Contract No. 68-W9-0051

HEALTH AND SAFETY PLAN

Action Anodizing Plating & Polishing Copiague, Suffolk County, New York

Remedial Planning Activities at Selected Uncontrolled Hazardous Substance Disposal Site USEPA Region II (NY, NJ, PR, VI)

Malcolm Pirnie, Inc.
2 Corporate Park Drive
White Plains, New York 10602

MARCH 1990
Malcolm Pirnie, Inc. has reviewed this draft document in accordance with the contractor's ARCS II QAPP and is submitting it to USEPA, Region II in compliance with the requirements under Work Assignment No. 001-2L3M and Contract No. 68-W9-0051.

This document has not been approved by USEPA Region II and is not intended for release to the public.
SCOPE

Malcolm Pirnie, Inc. is under contract to the United States Environmental Protection Agency (EPA) to complete a remedial investigation for the Action Anodizing, Plating and Polishing, Inc. This Site Safety and Health Plan has been developed to address safety requirements related to the field investigative activities to be undertaken at the site.

ACKNOWLEDGEMENTS

1. Site Safety and Health Plan - Reviewed by:

   Signature                      Date

   ______________________________ __________________
   Corporate Health and Safety Officer

   ______________________________ __________________
   Site Manager

   ______________________________ __________________
   Site Health & Safety Officer

   ______________________________ __________________
   Site Investigations Field Manager

2. Employee Acknowledgement (To be signed by all MPI and subcontractor employees prior to their work on site):

   I acknowledge that I have reviewed the information in this Site Safety and Health Plan and understand both the potential hazards which may confront me during field investigative activities at the Action Anodizing Plating and Polishing Inc. site and the procedures outlined in this plan to minimize those hazards.

   Employee  Company  Date

   ______________________  ______________________  ________________

   ______________________  ______________________  ________________

   ______________________  ______________________  ________________

   ______________________  ______________________  ________________

   ______________________  ______________________  ________________

   ______________________  ______________________  ________________
3. Site Safety and Health Plan - Approved by:

[Signature]  
Vice President

[Signature]  
PMO Health and Safety Manager  
3/19/90
Amendments made to the Action Anodizing, Plating and Polishing Inc. Health and Safety Plan will be attached to each copy of the plan.

A description and date of change will be recorded in each copy, as below.

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1.0 INTRODUCTION

1.1 PURPOSE

This Site Health and Safety Plan (SHSP) has been developed to present site specific hazard identification, assessment, and evaluation for the various remedial tasks which shall be required to complete remedial investigations of the Action Anodizing, Plating and Polishing Inc. (AAPP) Superfund site. U.S. Environmental Protection Agency (EPA) approval of the SHSP is required prior to the commencement of any remedial activities.

Safety, health and emergency response procedures are outlined for preventing accidents and protecting personnel from injury and occupational illness while remediation activities are ongoing at the site. Included in this SHSP are the assignment of responsibilities, personnel protection minimum requirements, safe work practices and emergency response procedures. This document is based upon available historical information and the assessment of potential physical and chemical hazards associated with the site and activities related to the planned remedial investigation.

Environmental monitoring (real-time) will be performed as necessary during the course of the field investigative activities to determine ambient levels of airborne contaminants, specifically, total organic vapors as measured by a photoionization detector. The SHSP will be modified as appropriate to address current site conditions and to present corrective procedures. Modification will be made by written addenda to this SHSP, and each modification topic and title will be noted on the record of changes provided in the front of this document.

MPI and its subcontractors are responsible for insuring that all personnel in their employment will strictly comply with the requirements of this SHSP while working at the site.

Consistent with the contents of this SHSP, all work will be performed in a safe and environmentally acceptable manner. Sound judgement will be exercised in order to minimize the risk to the community. Enforcement and adherence to the SHSP will help prevent the loss of life, injury or health hazards to the field personnel and the community. A copy of this SHSP
will be available on-site, in the keeping of the Site Health and Safety Officer during all field investigative activities.

1.2 REGULATORY REQUIREMENT AND GUIDELINES

The procedures outlined in this SHSP comply with the Occupational Safety and Health Administration (OSHA) requirements contained in 29 CFR 1910 and 1926 including the proposed final rule contained in 29 CFR 1910.120. The procedures are also consistent with the guidance contained in the Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities jointly prepared by the EPA, National Institute for Occupational Safety and Health (NIOSH), OSHA, the U.S. Coast Guard (USCG) and EPA's Standard Operating Safety Guides.
2.0 PROJECT DESCRIPTION

2.1 SITE LOCATION

Action Anodizing, Plating and Polishing, Inc. (AAPP) is located at approximate latitude 40° 41' and approximate longitude 73° 24' (see Figures 2-1 and 2-2).

It is located on Long Island, New York in the Town of Babylon in the hamlet of Copiague, New York. The Town of Babylon is located in southwest Suffolk County and encompasses approximately 53 square miles (33,920 acres) and is approximately 35 miles to the east of New York City (NYC). Suffolk County occupies the eastern two thirds of Long Island, and encompasses 900 square miles (576,000 acres).

The one-acre AAPP site is approximately one mile east of the Nassau-Suffolk County line and one-half mile south of Sunrise Highway.

2.2 SITE HISTORY

AAPP has occupied the facilities at 33 Dixon Avenue since 1968; prior to 1968 the facility was operated by Unqua Fabricare, a commercial laundry service. The AAPP operating facility is a small job shop providing metal anodizing, plating, polishing and painting, principally sulfuric acid anodizing of aluminum parts for the electronics industry, cadmium plating, chromate conversion coatings, metal dyeing and vapor degreasing. The operating facility includes approximately 3000 sq. ft. of floor area and about 2000 sq. ft. of office space. Attached to the operating facility is an approximate 7500 sq. ft. addition which was built in 1984. The addition is used for equipment storage. See Figures 2-3 and 2-4.

According to the AAPP site owner, liquid wastes from the processes include rinses of spent caustic and acidic solutions contaminated with cadmium, chromium, zinc and sodium cyanide. Prior to 1980, the rinses were stored in a concrete trough from which they were pumped into a low pressure steam boiler. The steam was condensed and reused as process make-up water. The solids from the rinse water were allowed to build up in the boiler tubes until the tubes became plugged (i.e., tubes plugged in about 5 years). Thereafter, the boiler was replaced with a new boiler.
FIGURE 2-1

NEW YORK

ACTION ANODIZING

NEW YORK CITY

REGIONAL MAP
NOT TO SCALE
FIGURE 2-2

Source: USGS Amityville Quadrangle

Action Anodizing, Plating and Polishing

Site Location Map

Scale: 1" = 2000'
FIGURE 2-3

GARBALDI AVE.

PROPERTY BOUNDARY

DIRT ROAD

SANITARY CESS POOL AND PIPING

PRIVATE RESIDENCE

ASSUMED LOCATION OF 2500 GAL SEPTIC TANK

POSSIBLE LOCATION OF FORMER LEACHING POOLS (4-6)

JUNK STORAGE

COLLECTION TROUGH

BOILER

ANODIZING AND PLATING PROCESS LINE

WASTE COLLECTION TROUGH

DIXON AVE.

STORAGE SHED

UNDERGROUND OIL TANK

UNPAVED PARKING LOT

MRN

ACTION ANODIZING, PLATING AND POLISHING

ACTION ANODIZING PRIOR TO 1980

NOT TO SCALE
The concrete rinse holding trough had been used by the commercial laundry as part of its drainage system. The trough was connected to a septic tank on the north side of the building. Tank overflow fed into a series of six leaching pits on the east side of the building. The bottom of pits were reportedly several feet above the groundwater table.

AAPP has stated that in January 1980 a pipe connecting the holding trough to the leaching system was accidentally broken, allowing the rinse water from the plating process to discharge to the leaching pits.

