 8 hrs)	590 mg/m^3 (for 8 hours)
Hexane (Used in decontamination of equipment)	headache and drowsiness by ingestion inhalation by eyes and nose	180 mg/m^3 (for 8 hrs)	180 mg/m^3 (for 8 hrs)
Polychlorinated Biphenyls (Chlorodiphenyl)	toxic/carcinogenic by ingestion, inhalation and skin adsorption	0.5 mg/m^3 (for 8 hrs)	0.001 mg/m^3 (for 8 hrs)

* Refer to Exhibit A for chemical properties and hazards.

Symptoms of Chemical Exposure

On-site workers should be aware of the specific symptoms of acute chemical exposure listed in Table 3. In general, workers should also be aware of some indications of toxic effects of chemical exposure which are described below:

- Observable by others:
  - Changes in complexion, skin discoloration
  - Lack of coordination
  - Changes in demeanor
  - Excessive salivation, papillary response
  - Changes in speech pattern
- Non-observable by others:
  - Headaches
  - Dizziness
  - Blurred vision
  - Cramps
  - Irritation of eyes, skin, or respiratory tract

First Aid

General first aid procedures for exposure include, but are not limited to, the following procedures:

- If contaminant contacts the eyes, irrigate immediately with large amounts of water
- If contaminant contacts skin, wash with soap and water promptly
- If contaminant is inhaled, move the exposed person to fresh air at once. If the worker's breathing has stopped, perform artificial respiration if appropriately trained and currently certified by the Red Cross. Request appropriate medical attention as soon as possible using telephone number(s) listed in Table 1 (Emergency Information and Local Resources).

On-site VHB personnel will keep a First-Aid Kit within a field vehicle during site activities.

Heat Stress

During the summer months, warm weather may become a health factor. Personnel working on-site may have to wear protective clothing and respirators, which would increase the chance of workers suffering from heat-related problems. The situation will be monitored periodically on days when the ambient temperature exceeds 60 ° F. Workers must be briefed on the signs and symptoms of heat-related problems and on preventive measures if work is performed when ambient temperature exceeds 60° F. There are three levels of Heat Stress which include the following:

- Heat Cramps;
- Heat Exhaustion; and
- Heat Stroke

Symptoms for heat cramps include painful muscle spasms. Treatment includes providing liquids with electrolytes. Symptoms for heat exhaustion include weakness, fatigue, dizziness, heavy sweating, headache, nausea, fainting and pale, cool, moist skin. Treatment includes resting in a cool place and providing liquids with electrolytes if the person is conscious; if unconscious, get medical help immediately. Symptoms for heat stroke include very dry, hot skin, mottled blue or red appearance, confusion, convulsions, rapidly rising temperature and unconsciousness. Treatment includes attaining medical attention immediately. **Heat stroke is a life-threatening emergency.**

If tyvek suits are being used during ambient air temperature that exceeds 60°F, cool liquids will be available on the Site and a cool down area identified on the Site will be identified for breaks.

On-Site Control

Marc Richards is designated to coordinate access control to the work zone.
No unauthorized personnel should enter the work zone without appropriate 40-hour OSHA site worker safety training. Control boundaries have been established as follows:

- Exclusion Zone: A 20 foot border surrounding the areas of the Site which have been identified to contain PCB greater than 10 ppm in soil will be treated as the Exclusion Zone.
- Contaminant Reduction Zone: An area outside the exclusion zone will be treated as the Contaminant Reduction Zone. All equipment will be decontaminated in this zone prior to being transferred to the Support Zone.
- Support Zone: The area located outside the Contaminant Reduction Zone.

These control boundaries are subject to change based on varying site conditions.

Monitoring Procedures

VHB will use a Thermo Environmental 580B Photoionization Detector (PID) to periodically monitor air quality within the breathing zone. The PID should also be used to monitor air quality if volatiles are encountered during sampling activities and to determine what type (if any) respiratory protection will be necessary at the Site during site activities. Action levels of total volatile organic compounds (TVOCs) are shown below. VHB may also use a Personal Dust Monitor, if it is deemed necessary by field observations, to determine what type (if any) respiratory protection will be necessary at the Site if, during excavation activities, visible emissions of particulate matter are observed in the air.

On-Site Personnel

Site Safety Officer:	Marc Richards
Regulatory Authority	EPA/RIDOH
Federal Agency Reps.	EPA
State Agency Reps.	RIDOH
Local Agency Reps.	Board of Health
Contractors:	Technical Drilling Services (TDS)

Work party(ies) consisting of two people will perform tasks.

Party Team Leader:	Marc Richards (617) 924-1770 ext. 1165
Rescue Team (in entries to IDLH environment	N/A
Decontamination Team	N/A
Emergency Contact	Dave Carlson (617) 924-1770 ext. 1320

Action Levels and Personnel Protection

The initial level of personnel protection will be Level D. The following table list the appropriate action level within each zone.

Location	Action Level	Response
Work Area	5 ppm TVOC in the ambient air	Monitor for benzene using a draeger table. If no draeger tubes are available, upgrade to level C.
Work Area	1 ppm benzene from draeger tubes or 10 ppm TVOC in the ambient air	Upgrade to level C
Work Area	10 mg/m^3 particulates	Upgrade to level C
Exclusion Zone	Any detection of TVOC in the ambient air	Modify work practices to minimize volatilization of contaminants
Exclusion Zone	5 ppm TVOC	Stop work until controls are identified that will reduce volatilization of contaminants. Do not restart work unless authorized by the project manger, department director, and/or the health and safety coordinator.

Level D personnel protection will include:

- Chemical-resistant gloves
- Boots/shoes, leather or chemical-resistant, steel toe and shank
- Safety glasses or chemical splash goggles (optional unless required for specific job function)
- Hard hat
- Ear Protection (optional)

Level D (modified) personnel protection will include:

- Tyvek coveralls
- Hard hat
- Boots/shoes, steel toe and shank
- Chemical-resistant outer boots
- Inner and outer gloves
- Ear protection (optional)

Level C personnel protection will include:

- Tyvek coveralls
- Air purifying respirator with dust and organic vapor cartridge (full-faced mask)
- Hard hat
- Boots/shoes, steel toe and shank
- Chemical-resistant outer boots
- Inner and outer gloves
- Ear protection (optional)

Monitoring/Surveillance Equipment

OVM:	X	**Metal Detector:**	X
OVA/GC:		**Explosimeter:**	X
Colorimetric Tubes	X	**O_2 Detector:**	X
Ensys Test Kit		Noise Survey Meter:	
Personal Sampling Pump		**Dragger Pump:**	X
Personal Dust Monitor:	X		
Notes:			

General Safety Requirements

The following General Safety Procedures shall be followed by all persons entering and/or working on the site:

- No employee or subcontractor may be allowed on-site without the prior knowledge and consent of the Site Safety Officer and review of these Health and Safety Procedures.

- There will be no activities conducted on-site without sufficient backup personnel. At a minimum, two persons must be present at the site.

- All contractor or subcontractor personnel shall bring to the attention of the Site Safety Officer or Supervisors any unsafe condition or practice associated with the site activities that they are unable to correct themselves.

- There will be no smoking, eating, chewing gum, or drinking in the restricted area.

- Hands shall be thoroughly cleaned prior to smoking, eating or other activities outside the restricted area.

- Team members must avoid unnecessary contamination (i.e., walking through known or suspected "hot" zones or contaminated puddles, kneeling or sitting on the ground, leaning against potentially contaminated barrels or equipment).

- Respiratory devices may not be worn with beards, long sideburns, or under other conditions that prevent a proper seal.

- No visitors will be allowed access without the knowledge and consent of the Site Manager and/or Safety Officer. All visitors will be required to be briefed on safety procedures and will be required to be escorted while on-site.

- All excavations will be conducted in compliance with EPA/OSHA Standards. Excavation greater than four feet deep which require people to work in the excavation will have sides sloped no greater than 45° (1 to 1) or be shored pursuant to OSHA.

Personal Protective Equipment

Based on an evaluation of potential hazards, the following levels of personal protection have been designated for the applicable work areas or tasks (see figure in Appendix A-1).

Location	Job Function	Level of Protection				
Exclusion Zone	Soil Excavation	A	B	C	**D***	Other
Contaminant Reduction Zone	Decontamination	A	B	C	**D**	Other
Support Zone		A	B	C	D	Other

* - indicates that Level D (modified) is required for this job function

Decontamination Procedures

All non-expendable equipment will be cleaned according to Standard Operating Protocols. This protocol includes:

- Rinse with tap water
- Wash with Alconox detergent (or soap) and water
- Rinse with acetone
- Rinse with hexane
- Rinse with distilled water

The decontamination procedure for Level D and Level D (modified) requires the disposal of gloves, tyveks (if used), and boot covers (if used) in plastic lined

containers on-site. All non-disposal equipment used on-site that becomes contaminated will be cleaned by the protocol referenced above.