On January 11, 1980, AAPP was ordered by the Suffolk County Department of Health Services (SCDHS) to cease discharge immediately and pump out and remove the contents of the entire leaching system.

In the Spring of 1980, AAPP contracted with the Patterson Chemical Company for the cleanup and removal of their leaching system. This work was supervised and approved by SCDHS. On September 30, 1980, SCDHS notified AAPP that area which had contained the leaching pits could be backfilled with clean sand and gravel.

Since 1980, AAPP reports that it has had its industrial waste hauled off-site for disposal. In January 1986, New York State Department of Environmental Conservation (NYSDEC) issued a Phase 1 Investigation Report on AAPP. A hazard ranking score for the site was presented as follows:

\[ S_\text{M} = 36.61 \quad (S_{gw} = 63.33 \quad S_{sw} = 0.0, \quad S_s = 0) \]
\[ S_{FE} = \text{N/A} \]
\[ SDC = 0 \]

In large measure, the hazard ranking was high for two reasons: (1) the remedial activity in 1980 was not checked by environmental monitoring to confirm whether it was effective and, (2) the area overlies a sole-source water supply aquifer.

2.3 CURRENT CONDITIONS

AAPP is still engaged in the anodizing and plating business. AAPP reports that their industrial wastes currently are stored on-site in double walled tanks for less than 90 days and then periodically hauled off-site.
The area where the former leaching field was located is presently covered by the approximate 7500 square foot addition constructed in 1984. The floor of the addition is a six inch concrete slab which was placed over existing soil. According to the AAPP site owner and the construction contractor, an underground oil tank was removed from the vicinity prior to constructing the addition. However, no records documenting the tank removal are available.

When the addition was built, four separate drainage systems were installed to collect surface runoff from the building's roofs and two proposed parking lots. See Figure 2-4. The parking lots were never built and the roof drains were not connected to the drainage systems. The area proposed for the parking lots is currently an unpaved area overgrown with brush and weeds.

2.4 PROPOSED WORK

The purpose of the field investigations is to define the existence, nature, depth and lateral extent of any contamination resulting from the operation of Action Anodizing, Plating and Polishing. A detailed description of the proposed work is in the AAPP Work Plan.

The data generated during the field investigation will be used to assess what risks, if any, the contamination resulting from operations at AAPP present to public health and to the environment. Based on this data, it will be determined whether the contaminants are of sufficient concentration to warrant a remedial action. Finally, the data will be used to evaluate appropriate remedial response alternatives for the site.
3.0 PROJECT ORGANIZATION AND RESPONSIBILITY

3.1 QUALIFICATIONS OF SAFETY PERSONNEL

An organizational chart identifying health and safety personnel is shown in Figure 3-1. Resumes of key personnel are provided in Appendix A.

3.2 RESPONSIBILITIES OF SAFETY PERSONNEL

Program Manager - The ARCS II Program Manager (PM) has the overall responsibility for health and safety of Malcolm Pirnie personnel assigned under this Contract. The operational aspects of this responsibility are delegated to the Program Health and Safety Manager (PMOHSM).

PMO Health and Safety Manager - The PMO Health and Safety Manager (PMOHSM) is responsible for development and implementation of the ARCS II health and safety program. The PMOHSM functions as a liaison with EPA Region II, OSHA and other agencies on ARCS II health and safety issues. The PMOHSM conducts or directs periodic site audits to ensure successful implementation of the site health and safety plans.

Site Manager - The Site Manager has full responsibility for implementing and executing an effective program of site-specific personnel protection and accident prevention. The Site Manager supervises the allocation of resources and staffing to implement specific aspects of the SHSP, and may delegate authority to expedite and facilitate any application of the program.

Site Safety and Health Officer - The Site Health and Safety Officer is knowledgeable in safety and worker protection techniques as they relate to the project. Responsibilities include ensuring the day to day compliance of work to this SHSP, having the ability and authority to make needed changes or additions to the plan and providing technical assistance to project management on problems relating to industrial hygiene and work site safety.
Health & Safety Organization Chart

US EPA RPM
  Stephen Cipot

PMO Health & Safety Manager
  Catherine Bobenhausen

Site Manager
  Sandra Cointreau

Site Health & Safety Officer
  Margaret Muldoon

RI Team Leader
  John Logigian

Field Team
The Site Health and Safety Officer is also responsible to ensure monitoring of chemical toxicants contained in air. This may consist of performing workplace air sampling such as organic vapor monitoring, as well as the interpretation and documentation of all data. As data are obtained and evaluated the Site Health and Safety Officer may modify this SHSP to fit the current personal protection needs. The levels of personnel protection outlined in this plan may be downgraded based on such information; the levels of personal protection outlined in this plan cannot be downgraded without the approval of PMOHS. The Health and Safety Officer will also conduct regular on-site briefings pertaining to health and safety requirements of the project.

The Site Health and Safety Officer (SHSO) is responsible for the development and set-up of emergency procedures and personal decontamination procedures and personal decontamination procedures. The SHSO shall complete a daily diary of activities with health and safety relevance. At any time unsafe work conditions are determined, the SHSO is authorized to stop work. Resolution of all on-site health and safety problems will be coordinated through the Site Manager with assistance from the Health and Safety Manager.

Field Personnel - Field personnel are required to become thoroughly familiar with this SHSP, follow the health and safety procedures and guidelines outlined in this SHSP, and use protective equipment and devices properly in order to protect themselves and their fellow workers from injury and to prevent damage to material, equipment, and facilities. Field personnel will contribute any suggestions and assist in discovering or correcting unsafe working conditions.

Subcontractor Personnel - Subcontractor personnel will follow the health and safety procedures and guidelines outlined in this SHSP. Additional health and safety procedures may be required by the subcontractor. Subcontractors will ensure that their personnel are familiar with the proper use of protective equipment and devices in order to protect themselves and fellow workers from injury and to prevent damage to material, equipment, and facilities. Subcontractor personnel will contribute any suggestions and assist in discovering or correcting unsafe working conditions.
The following MPI personnel have health and safety responsibility for this project:

PMO Health and Safety Manager
Name: Catherine Bobenhausen
Work Telephone: (914) 694-2100
Home Telephone: (914) 478-3614

Site Manager
Name: Sandra Cointreau
Work Telephone: (914) 694-2100
Home Telephone: (203) 266-4206

Site Health and Safety Officer
Name: Margaret A. Muldoon
Work Telephone: (914) 694-2100
Home Telephone: (914) 242-0943

MPI subcontractors include:
Not identified at this time.
4.0 HAZARD ASSESSMENT

4.1 HAZARDOUS SUBSTANCE CHARACTERISTICS AND TOXICOLOGY

The contaminants detected in water on-site and the range of values measured are presented in Tables 4-1a and b, along with occupational guidance levels (Permissible Exposure Limits set by OSHA) and relevant physical and chemical data. Chemical constituents and compounds selected from that list as those contaminants which may pose a potential risk to human health are listed below:

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<td>Benzene</td>
</tr>
<tr>
<td>Chromium</td>
<td>1,1-Dichloroethylene</td>
</tr>
<tr>
<td>Cyanide</td>
<td>1,2-Dichloroethylene</td>
</tr>
<tr>
<td>Lead</td>
<td>Tetrachloroethylene</td>
</tr>
<tr>
<td>Nickel</td>
<td>Toluene</td>
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<tr>
<td></td>
<td>Trichloroethylene</td>
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<tr>
<td></td>
<td>Vinyl Chloride</td>
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The environmental fate and transport, pharmacokinetics and toxicology of the listed chemicals are described below. Much of the toxicological data for these chemicals are derived from long-term (chronic) exposure from ingestion and/or inhalation exposure routes. Oral and dermal exposures over short time frames (acute and subchronic) are the conditions most directly applicable to any potential exposure to these compounds during the remediation activities at this site.

**Metals and Inorganics**

**Cadmium** - Compared to most other heavy metals, cadmium is relatively mobile in the aqueous environment. In natural waters, cadmium may exist as the hydrated ion (Cd^{2+}.6H_2O); as metal-inorganic complexes with CO_3^{2-}, OH^-, Cl^-, or SO_4^{2-}; or as metal-organic complexes with humic acids. Because cadmium exists only in the 2^+ oxidation state, aqueous cadmium is not strongly influenced by the oxidizing or reducing potential of the water.
The concentration of cadmium in water is usually inversely related to the pH value and amount of organic material present.

Cadmium sulfide tends to precipitate in sediments under reducing conditions that yield sulfide. Exposure of cadmium-containing sediments to oxygen can result in the oxidation of sulfide and solubilization of Cd^{2+}. Humic substances account for most of the organic complexes, being either soluble or insoluble depending upon the nature of the humic substance. These products are important because they are more easily assimilated by the sediments than the free divalent cation. Sorption by clays and iron oxides in suspended solids and sediments is an important mechanism for reducing the aquatic load of cadmium. Cadmium does not form volatile compounds in the aquatic environment, nor does biological methylation occur.

Cadmium can enter the blood by absorption from the stomach or intestines after ingestion of food or water, or by absorption from the lungs after inhalation. Very little cadmium enters the body through the skin. Usually only about 1 to 5% of what is taken in by mouth is absorbed into the blood, while about 30 to 50% of that which is inhaled is taken up into the blood. Once cadmium enters the body, it is retained. Therefore, even low doses may build up significant cadmium levels in the body if exposure continues for a long time.

Cadmium can cause a number of adverse health effects. Ingestion of high doses causes severe irritation to the stomach, leading to vomiting and diarrhea; inhalation of high doses leads to severe irritation of the lungs. Such high exposures, however, are extremely rare today. Of greater concern are the effects which may occur following long-term, low-level exposure. Examples of effects resulting from various levels and durations of exposure are as follows:

- Kidney damage occurs in people who are exposed to excess cadmium either through air or through the diet. This kidney disease is usually not life threatening, but it can lead to the formation of kidney stones and effects on the skeleton that are equally painful and debilitating.

- Lung damage, such as fibrosis or emphysema, has been observed in workers in factories where levels of cadmium concentration in air are high.
Lung cancer has been shown to occur in animals exposed for long periods to cadmium in air. Studies in humans also suggest that long-term inhalation of cadmium can result in increased risk of lung cancer. Oral exposure to cadmium is not believed to cause cancer.

High blood pressure has been observed in animals exposed to cadmium. Whether or not cadmium exposure plays an important role in human hypertension is controversial and requires further research.

Other tissues reported to be injured by cadmium exposure in animals or humans include the liver, the testes, the immune system, the nervous system, and the blood. Reproductive and developmental effects have been observed in animals treated with cadmium, but these have not been reported in humans.

**Lead** - Lead has three valence states: +2, which dominates its inorganic form; 0, comprising its metals and alloys; and +4, dominated by organolead compounds.

Lead in aquatic media is primarily removed to bed sediments by two processes, precipitation as PbCO\(_3\), PbS, PbSO\(_4\) or adsorption onto organic materials, hydrous iron or manganese oxides. In some bodies of water, precipitation may be the most important process, but under most circumstances sorption may predominate. Biomethylation of lead by benthic microbes may cause some remobilization of lead from bed sediments. It should be emphasized that the removal of lead from aquatic media may be strongly pH dependent. In acidic pH ranges, lead may be more mobile than in alkaline pH ranges because of inherent higher solubility of precipitable lead salts and lower sorption characteristics of lead in solution.

Lead in soil is expected to undergo speciation to more insoluble salts. Lead does not usually move downward in soil because of the relative insolubility of lead salts and the binding capacity of organic fractions that may be present in soils. Under certain circumstances, however, lead may be solubilized through complexation with organics present in soils. In the absence of suitable sorbents, the complexed lead may move downward in the soil. Studies have shown leaching of lead into ground water under certain soil conditions.

It has been estimated that around 8 percent of the lead ingested daily is absorbed in adult humans and animals. Lead absorption in
children and newborn animals is considerably higher. Gastrointestinal absorption is influenced by diet and the chemical nature of the lead consumed. Lead phthalate and lead carbonate appear to be absorbed the most.

Available evidence suggests that effects of lead on the formation of hemoglobin and other hemo-proteins are detectable at lower levels of lead exposure than are effects on any other organ or system. Neurological effects in children are indicators of lead toxicity although the threshold for noticeable effects has not been well defined.

Toxic effects from subchronic lead exposure have been noted in rats. The most sensitive indication of lead toxicity in newborn rats is histological changes in the kidney. Chronic exposure of rats receiving oral and subcutaneous lead doses has caused weight loss, poor hair coats, depression of tissue excitability, increases in systolic blood pressure, decreases in blood hemoglobin concentrations, enlarged bile ducts, and changes in the kidney.

Pregnant rats receiving lead doses have shown delayed births. When second generation rats were continued on the same lead treatment, excessive mortality occurred in the third generation offspring. Women in occupations associated with high exposure to lead shown increases in spontaneous abortions, premature deliveries, and early membrane rupture.

No data are available regarding lead's oral carcinogenic potential in humans. Bioassays using oral doses of lead acetate in rats have produced renal tumors. However, humans are not usually environmentally exposed to the lead salts associated with tumors in animals.

Nickel - Nickel persists in water, existing in numerous soluble and insoluble forms depending upon the chemical and physical properties of the water. The mobility of nickel in aquatic media is controlled by complexation, precipitation/dissolution, adsorption/desorption, and oxidation/reduction reactions. Limited data suggest that in pristine environments nickel may exist primarily as hexahydrate ions that are subsequently coprecipitated or sorbed by hydrous oxides of iron, silica, and manganese, leading to decreases in mobility and bioavailability. In more organo-rich polluted waters, organic materials will keep nickel solubilized by complexation, and approximately half may exist as simple inorganic salts and half as stable organic complexes, e.g., with humic
acids. In water where anaerobic conditions exist, nickel will precipitate out of solution as nickel sulfide in the presence of sulfides. The results of one study indicate that although amorphous oxides of iron and manganese generally control the mobility of nickel in aqueous media, variation in such properties as sulfate concentration, pH, and iron oxide surface area could affect the mobility of nickel. No data have been found which would suggest that nickel compounds volatilize from water.

It has been shown that the free aqua species of nickel \([\text{Ni}(\text{H}_2\text{O})_6^{2+}]\) predominates at pH 9 in most aerobic waters, and soluble nickel compounds will form as a result of nickel complexation with naturally occurring ligands \((\text{OH}^->\text{SO}_4^{2-}>\text{Cl}^->\text{NH}_3)\). In aerobic environments at pH <9, the hydroxide and/or carbonate species will precipitate out of solution. Under anaerobic conditions, sulfide ions present in water will control the solubility of nickel. No data have been found which suggest that nickel undergoes any biological transformation process by microorganisms in water.

Nickel can enter the body when a person breathes nickel dust or particles of nickel compounds. The amount of nickel that enters the blood from the lungs or that remains in the lungs depends on the size of the particles and the solubility of the nickel compounds, among other physical properties of the compounds. Intake of nickel or its compounds by ingestion of drinking water is typically less than through diet. Nickel can also penetrate the skin.

Very small amounts of nickel have been shown to be essential to some species of animals, so that small amounts may also be essential to humans.