The decontamination procedures to be utilized for Level C site conditions will consist of the following nine-step process:

- All sampling devices, monitoring instruments and other equipment used on-site will be segregated into piles on a plastic drop cloth and decontaminated as necessary.
- Outer boots and gloves will be washed with soap and water and then rinsed with water or appropriately disposed.
- Tape around the outer boots and gloves will be removed and deposited into a plastic-lined container.
- Outer boots will be removed and placed on the plastic drop cloth.
- Outer gloves will be removed and disposed of in a plastic-lined containers.
- Tyvek coveralls will be removed and disposed of in a plastic-lined containers.
- Respirator will be removed and washed with clean water and sanitizer.
- Inner gloves will be removed and disposed in a plastic-lined container.
- Worker's hands and face will be washed with soap and water before leaving the Site.

Additional personnel and equipment leaving the Exclusion Zone shall be thoroughly decontaminated. The standard Level D Decontamination Protocol shall be instituted at the decontamination stations.

Emergency Medical Care

The following are qualified on-site First Aid Responders and/or EMTs: None

First Aid equipment is available on-site at the following locations:

First Aid Kit: Located in field vehicle

Emergency Eye Wash: Located in field vehicles

Emergency Shower: Water located in field vehicle, water hose located at the warehouse building.

Other (Specify): _____

Site Resource(s) and Locations.

Water Supply: There is an on-site water supply at the warehouse building

Telephones: Portable telephone in field vehicle (617) 686-0812 or car (617) 645-5426

Communication Systems: Portable telephone and/or mobile pager(s)

Other: _____

Emergency Procedures

The following standard emergency procedures will be used by on-site personnel. These procedure may be modified as appropriate and required for each incident. The Site Safety Officer will be notified of any on-site emergencies and will be responsible for ensuring that the appropriate procedures are followed.

- **Fire/Explosion:** The fire department will be notified and all personnel moved to a safe distance from the involved area.
- **Personal Protective Equipment Failure:** If any site worker experiences a failure or malfunction of personal protective equipment that adversely affects the protection factor, that person and his/her buddy will immediately leave the Exclusion Zone. Re-entry will not be permitted until the equipment has been repaired or replaced.
- **Other Equipment Failure:** If any other equipment on-site fails to operate properly, the Site Manager and Site Safety Officer will be notified and will then evaluate the effect of such failure on continuing operations. If the failure affects personnel safety or prevents completion of the investigation activities, all personnel will leave the Exclusion Zone until the situation is remedied through appropriate action(s).

Signature Page

I have read, understood, and agree to comply with the provisions set forth in this Site-specific Health and Safety Plan and as reviewed in the Health and Safety Briefing by the Site Safety Officer.

Prepared By:

Marc J. Richards	_____	_____
Site Safety Officer	Signature	Date

Approved By:

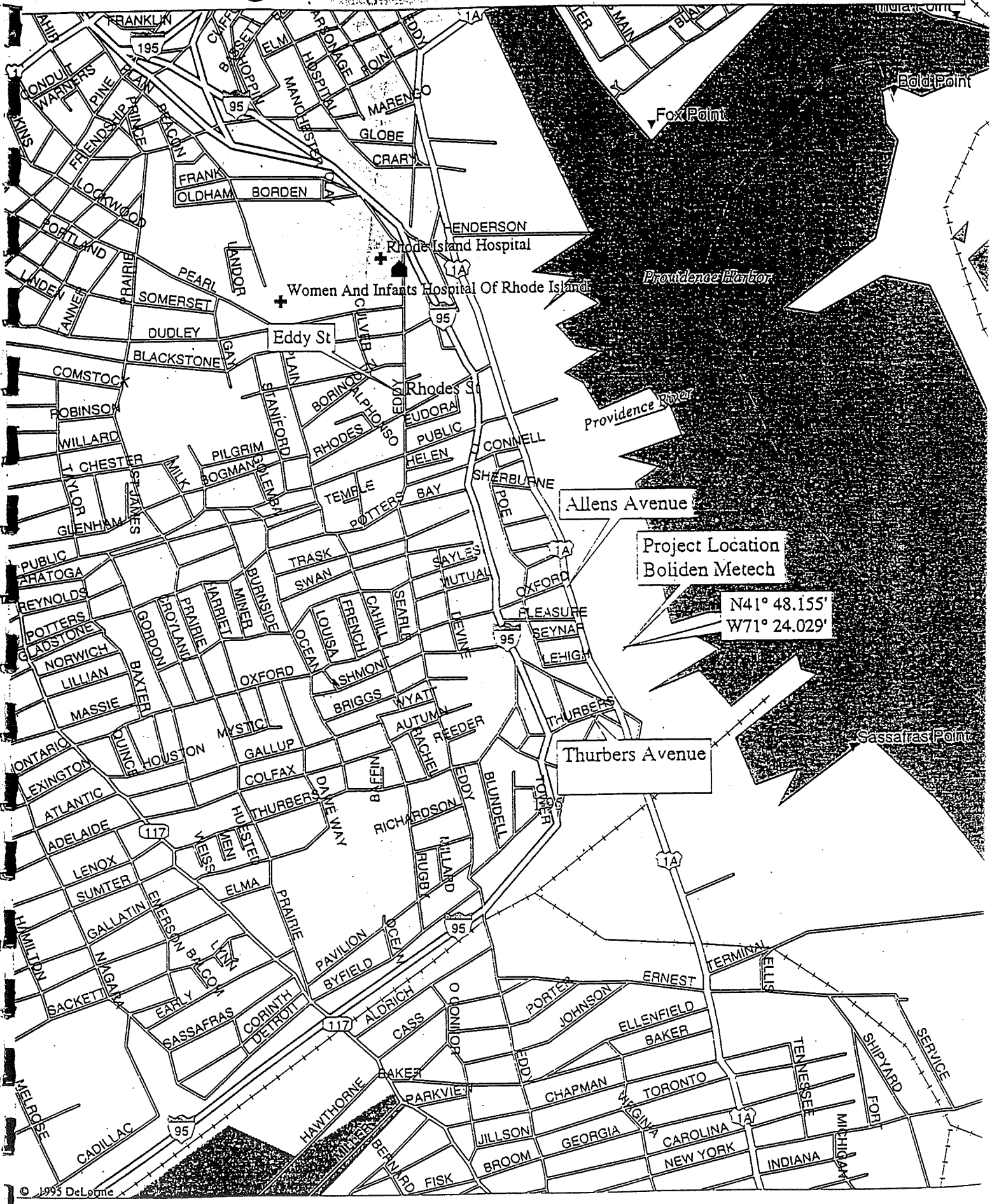
Dave A. Carlson	_____	_____
Project Manager	Signature	Date
Timothy M. Downey	_____	_____
Health and Safety Coordinator	Signature	Date

Site Personnel

Signature	Affiliation	Date

Appendix A-1
Figures

Figure 1: Site Location Map



Appendix B-1
Hazardous Waste Site Workers Basic Health and Safety Course

The New England Consortium

(Partially supported by the National Institute of Environmental Health Sciences)

This is to certify that

Marc J. Richards

Certificate #9734

has successfully completed the

8-Hour Hazardous Waste Worker Health and Safety Refresher Course

April 24, 1997 at Lowell, MA

conducted in conjunction with
ConnectiCOSH
MassCOSH
New Hampshire COSH
RICOSH
Western MassCOSH
Work Environment Program at the University of Massachusetts Lowell