High levels of nickel and nickel compounds are clearly toxic. Nickel and its compounds can cause effects on the lungs and on the body's defense mechanism against infection (the immune system) regardless of the length of exposure. Nickel and its compounds can also cause asthma in sensitive people. Continued contact with the skin can cause skin allergies, which are the most common adverse effects of nickel exposure to the general population. Surveys indicate that 2.5 to 5.0% of the general population may be nickel-sensitive. Individuals are sensitized by frequent skin contact with nickel-containing and nickel-plated consumer products.

By inhalation, nickel refinery dust including nickel subsulfide as a component causes cancer in the lung, nasal cavity, and voice box in humans. Metallic nickel and nickel carbonyl are shown to be carcinogenic.
in humans. The carcinogenic potential of other nickel salts or, more broadly, nickel in any form is uncertain. By analogy, ingested nickel could be thought to have a carcinogenic potential, yet limited animal testing of a few nickel compounds has not shown carcinogenicity.

Studies in laboratory animals indicate that exposure to high levels of some nickel compounds during pregnancy can cause miscarriages, pregnancy complications, and low birth weight in newborns. There are no data regarding birth defects from nickel or its compounds in humans.

Studies in animals indicate that nickel compounds can affect the kidneys, blood, and growth.

Cyanide - Cyanide compounds are naturally occurring substances found in a number of foods and plants, and produced by certain bacteria, fungi, and algae. However, most of the cyanide found in the environment comes from industry. Two predominant forms of cyanide are hydrogen cyanide (HCN) and sodium cyanide (NaCN). The former is used primarily in the production of organic chemicals, the latter is used primarily in electroplating and metal treatment. Exposure from both forms includes inhalation, ingestion and dermal contact.

Hydrogen cyanide is a colorless gas or liquid with a faint bitter almond odor. However, because the sense of smell is easily fatigued and there is wide individual variation in the minimum odor threshold, the odor of hydrogen cyanide may not provide adequate forewarning in its presence. It has a relatively low boiling point of 25.7°C. It is soluble in alcohol, and ether and is miscible with water. All potential sources of vapor or liquid exposure should be carefully studied prior to work on-site where it might be present and adequate local ventilation be provided. Because hydrogen cyanide is highly toxic in water to all living species, special attention should be given to the possibility of water pollution. Hydrogen cyanide is flammable and burns in air with a bluish flame. The flammable limits are from 5.6 to 40% by volume in air.

Sodium cyanide is a white crystalline solid and is readily soluble in water and slightly soluble in alcohol. Sodium cyanide produces all the typical symptoms of other sources of cyanide, including acute symptoms by inhalation, ingestion and dermal absorption. Cyanide salts appear to be readily absorbed through skin.
Adverse effects to the central nervous system, respiratory system, and cardiovascular system seem to be the primary effect of exposure to high levels of cyanide for a short period of time. Short-term exposure to high levels of cyanide can cause coma and/or death. Brief exposures to lower levels result in rapid deep breathing; shortness of breath; convulsions; and loss of consciousness. These short-term effects are reversible over time because cyanide does not remain in the body. Skin contact with dust from cyanide salts can cause skin irritation.

Chromium - Primarily the trivalent (+3) (Cr III) and hexavalent (+6) (Cr VI) states of chromium are of concern for exposure. Exposure to these forms includes inhalation, ingestion and, in some instances, dermal contact.

General population exposure to chromium results from inhalation of air and ingestion of drinking water and food containing chromium. Higher exposure to chromium occurs to people working in certain chromium industries and people who smoke cigarettes. Occupational exposure to chromium occurs mainly from stainless steel welding, chrome production, chrome plating, ferrochrome alloys, chrome pigment, and tanning industries. For most occupations, the exposure is due to both Cr III and Cr VI states present as soluble and insoluble fractions. Each, however differ in their effects on the human body. Cr III is thought to be an essential nutrient. Acute oral data indicate that Cr VI compounds are more toxic than are Cr III compounds.

Short-term high level exposure to Cr VI can result in adverse effects at the contact site, such as ulcers of the skin, irritation and perforation of the nasal mucosa, and irritation of the gastrointestinal tract. It may also cause adverse effects in the kidney and liver. Intermediate exposure to Cr VI compounds include irritation of the nasal mucosa and transient decrease in lung function. Cr VI is relatively stable and mobile in sandy soils or soils that contain low concentrations of organic matter. Increasing pH will help mobilize Cr VI from soils. Two processes that may increase the mobility of chromium in soil are the conversion of Cr III to Cr VI and the complexation of Cr III with organic matter to form water-soluble complexes. Part of the Cr VI in soil will be sorbed, some will be reduced, and some may leach into groundwater, and may be available for plant uptake. This distribution will depend on soil pH, organic
matter content, presence of reducing agent, and the texture of soil. The ammonium and alkali metal salts of Cr VI are generally soluble, whereas the alkaline metal salts are sparingly soluble or insoluble in water.

Long term inhalation exposure of workers to low level of chromium compounds has been associated with lung cancer. It is not clear which form of chromium is responsible. Only Cr VI has been found to cause cancer in animal studies. Chromium +6 should be regarded as a probable cancer-causing substance in humans exposed by inhalation. Inhalation exposure to chromium may result in adverse effects on the respiratory system and may affect some components of the immune system. Effects on the immune system have not been shown to change the body's resistance to disease. Respiratory tract effects, including irritation of the nasal mucosa, transient decrease in lung function, and induction of cancer, seem to be the key end points for inhalation exposure of humans.

Absorption studies of chromium compounds in humans and animals indicate Cr VI compounds are more readily adsorbed from all routes of exposure than are Cr III compounds. This is consistent with the water solubilities of these compounds.

Studies of chromium distribution in animals following inhalation exposure have found high levels in the kidneys, lungs and spleen. Once absorbed, Cr VI is reduced to Cr III. Absorbed chromium is excreted from the body in a rapid phase representing clearance from the blood in at least two slower phases representing clearance from tissues. Urinary excretion is the primary route of elimination.

Organics

Vinyl Chloride - Vinyl chloride is volatile and readily passes from solution into the gas phase under most laboratory and ecological conditions. Since various salts have the ability to form complexes with vinyl chloride and increase or decrease its solubility in water, the amounts of vinyl chloride in water could be influenced significantly by the presence of salt.

Vinyl chloride introduced into aquatic systems will most probably be quickly transferred to the atmosphere through volatilization. In fact, results from model simulations indicate that vinyl chloride should not remain in an aquatic ecosystem under most natural conditions. Once in the
troposphere, vinyl chloride reacts at an extremely rapid rate with hydroxyl radicals, exhibiting a half-life on the order of a few hours with the subsequent formation of hydrogen chloride or formyl chloride as possible products. Formyl chloride, if formed, is reported to decompose thermally at ambient temperatures with a half-life of about 20 minutes, yielding carbon monoxide and hydrogen chloride. As a result, vinyl chloride in the troposphere should be decomposed within a day or two of release.

Based on the information found, it does not appear that oxidation, hydrolysis, biodegradation or sorption are important fate processes for vinyl chloride in the aquatic environment.

In rats, rapid absorption of vinyl chloride from the gastrointestinal tract into the blood has been reported. Vinyl chloride has been known to have carcinogenic effects in humans and animals from both oral and inhalation routes. It is regarded by EPA as a Group A human carcinogen (i.e., there is sufficient evidence from epidemiological studies). In humans, exposure to vinyl chloride is associated with angiosarcoma of the liver. Several tumor types have been reported in animals following exposure to vinyl chloride through ingestion or inhalation. In addition to the liver, organs most likely to be affected are the brain, lung and hemato- and lymphopoietic systems. Toxicity and carcinogenicity are mediated through a metabolic intermediate, with the incidence of effect related to the amount of vinyl chloride metabolized rather than to the concentration of exposure. Vinyl chloride has also been shown to bind to DNA in short-term studies.

Data regarding the teratogenicity of orally administered vinyl chloride are generally not available, however it was not teratogenic when administered via inhalation to rats, mice or rabbits. Data are inadequate to characterize the teratogenicity of vinyl chloride to humans.

1,1-Dichloroethylene - 1,1-Dichloroethylene (Vinylidene Chloride) is a synthetic halogenated aliphatic hydrocarbon and is used as a copolymer in the production of synthetic materials including Saran. Vinylidene Chloride is also used in the product of adhesives and synthetic fibers. It is highly reactive and, in the presence of air, can form explosive, complex peroxides. Formaldehyde, phosgene and hydrochloric acid may be produced from such an explosion. Acute effects of vinylidene chloride
include anaesthesia, and liver and kidney damage. Both liver and kidney
damage have also been reported to result from inhalation or ingestion
exposure. Vinylidene chloride is considered to be a "possible" human
carcinogen. The potential for inhalation is the most important route of
exposure.

**Trans-1,2-Dichloroethylene** - The most important transport and fate
process for the chlorinated ethylenes in the upper layer of soil and
surface water is volatilization into the atmosphere where they can react
with hydroxyl (OH') radicals to produce hydrochloric acid, carbon monoxide,
carbon dioxide and carboxylic acid.

The chlorinated ethylenes can be bioaccumulated to some degree and
there is some evidence that they can be metabolized by higher organisms.
Based on studies with TCE, virtually complete absorption of trans-
1,2-dichloroethylene from oral exposure can be assumed.

Both the trans- and cis-isomers demonstrate a potential for liver and
kidney damage, although little information is available on the effects of
chronic exposure. They possess general anaesthetic and narcotic
properties at exposure levels above those at which liver and kidney
effects are seen. Data on the human health aspects of exposure to trans-
1,2-dichloroethylene are unavailable. Trans-1,2-dichloroethylene was
non-mutagenic when assayed with E. coli, non-mutagenic in Salmonella
tester strains and failed to induce chromosomal aberrations in mouse bone
marrow cells following intraperitoneal injections. Data are lacking on
the teratogenicity and carcinogenicity of 1,2-dichloroethylene.

Long-term studies on the carcinogenic potential of trans-1,2-
dichloroethylene have not been carried out and the compound is in Group
D, not classified, in the USEPA weight of evidence categories for
potential carcinogens.

**Trichloroethylene** - Trichloroethylene (TCE) is a common industrial
solvent used primarily in dry cleaning and metal degreasing. TCE rapidly
volatilizes into the atmosphere where it reacts with hydroxyl radicals.
This is probably the most important transport and fate process for TCE.
In surface water and in the upper layer of soil TCE leaches into the
groundwater fairly readily.
The pharmacokinetics and metabolism of TCE have been studied in man as well as in animals. TCE absorption after oral ingestion is virtually complete; TCE absorption from inhalation increases in proportion to the duration of exposure and concentration in air. The compound distributes widely into body tissues and is eliminated via liver metabolism to urinary metabolites. In man, metabolism of TCE is linearly proportional to the inhaled dose and there is no indication that the metabolism is saturation dependent. While studies have not been made of TCE metabolism in man after oral exposure, at the concentrations typically found or expected in drinking water, TCE is expected to be completely absorbed and metabolized.

Mild poisoning via inhalation produces headache, vertigo and visual disturbance, more severe poisonings include greater disturbances to the respiratory and central nervous system, heart, liver and kidneys.

While the teratogenic potential of TCE for humans cannot be directly extrapolated from animal studies, exposure of various gestating laboratory animals to levels greatly in excess of those generally found in the environment has not been observed to result in any teratogenic effects. Available data provide suggestive evidence that commercial grade TCE is a weakly active, indirect mutagen causing effects in a number of different test systems.

The USEPA classifies TCE as a Group B2 probable human carcinogen (sufficient animal evidence of carcinogenicity and inadequate human evidence) via both oral and inhalation routes of exposure. Some uncertainty exists, however, within the nation and international scientific communities as to the classification of TCE as a carcinogen. The interpretation of the incidence of liver tumors in studies involving male mice is the cause of the uncertainty. The induction of tumors in both sexes of mice in multiple studies, the incidence of other tumor types in mice, some evidence of mutagenicity and binding with DNA are the bases of the conservative classification. There are no adequate epidemiologic data in humans. The carcinogenic potential of TCE is generally considered to reside in cellular-reactive intermediate metabolites.

Tetrachloroethylene or PCE - PCE is a moderately volatile chlorinated hydrocarbon which has important applications in the dry cleaning of fabrics and in the degreasing of fabricated metal parts.
PCE is moderately to highly mobile in soil and is susceptible to leaching which is how PCE gets into the groundwater. Tetrachloroethylene in surface water will predominantly volatilize into the atmosphere. Although volatilization is rapid, actual volatilization rates are dependent on temperature, water movement and depth, associated air movement, and other factors.

PCE is rapidly and virtually completely absorbed following oral administration, presumably because of its lipid solubility. Pulmonary uptake of PCE during inhalation exposure is linearly proportional to exposure duration and the concentration in air. Absorption of PCE during vapor or liquid contact with the skin of experimental animals or man is very slow. PCE distributes widely into body tissues and readily crosses the blood brain barrier and placental barrier.

Most of the human toxicological data for PCE is derived from accidental and occupational exposures to high, often unknown, ambient concentrations. Although a wide variety of toxic effects have been observed, the effects on the central nervous system are the most noticeable. Effects on the liver and kidneys, some of which have occurred after an elapsed period of time, have also been noted. The effects are similar to those observed in laboratory animals following acute, subchronic and chronic exposures to PCE. Additional adverse effects in humans may include irritation of the mucous membranes and intoxication.

**Benzene** - Benzene is an important industrial solvent and chemical intermediate. Sorption, leaching and biodegradation are environmental fate processes for benzene introduced in soils. The octanol/water partition coefficient for benzene indicates that it will sorb to sedimentary organic material. Sorption processes are likely removal mechanisms in both groundwater and surface waters. Benzene is expected to leach from soils of low organic content. Although the bioaccumulation potential for benzene appears to be low, gradual biodegradation by a variety of microorganisms probably occurs. Volatilization is the primary transport process in aquatic systems.

The USEPA has classified benzene as Group A, a human carcinogen via both inhalation and oral routes. Inhalation is the most frequent route of exposure to benzene and it is readily absorbed into the blood. Benzene is a hematological poison. It is toxic to bone marrow which may cause
effects ranging from a mild decrease in platelets to aplastic anemia. Benzene has been observed to cause leukemias and decrease serum antibody levels and immune system response.

Acute exposures to benzene have resulted in a wide range of symptoms including irritation of the eyes and respiratory tract, and central nervous system depression. Death from acute exposure is usually the result of cardiac or respiratory failure. The major concern associated with chronic human exposure is benzene-induced blood disorders, including leukemia.

Benzene exposure is associated with chromosomal damage, although it is not mutagenic in microorganisms. It was fetotoxic and caused embryolethality in experimental animals. Although most benzene hazards are associated with inhalation exposure, dermal absorption of liquid benzene may occur, and prolonged or repeated skin contact may produce blistering, erythema, and a dry scaly dermatitis. Data regarding cancer incidence in humans following oral exposure to benzene is generally unavailable.

**Toluene** - Toluene is an organic liquid derived from coal tar. It is used in the manufacturing of many organic compounds and as solvents for paints, lacquers and resins. It is also used in plant extractions and as a gasoline additive. Volatilization is the major route of removal of toluene from aquatic environments. Precipitation or dry deposition can place toluene and its oxidation products into aquatic and terrestrial systems. In subsurface soil, toluene may undergo variable degrees of biodegradation depending on the nature of the soil, but a certain portion of the undegraded toluene may percolate through soil into groundwater.