Signed: _____

Next Refresher Due - April, 1998

Appendix C-1
Chemical Properties and Hazards

Chemical name, structure/formula, CAS and RTECS Nos., and DOT ID and guide Nos.	Synonyms, trade names, and conversion factors	Exposure limits (TWA unless noted otherwise)	IDLH	Physical description	Chemical and physical properties		Incompatibilities and reactivities	Measurement method (See Table 1)
					MW, BP, SOL Fl.P, IP, Sp, Gr, flammability	VP, FRZ UEL, LEL		
cetaldehyde CH_3CHO 5-07-0 AB1925000 1089 26	Acetic aldehyde, Ethanal, Ethyl aldehyde 1 ppm = 1.83 mg/m³	NIOSH Ca See Appendix A See Appendix C (Aldehydes) OSHA† 200 ppm (360 mg/m³)	Ca [2000 ppm]	Colorless liquid or gas (above 69°F) with a pungent, fruity odor. Sp.Gr: 0.79 Class IA Flammable Liquid	MW: 44.1 BP: 69°F Sol: Miscible Fl.P: -36°F IP: 10.22 eV	VP: 740 mm FRZ: -190°F UEL: 60% LEL: 4.0%	Strong oxidizers, acids, bases, alcohols, ammonia & amines, phenols, ketones, HCN, H_2S [Note: Prolonged contact with air may cause formation of peroxides that may explode and burst containers; easily undergoes polymerization.]	XAD-2*; Toluene; GC/FID; III [#2538]
cetic acid CH_3COOH 64-19-7 AF1225000 2790 60 (10-80% acid) 2789 29 (>80% acid)	Acetic acid (aqueous), Ethanoic acid, Glacial acetic acid (pure compound), Methanecarboxylic acid [Note: Can be found in concentrations of 5-8% in vinegar.] 1 ppm = 2.50 mg/m³	NIOSH 10 ppm (25 mg/m³) ST 15 ppm (37 mg/m³) OSHA 10 ppm (25 mg/m³)	50 ppm	Colorless liquid or crystals with a sour, vinegar-like odor. [Note: Pure compound is a solid below 62°F. Often used in an aqueous solution.] Sp.Gr: 1.05 Class II Combustible Liquid	MW: 60.1 BP: 244°F Sol: Miscible Fl.P: 103°F IP: 10.66 eV	VP: 11 mm FRZ: 62°F UEL(200°F): 19.9% LEL: 4.0%	Strong oxidizers (especially chromic acid, sodium peroxide & nitric acid), strong caustics [Note: Corrosive to metals.]	Char; HCOOH; GC/FID; III [#1603]
Acetic anhydride $(CH_3CO)_2O$ 108-24-7 AK1925000 1715 39	Acetic acid anhydride, Acetic oxide, Acetyl oxide, Ethanoic anhydride 1 ppm = 4.24 mg/m³	NIOSH C 5 ppm (20 mg/m³) OSHA† 5 ppm (20 mg/m³)	200 ppm	Colorless liquid with a strong, pungent, vinegar-like odor. Sp.Gr: 1.08 Class II Combustible Liquid	MW: 102.1 BP: 282°F Sol: 12% Fl.P: 120°F IP: 10.00 eV	VP: 4 mm FRZ: -99°F UEL: 10.3% LEL: 2.7%	Water, alcohols, strong oxidizers (especially chromic acid), amines, strong caustics [Note: Corrosive to iron, steel & other metals. Reacts with water to form acetic acid.]	Bub; Reagent; Vis; III [#3506]
Acetone $(CH_3)_2CO$ 67-64-1 AL3150000 1090 26	Dimethyl ketone, Ketone propane, 2-Propanone 1 ppm = 2.42 mg/m³	NIOSH 250 ppm (590 mg/m³) OSHA† 1000 ppm (2400 mg/m³)	2500 ppm [LEL]	Colorless liquid with a fragrant, mint-like odor. Sp.Gr: 0.79 Class IB Flammable Liquid	MW: 58.1 BP: 133°F Sol: Miscible Fl.P: 0°F IP: 9.69 eV	VP: 180 mm FRZ: -140°F UEL: 12.8% LEL: 2.5%	Oxidizers, acids	Char; CS_2; GC/FID; III [#1300, Ketones I]

Personal protection and sanitation (See Table 3)	Recommendations for respirator selection — maximum concentration for use (MUC) (See Table 4)	Health hazards				
		Route	Symptoms (See Table 5)	First aid (See Table 6)		Target organs (See Table 5)
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R. Provide: Eyewash, Quick drench	NIOSH ¥: SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE	Inh Ing Con	Irrit eyes, nose, throat; eye, skin burns; derm; conj; cough; CNS depres; delayed pulm edema; In animals: kidney, repro, terato effects; [carc]	Eye: Irr immed Skin: Water flush prompt Breath: Resp support Swallow: Medical attention immed		Eyes, skin, resp sys, kidneys, CNS, repro sys [In animals: nasal cancer]
[Acetaldehyde]						
Skin: Prevent skin contact (>10%) Eyes: Prevent eye contact Wash skin: When contam (>10%) Remove: When wet or contam (>10% Change: N.R. Provide: Eyewash (>5%), Quick drench (>50%)	NIOSH/OSHA 50 ppm: SA:CF*/PAPROV*/CCRFOV/GMFOV/SCBAF/SAF §: SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE	Inh Con	Irrit eyes, skin, nose, throat; eye, skin burns; skin sens; dental erosion; black skin, hyperkeratosis; conj, lac; phar edema, chronic bron	Eye: Irr immed Skin: Water flush immed Breath: Resp support Swallow: Medical attention immed		Eyes, skin, resp sys, teeth
[Acetic acid]						
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R Provide: Eyewash, Quick drench	NIOSH/OSHA 125 ppm: SA:CF*/PAPROV* 200 ppm: CCRFOV/GMFOV/PAPRTOV*/SCBAF/SAF §: SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE	Inh Ing Con	Conj, lac, corn edema, opac, photo; nasal, phar irrit; cough, dysp, bron; skin burns, vesic, sens derm	Eye: Irr immed Skin: Water flush immed Breath: Resp support Swallow: Medical attention immed		Eyes, skin, resp sys
[Acetic anhydride]						
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.	NIOSH 2500 ppm: CCROV*/PAPROV*/GMFOV/SA*/SCBAF §: SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE	Inh Ing Con	Irrit eyes, nose, throat; head, dizz, CNS depres; derm	Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed		Eyes, skin, resp sys, CNS
[Acetone]						