There is no conclusive evidence that toluene is carcinogenic or mutagenic in animals or humans. Oral exposure of toluene at low doses produced a significant increase in embryonic lethality in mice, however other research indicated that it is not teratogenic. Acute exposure to toluene may cause narcotic effects (impairment of coordination and reaction time), loss of appetite, headache, nausea and eye irritation. Generally, acute poisoning due to exposure to high concentrations is rare, and individuals recover easily when removed from the exposure.
4.2 FIELD ACTIVITIES AND POTENTIAL HAZARDS

The site is an operating industrial facility and remedial investigation workers should be aware of related common hazards. For example, workers should be aware of slippery floors and tripping hazards. Proper precautions should be taken around equipment, particularly the moving parts of equipment that may not be properly guarded.

Due to the limited amount of available space inside the building, equipment will be required to move the stored boxes, shelves and other items. Material handling equipment, such as hand trucks and pallet jacks, may be used. Special awareness should be taken when moving and lifting heavy items by hand, to avoid back injuries.

During the installation of the monitoring wells and the drilling of soil borings, precautions should be taken to prevent underground utilities hazards. The utility companies, including gas, electric and telephone, should be contacted prior to the start of breaking ground. Local municipalities should be contacted to determine the locations of sanitary and storm sewers. The agency for Below Ground Utilities should be contacted to facilitate the location of underground cables. A four day notice prior to digging or drilling will be posted. The notice will include a phone number so that any resident with knowledge of an underground utility can call.

A plastic lined area will be used to prevent the spread of potential contamination when filling a drum with drill cuttings or when pouring fuel into an engine.

All chemicals brought on-site will have proper labeling including the chemical names and levels of flammable, explosive and toxic hazards. Material Safety Data Sheets (MSDS) will be available for chemicals brought on-site.

Location of the Underground Storage Tank - There is a possibility that an underground storage tank is located under the new addition. Information indicates the tank has been removed but documentation to confirm this is not available. Therefore, remote sensing techniques (i.e., ground penetrating radar) will be used to determine if the tank is still located under the structure.
Drilling of Monitoring Wells and Soil Borings - Monitoring wells will be drilled with a hollow stem auger rig. Wells will be developed using a centrifugal pump. Development water along with drill cuttings will be drummed onsite. Inside of the AAPP building, soil borings will be drilled.

Safe Work Practices:

1. Do not drill in electrical storms.
2. Do not use cat head when raining.
3. Monitor the work zone at all times with a photoionization detector for volatile organics.
4. Use shovels to remove soil cuttings from borehole.
5. Know where the emergency kill switch is on the drill rig.
6. Avoid skin contact with grout mix, drilling fluids and ground water.
7. Do not wear loose clothing or leave long hair uncontrolled when working near the rig.
8. When drilling indoors, do not smoke and be sure there is plenty of cross-ventilation to move fresh air into and through the work zone.

Before drilling of the soil borings inside the AAPP building can begin it will have to be determined whether an underground storage tank is under the new addition. If the tank is still there, work will be stopped until the situation is adequately appraised. If the tank has been removed, work will continue as planned.

Soil borings will be drilled with a hollow stem auger. In order to drill the borings inside the building, access must be made through the concrete slab. A concrete plug cutter will be used to remove a small amount of the slab to minimize disruptions and damage to the floor.

Confined Space Entry - See Excavation to uncover septic tank.

Excavation to Uncover Septic Tank - A certain amount of excavation will be necessary to uncover septic tanks, cesspools, drainage pools and or concrete discharges boxes. Based on current information in the records,
these tanks are 1-2 ft below grade. Samples will be collected from the tanks but entry into the tanks is not anticipated. This SHSP will be updated, as needed, prior to confined space entry once the underground systems have been uncovered and viewed. Combustible gas/oxygen meter will be used to monitor the air space within the work zone. Work will be stopped if the oxygen level is less than 19.5% and/or if the combustible gas level is 25% of the lower explosive limit (LEL).

**Septic Tank Sampling** - The septic tanks were used to hold drained grey water from the plant building. Sediment and water samples will be collected from the tank.

**Safe Work Practices:**

1. Clearly mark the perimeter of the trench with safety tape and flags.
2. Cover the trench at night with plywood.
3. Air monitor the immediate area around the trench.
4. Use extension probes to monitor any confirmed space prior to entry.
5. Monitor the work zone at all times with a photoionization detector, especially in the breathing zone while opening the tank.

**Groundwater Sampling**

Water quality samples will be collected at least 2 weeks after well development is completed.

**Safe Work Practices:**

1. Allow well to vent several minutes after opening and before purging.
2. Monitor the work zone at all times with a photoionization detector, especially in the breathing zone while opening the well to allow venting.
3. Avoid skin contact with purge water.
4. Handle purge water in accordance with decontamination practices.
5. Do not fill sample containers without the proper gloves on.
Surface Soil Sampling - When working in the bushes, beware of snakes, biting insects, and poison ivy.

Air Sampling - Care should be taken when breaking the tips off the detector tubes.

Drainage Pool Sampling - Both sediment and water samples will be taken. Monitor the work zone at all times with a photoionization detector, especially in the breathing zone.

Smoke Testing - Care should be taken when removing the manhole cover. Monitor the work zone at all times with a combustible gas/oxygen meter, especially in the breathing zone.

Site Preparation - Installation of a security fence for storage of 55 gallon drums for drill cuttings and wastewater. Beware of underground utilities when digging fence posts.


<table>
<thead>
<tr>
<th>Contaminants</th>
<th>Concentration Range&lt;sup&gt;1&lt;/sup&gt; (mg/L)</th>
<th>Permissible Exposure Limit&lt;sup&gt;1&lt;/sup&gt; (mg/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cadmium</td>
<td>&lt;0.02 - 29,000</td>
<td>0.01</td>
</tr>
<tr>
<td>Chromium</td>
<td>0.04 - 8,500</td>
<td>0.50</td>
</tr>
<tr>
<td>Copper</td>
<td>0.07 - 2,6000</td>
<td>1.00</td>
</tr>
<tr>
<td>Cyanide&lt;sup&gt;2&lt;/sup&gt;</td>
<td>Unknown</td>
<td>5.00</td>
</tr>
<tr>
<td>Iron</td>
<td>0.27 - 950</td>
<td>10.00</td>
</tr>
<tr>
<td>Lead</td>
<td>&lt;0.01 - 50</td>
<td>0.05</td>
</tr>
<tr>
<td>Nickel</td>
<td>&lt;0.1 - 22</td>
<td>1.00</td>
</tr>
<tr>
<td>Silver</td>
<td>&lt;0.02 - 0.64</td>
<td>0.01</td>
</tr>
<tr>
<td>Zinc</td>
<td>0.03 - 78</td>
<td>10.00</td>
</tr>
</tbody>
</table>

Notes:

<sup>1</sup>Data collected by Suffolk County Department of Health Services during 1980 sampling.

<sup>2</sup>No analytical data is available. Cyanide is used in the electroplating process and should be considered a potential contaminant.

<sup>3</sup>Based on review of the data, at least some of the water samples appeared to have had soil particles included (i.e., they don't appear to have been clarified).
<table>
<thead>
<tr>
<th>Contaminants</th>
<th>Concentration Range(^1) (PPBv)</th>
<th>Permissible Exposure Limit (mg/m(^3))</th>
<th>Water Solubility (mg/L)</th>
<th>Vapor Pressure (mmHg)</th>
<th>Odor Threshold (mg/m(^3))</th>
<th>Ionization Potential (eV)</th>
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<tbody>
<tr>
<td>Benzene</td>
<td>2.11 - 9.83</td>
<td>1.75E+03</td>
<td>9.52E+01</td>
<td>5</td>
<td>9.25</td>
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<td>t-1,2-Dichloroethylene</td>
<td>19 - 30</td>
<td>790.00</td>
<td>8.52E+03</td>
<td>445</td>
<td>9.64</td>
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<td>1,1-Dichloroethylene</td>
<td>8.23 - 34.38</td>
<td>4.00</td>
<td>2.25E+03</td>
<td>500</td>
<td>9.66</td>
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<tr>
<td>Tetrachloroethylene (PCE)</td>
<td>5.50 - 750.68</td>
<td>170.00</td>
<td>1.50E+02</td>
<td>35</td>
<td>9.32</td>
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<tr>
<td>Toluene</td>
<td>1.49 - 2.11</td>
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<td>5.35E+02</td>
<td>8</td>
<td>8.82</td>
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<tr>
<td>Total Organics</td>
<td>30.1 - 582.52</td>
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<td>Trichloroethylene</td>
<td>1.45 - 72.46</td>
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<tr>
<td>Vinyl Chloride</td>
<td>18.1</td>
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<td>2.67E+03</td>
<td>3000</td>
<td>9.995</td>
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</tbody>
</table>

Notes:

\(^1\) Data collected during a soil gas survey by ERT in September, 1989.
5.0 TRAINING

5.1 HEALTH AND SAFETY ORIENTATION TRAINING

All MPI and Subcontractor personnel involved with the remediation activities are required to have completed the 40-hour hazardous materials health and safety training as specified in 29 CFR 1910.120. This training, designed to orient personnel potentially exposed to hazardous substances, health hazards, or safety hazards, includes the following:
- Safety and health risk analysis;
- Use of personal protective clothing;
- Work practices by which the employee can minimize risks from hazards;
- Safe use of engineering controls and equipment;
- Medical surveillance requirements including recognition of symptoms and signs which might indicate overexposure to hazards;
- General safety concepts; and
- Emergency response plans.

5.2 SPECIALIZED TRAINING

All MPI and subcontractor field personnel will be knowledgeable in the particular hazards that may be encountered during this project and will be familiar with all safe operating procedures. They will be trained to a level that will be consistent with the worker's particular job function and responsibilities. Field personnel will also be familiar with all emergency response procedures outlined in this safety plan. The site Health and Safety Officer will have additional training, including CPR, First Aid, and the 8-hour hazardous materials on-site supervision training.
5.3 PRE-REMEDIATION HEALTH AND SAFETY BRIEFING

All MPI and subcontractor personnel involved with the project will attend a site-specific health and safety training program. The topics to be discussed include:

- Characteristics and potential hazards of chemicals and other contamination known to be present at the site;
- Personal protective clothing: function, donning/doffing, demonstrations;
- Respirators: selection, use, care;
- Personal hygiene;
- Environmental monitoring;
- Decontamination procedures;
- Work zone designations;
- Heat stress/Cold stress;
- General safety concepts; and
- Site contingency plans.

5.4 MORNING SAFETY MEETINGS

Morning safety and health briefings will be conducted by the Site Health and Safety Officer as designated by the MPI. Problems relative to respiratory protection, inclement weather, heat/cold stress, or the interpretation of newly available environmental monitoring data are examples of topics which might be covered during these briefings. An outline report of meetings giving the date, time, attendees, subjects discussed, and instructor shall be maintained and copies furnished to the designated authority on request. Visitors will be properly oriented to existing site conditions, planned activities, levels of personal protection, and other procedures outlined in this SHSP.
6.0 MEDICAL SURVEILLANCE AND EXPOSURE MONITORING

6.1 MEDICAL SURVEILLANCE

MPI and subcontractor personnel, whose work may involve potential chemical exposure or present unusual physical parameters, will have initial employment, annual, and employment termination examinations. Medical evaluations will be performed by an approved occupational physician in accordance with the ARCS II Contract.

Purpose - The purposes of the medical evaluation are to: 1) determine fitness for duty on hazardous waste sites, and 2) establish baseline data for future reference. Such an evaluation is based upon the employee's occupational and medical history, a comprehensive physical examination, and an evaluation of the ability to work while wearing protective equipment. The medical examination must include an OSHA-type evaluation of the workers' ability to use respiratory protective equipment.

Supplemental Examinations - Supplemental examinations may be performed whenever there is an actual or suspected excessive exposure to chemical contaminants or upon experience of exposure symptoms, or following injuries or temperature stress.

Medical Certification - The Contractor must obtain and keep medical certification for all Contractor and subcontractor personnel who will work at the Action Anodizing Plating and Polishing site.

6.2 EXPOSURE MONITORING

Whenever feasible, the level of protection established for workers will be based upon quantitative determinations of the chemical agents and physical stresses present in the work environment. It is proposed the work will be conducted during late winter and early spring months therefore cold exposure is an issue of concern. Heat stress monitoring is included in the event that the work is postponed until the summer.
Cold Exposure

Persons working outdoors in temperatures at or below freezing may be frostbitten. Extreme cold for a short time may cause severe injury to the surface of the body or result in profound generalized cooling, causing death. Areas of the body that have a high surface-area-to-volume ratio, such as fingers, toes, and ears, are the most susceptible.

Two factors influence the development of a cold injury: ambient temperature and the velocity of the wind. Wind chill is used to describe the chilling effect of moving air in combination with low temperature. For instance, 10°F with a wind of 15 mph is equivalent in chilling effect to still air at -18°F.

As a general rule, the greatest incremental increase in wind chill occurs when a wind of five mph increases to ten mph. Additionally, water conducts heat 240 times faster than air. Thus, the body cools suddenly when chemical-protective equipment is removed if the clothing underneath is soaked with perspiration.

1. Frost nip or incipient frostbite. The condition is characterized by sudden blanching or whitening of the skin.

2. Superficial frostbite. Skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.

3. Deep frostbite. Tissues are cold, pale, and solid; extremely serious injury.

Systemic hypothermia is caused by exposure to freezing or rapidly dropping temperature. Its symptoms are usually exhibited in five stages: (1) shivering, (2) apathy, listlessness, sleepiness and (sometimes) rapid cooling of the body to less than 95°F, (3) unconsciousness, glassy stare, slow pulse and slow respiratory rate, (4) freezing of the extremities, and finally, (5) death. Detailed information about the types and symptoms of hypothermia is included in Appendix B.

Heat Stress Monitoring - Heat stress is probably one of the most common and potentially serious illnesses at hazardous waste sites. The potential for heat stress is dependent on a number of factors, including environmental conditions, clothing, workload, physical conditioning, and age. The effects of heat stress can range from mild symptoms, such as
fatigue, irritability, and decreased mobility, to death. The body's response to heat stress include the following:

- **Heat Rash**: A result of continuous exposure to heat and humidity, heat rash decreases the body's ability to tolerate heat.

- **Heat Cramps**: A result of profuse perspiration with inadequate fluid intake and chemical replacement, heat cramps are signaled by muscle spasms and pain in the abdomen and the extremities.

- **Heat Exhaustion**: A result of increased stress on various organs. The signs of heat exhaustion include shallow breathing; pale, cool, moist skin; profuse sweating; dizziness and lassitude.

- **Heat Stroke**: The most severe form of heat stress, heat stroke must be relieved immediately to prevent severe injury or death. The signs of heat stroke are red, hot, dry skin; no perspiration; nausea; dizziness and confusion; strong, rapid pulse; coma. The body must be cooled and medical attention sought immediately.

Preventive measures to preclude heat stress include regular work breaks during field activity, regular fluid replenishment, and the availability of shelter (i.e. shaded area). All personnel will be made aware of the symptoms of heat stress. Should one or more symptoms be detected, the affected worker will be assisted to seek shade, drink plenty of fluids, and seek medical attention, if required.