Chemical name, structure/formula, CAS and RTECS Nos., and DOT ID and guide Nos.	Synonyms, trade names, and conversion factors	Exposure limits (TWA unless noted otherwise)	IDLH	Physical description	Chemical and physical properties		Incompatibilities and reactivities	Measurement method (See Table 1)
					MW, BP, SOL Fl.P, IP, Sp, Gr, flammability	VP, FRZ UEL, LEL		
Hexamethyl phosphoramide $[(CH_3)_2N]_3PO$ 680-31-9 TD0875000	Hexamethylphosphoric triamide, Hexamethylphosphoro-triamide, HMPA, Tris(dimethylamino)-phosphine oxide 1 ppm = 7.45 mg/m³	NIOSH Ca See Appendix A OSHA none	N.D.	Clear, colorless liquid with an aromatic or mild, amine-like odor. [Note: A solid below 43°F.]	MW: 179.2 BP: 451°F Sol: Miscible Fl.P: 222°F IP: ? Sp.Gr: 1.03 Class IIIB Combustible Liquid	VP: 0.03 mm FRZ: 43°F UEL: ? LEL: ?	Oxidizers, strong acids, chemically-active metals (e.g., potassium, sodium, magnesium, zinc)	None available
n-Hexane $CH_3[CH_2]_4CH_3$ 110-54-3 MN9275000 1208 27	Hexane, Hexyl hydride, normal-Hexane 1 ppm = 3.58 mg/m³	NIOSH 50 ppm (180 mg/m³) OSHA† 500 ppm (1800 mg/m³)	1100 ppm [LEL]	Colorless liquid with a gasoline-like odor.	MW: 86.2 BP: 156°F Sol: 0.002% Fl.P: -7°F IP: 10.18 eV Sp.Gr: 0.66 Class IB Flammable Liquid	VP: 124 mm FRZ: -219°F UEL: 7.5% LEL: 1.1%	Strong oxidizers	Char; CS₂; GC/FID; III [#1500, Hydro-carbons]
Hexane isomers (excluding n-Hexane) C_6H_{14} 1208 27	Diethylmethylmethane; Diisopropyl; 2,2-Dimethylbutane; 2,3-Dimethylbutane; Isohexane; 2-Methylpentane; 3-Methylpentane; [Note: Also see specific listing for n-Hexane.] 1 ppm = 3.58 mg/m³	NIOSH 100 ppm (350 mg/m³) C 510 ppm (1800 mg/m³) [15-min] OSHA† none	N.D.	Clear liquids with mild, gasoline-like odors. [Note: Includes all the isomers of hexane except n-hexane.]	MW: 86.2 BP: 122-145°F Sol: Insoluble Fl.P: -54 to 19°F IP: ? Sp.Gr: 0.65-0.66 Class IB Flammable Liquids	VP: ? FRZ: -245 to -148°F UEL: ? LEL: ?	Strong oxidizers	None available
n-Hexanethiol $CH_3[CH_2]_5SH$ 111-31-9 MO4550000	1-Hexanethiol, Hexyl mercaptan, n-Hexyl mercaptan, n-Hexylthiol 1 ppm = 4.91 mg/m³	NIOSH C 0.5 ppm (2.7 mg/m³) [15-min] OSHA none	N.D.	Colorless liquid with an unpleasant odor.	MW: 118.2 BP: 304°F Sol: Insoluble Fl.P: 68°F IP: ? Sp.Gr: 0.84 Class IB Flammable Liquid	VP: ? FRZ: -113°F UEL: ? LEL: ?	Oxidizers, reducing agents, strong acids & bases, alkali metals	None available

Personal protection and sanitation (See Table 3)	Recommendations for respirator selection — maximum concentration for use (MUC) (See Table 4)	Health hazards			
		Route	Symptoms (See Table 5)	First aid (See Table 6)	Target organs (See Table 5)
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R. Provide: Eyewash, Quick drench	NIOSH ¥: SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE	Inh Abs Ing Con	Irrit eyes, skin, resp sys; dysp; abdom pain; [carc]	Eye: Irr immed Skin: Water flush immed Breath: Resp support Swallow: Medical attention immed	Eyes, skin, resp sys, CNS, GI tract [in animals: cancer of the nasal cavity]
[Hexamethyl phosphoramide]					
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.	NIOSH 500 ppm: SA* 1100 ppm: SA:CF*/SCBAF/SAF §: SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE	Inh Ing Con	Irrit eyes, nose; li-head; nau, head; peri neur: numb extremities, musc weak; derm; gidd; chemical pneu (aspir liq)	Eye: Skin: Breath: Resp support Swallow: Medical attention immed	Eyes, skin, resp sys, CNS, PNS
[n-Hexane]					
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.	NIOSH 1000 ppm: SA* 2500 ppm: SA:CF* 5000 ppm: SAT:CF*/SCBAF/SAF §: SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE	Inh Ing Con	Irrit eyes, skin, resp sys; head, gidd, dizz, li-head; nau; chemical pneu (aspir liq); derm	Eye: Skin: Breath: Resp support Swallow: Medical attention immed	Eyes, skin, resp sys, CNS
[Hexane isomers (excluding n-Hexane)]					
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.	NIOSH 5 ppm: CCROV/SA 12.5 ppm: SA:CF/PAPROV 25 ppm: CCRFOV/GMFOV/PAPRTOV/SCBAF/SAF §: SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE	Inh Ing Con	Irrit eyes, skin, nose, throat; weak, cyan, incr respiration, nau, drow, head, vomit	Eye: Skin: Breath: Resp support Swallow: Medical attention immed	Eyes, skin, resp sys, CNS, blood
[n-Hexanethiol]					

Chemical name, structure/formula, CAS and RTECS Nos., and DOT ID and guide Nos.	Synonyms, trade names, and conversion factors	Exposure limits (TWA unless noted otherwise)	IDLH	Physical description	Chemical and physical properties		Incompatibilities and reactivities	Measurement method (See Table 1)
					MW, BP, SOL, Fl.P, IP, Sp, Gr, flammability	VP, FRZ, UEL, LEL		
Chlorodiphenyl (42% chlorine) $C_6H_4ClC_6H_3Cl_2$ (approx) 53469-21-9 TQ1356000 2315 31	Aroclor® 1242, PCB, Polychlorinated biphenyl 1 ppm 10.72 mg/m³ (approx)	NIOSH* Ca 0.001 mg/m³ See Appendix A [*Note: The NIOSH REL also applies to other PCBs.] OSHA 1 mg/m³ [skin]	Ca [5 mg/m³]	Colorless to light-colored, viscous liquid with a mild, hydrocarbon odor.	MW: 258 (approx) BP: 617-691°F Sol: Insoluble Fl.P: NA IP: ? Sp.Gr(77°F): 1.39 Nonflammable Liquid, but exposure in a fire results in the formation of a black soot containing PCBs, polychlorinated dibenzofurans & chlorinated dibenzo-p-dioxins.	VP: 0.001 mm FRZ: -2°F UEL: NA LEL: NA	Strong oxidizers	Filter/ Florisil; Hexane; GC/ECD; III [#5503, PCBs]
Chlorodiphenyl (54% chlorine) $C_6H_3Cl_2C_6H_2Cl_3$ (approx) 11097-69-1 TQ1360000 2315 31	Aroclor® 1254, PCB, Polychlorinated biphenyl 1 ppm 13.55 mg/m³ (approx)	NIOSH* Ca See Appendix A 0.001 mg/m³ [Note: The NIOSH REL also applies to other PCBs.] OSHA 0.5 mg/m³ [skin]	Ca [5 mg/m³]	Colorless to pale-yellow, viscous liquid or solid (below 50°F) with a mild, hydrocarbon odor.	MW: 326(approx) BP: 689-734°F Sol: Insoluble Fl.P: NA IP: ? Sp.Gr(77°F): 1.38 Nonflammable Liquid, but exposure in a fire results in the formation of a black soot containing PCBs, polychlorinated dibenzofurans & chlorinated dibenzo-p-dioxins.	VP: 0.00006 mm FRZ: 50°F UEL: NA LEL: NA	Strong oxidizers	Filter/ Florisil; Hexane; GC/ECD; III [#5503, PCBs]
Chloroform $CHCl_3$ 67-66-3 FS9100000 1888 55	Methane trichloride, Trichloromethane 1 ppm = 4.96 mg/m³	NIOSH Ca See Appendix A ST 2 ppm (9.78 mg/m³) [60-min] OSHA† C 50 ppm (240 mg/m³)	Ca [500 ppm]	Colorless liquid with a pleasant odor.	MW: 119.4 BP: 143°F Sol(77°F): 0.5% Fl.P: NA IP: 11.42 eV Sp.Gr: 1.48 Noncombustible Liquid	VP: 160 mm FRZ: -82°F UEL: NA LEL: NA	Strong caustics; chemically-active metals such as aluminum or magnesium powder, sodium & potassium; strong oxidizers [Note: When heated to decomposition, forms phosgene gas.]	Char; CS.; GC/FID; III [#1003, Halogenated Hydrocarbons]
bis-Chloromethyl ether $(CH_2Cl)_2O$ 542-88-1 KN1575000 2249 55	BCME, bis-CME, Chloromethyl ether, Dichlorodimethyl ether, Dichloromethyl ether, Oxybis(chloromethane) 1 ppm = 4.78 mg/m³	NIOSH Ca See Appendix A OSHA [1910.1008] See Appendix B	Ca [N.D.]	Colorless liquid with a suffocating odor.	MW: 115.0 BP: 223°F Sol: Reacts Fl.P: <66°F IP: ? Sp.Gr: 1.32 Class IB Flammable Liquid	VP(72°F): 30 mm FRZ: -43°F UEL: ? LEL: ?	Acids, water [Note: Reacts with water to form hydrochloric acid & formaldehyde.]	Imp; Reagent; GC/ECD; OSHA [#10]

Personal protection and sanitation (See Table 3)	Recommendations for respirator selection — maximum concentration for use (MUC) (See Table 4)	Health hazards			
		Route	Symptoms (See Table 5)	First aid (See Table 6)	Target organs (See Table 5)
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: Daily Provide: Eyewash, Quick drench [Chlorodiphenyl (42% chlorine)]	NIOSH ¥: SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOVHiE/SCBAE	Inh Abs Ing Con	Irrit eyes; chloracne; liver damage; repro effects; [carc]	Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed	Skin, eyes, liver, repro sys [in animals: tumors of the pituitary gland & liver, leukemia]
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: Daily Provide: Eyewash, Quick drench [Chlorodiphenyl (54% chlorine)]	NIOSH ¥: SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOVHiE/SCBAE	Inh Abs Ing Con	Irrit eyes; chloracne; liver damage; repro effects; [carc]	Eye: Skin: Irr immed Breath: Soap wash immed Swallow: Resp support Medical attention immed	Skin, eyes, liver, repro sys [in animals: tumors of the pituitary gland & liver, leukemia]
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R. Provide: Eyewash, Quick drench [Chloroform]	NIOSH ¥: SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE	Inh Abs Ing Con	Irrit eyes, skin; dizz, mental dullness, nau, conf; head, ftg; anes; enlarged liver; [carc]	Eye: Skin: Irr immed Breath: Soap wash prompt Swallow: Resp support Medical attention immed	Liver, kidneys, heart, eyes, skin, CNS [in animals: liver & kidney cancer]
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam/Daily Remove: When wet (flamm) Change: Daily Provide: Eyewash, Quick drench [bis-Chloromethyl ether]	NIOSH ¥: SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE	Inh Abs Ing Con	Irrit eyes, skin, muc memb, resp sys; pulm congestion, edema; corn damage, nec; decr pulm function, cough, dysp, wheez; blood-stained sputum, bronchial secretions; [carc]	Eye: Skin: Irr immed Breath: Soap wash immed Swallow: Resp support Medical attention immed	Eyes, skin, resp sys [lung cancer]