Heat stress monitoring of all personnel will commence when the ambient temperature in the work areas is above normal room temperature. A standard mercury-in-glass thermometer will be available on site to measure air temperature. As indicated in Table 6-1 the frequency of heat stress monitoring will govern the length of each work cycle.

Several screening techniques can be used to detect early warning signs of heat stress. The following method, based on body temperature measurements, is simple and straightforward and will be conducted by the Site Health and Safety Officer as indicated. Body temperature will be measured with a digital-readout clinical thermometer with disposable tips.

Body temperature will be measured orally (3 minutes under the tongue) with a clinical thermometer at the end of each work period and before drinking. Oral temperature at the end of the work period should not exceed 99.6°F. If it does, the next work period should be shortened by 10 minutes (or 33%), while the length of the rest period stays the same.
However, if the oral temperature exceeds 99.6°F at the beginning of the next rest period, the following work cycle should be further shortened by 33%. Oral temperature should be measured again at the end of the rest period to make sure that it has dropped below 99.°F. No worker may be permitted to continue wearing semipermeable or impermeable garments when his/her oral temperature exceeds 100.6°F.
<table>
<thead>
<tr>
<th>Adjusted Temperature</th>
<th>Normal Work Ensemble</th>
<th>Impermeable Ensemble</th>
</tr>
</thead>
<tbody>
<tr>
<td>90°F (32.2°C) or above</td>
<td>After each 45 minutes of work</td>
<td>After each 15 minutes of work</td>
</tr>
<tr>
<td>87.5°-90°F (30.8°-32.2°C)</td>
<td>After each 60 minutes of work</td>
<td>After each 30 minutes of work</td>
</tr>
<tr>
<td>82.5°-87.5°F (28.1°-30.8°C)</td>
<td>After each 90 minutes of work</td>
<td>After each 60 minutes of work</td>
</tr>
<tr>
<td>77.5°-82.5°F (25.3°-28.1°C)</td>
<td>After each 120 minutes of work</td>
<td>After each 90 minutes of work</td>
</tr>
<tr>
<td>72.5°-77.5°F (22.5°-25.3°C)</td>
<td>After each 150 minutes of work</td>
<td>After each 120 minutes of work</td>
</tr>
</tbody>
</table>


b. For work levels of 250 kilocalories/hour.

c. Calculate the adjusted air temperature (ta adj) by using this equation: ta adj °F = ta °F + (13 x % sunshine). Measure air temperature (ta) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow. (100 percent sunshine = no cloud cover and a sharp, distinct shadow; 0 percent sunshine = no shadows.)

d. A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.
7.0 ENVIRONMENTAL MONITORING

The following monitoring instruments will be routinely used during field investigation to monitor all field personnel, especially those with the likelihood of greatest exposure:

- Foxboro Analytical Century Model OVA-128 Portable Organic Vapor Analyzer.
- HNu Model PI 101 photoionization detector fitted with a 10.2 eV lamp.
- Oxygen/combustible gas meter.
- Detector tubes (Cyanide)
- Particulate sampler (i.e. mini ram)

All monitoring equipment instrument will be protected from surface contamination during use to allow easy decontamination. All instrumentation will be calibrated before use; periodic calibration checks will be made and documented in the field over the duration of the field activities.

Action levels associated with the OVA and HNu readings, which must be considered in concert with other site conditions in triggering the need for respiratory protection, are as follows:

- Level B - Total atmospheric concentrations of unidentified vapors or gases ranging from 5 to 50 ppm and vapors are not suspected of containing high levels of chemicals toxic to the skin.
- Level C - Total atmospheric concentration of unidentified vapors or gases ranging from background to 5 ppm above background.
- Level D - Level D is primarily a work uniform. It can be worn in areas where there are no inhalable toxic substances.

The action levels apply to persistent readings in the breathing zone of personnel conducting field investigative and treatability testing activities. The levels are based on EPA's rationale for relating total atmospheric vapor/gas concentrations to the selection of the level of personal protection as provided in the EPA Standard Operating Safety Guides.
Cyanide will be monitored with color detector tubes. The threshold limit valve-time weighted average (TLV-TWA) for cyanide is 5 mg/m$^3$.

Visual judgement will be used to determine if further monitoring with a dust meter (i.e. mini ram) should be used. The TLV-TWA for particulates is 10 mg/m$^3$.

Methane is an odorless, simple asphyxiant; as such no numerical action level had been established. Oxygen levels between 19.5 and 25% and combustible gas levels less than 25 percent of the lower explosive limit (LEL) should be protective from respiratory hazards. Where the oxygen levels are lower than specified, and the combustible gases are high, work shall be discontinued until the area is thoroughly vented and monitoring indicates consistently acceptable conditions, as defined above (i.e., oxygen between 19.5% and 25% and combustible gas levels below 25%).

The Occupational Safety and Health Administration (OSHA) has adopted the following permissible exposure limit (PELs) for Hydrogen Sulfide: 10 ppm as an 8-hour time weighted time weighted average and 15 ppm as a short-term exposure limit. Field activities will cease until corrective actions can be taken if hydrogen sulfide levels of 10 ppm or greater persist in the worker's breathing zone. Air purifying cartridge respirators (level C) are not approved for hydrogen sulfide.
8.0 SITE CONTROL

A daily log containing the names of personnel, site entry and exit times, and their levels of personal protection shall be maintained by the Site Health and Safety Officer. The daily log shall also include all information and times associated with monitoring for heat/cold stress, calibration of air monitoring instrumentation, and any health related symptoms noticeable among the workers.

8.1 ACCESS/EGRESS

Emergency egress is generally limited to Dixon Avenue.

8.2 WORK ZONES

The Contractor shall clearly layout and identify work zones in the field and shall limit equipment, operations and personnel in the zones as described in EPA Standard Operating Safety Guides.

- Exclusion Zone(s) (Hazardous Work Zone). Because AAPP is an operating facility, the designation of the work zone is dependent upon when and where the work is being done.

Exterior Work Zone - For all exterior borings, the work area is a ten foot radius circle beyond the drill rig. During sample collection a five foot radius circle around the sampling point will be the designated work area. A plastic drop cloth will be used to eliminate contact between potential contaminated ground surface and clean sampling equipment and containers.

Interior Work Zone - When conditions allow (i.e., plant operations), the entire new addition will be designated the interior exclusion zone. This will provide general worker safety from noise, dust and physical harm. In the operating portion of the facility or when access to the storage area is needed for facility operation, a 10-foot radius around the boring to be drilled will be the designated area. During interior sampling a five foot radius around the sampling point will be the work zone.

The level of personnel protective equipment required in both the Interior and Exterior Work Zone shall be in accordance with the specified requirements as a minimum or as determined by the Safety Officer after monitoring and on-site inspection. No eating, drinking or smoking will be allowed in this zone.
Contamination Reduction (Buffer) Zone(s). This Zone shall occur at the interface of Exclusion and Support Zones and will be the area designated for the decontamination of personnel and clothing prior to entering the Support Zone, and for the physical segregation of the Support and Exclusion Zones. The level of personnel protective equipment required in this Zone shall be in accordance with the specified requirements as a minimum or as determined by the Safety Officer after monitoring and on-site inspection. No eating, drinking or smoking will be allowed in this zone.

Support (Safe or Clean) Zone(s). This Zone will be established on the Site and is defined as the area outside the zone of significant contamination. The Support Zone shall be clearly delineated and shall be secured against active or passive contamination from the work site. The level of personnel protective equipment required in this Zone shall be in accordance with the specified requirements as a minimum or as determined by the Safety Officer after monitoring and on-site inspection. Eating, drinking and smoking will be allowed only in this Zone.

The function of the Support zone is to provide:

- An entry area for personnel, material and equipment to the Exclusion Zone.
- An exit area for decontaminated personnel, materials and equipment from the Contamination Reduction Zone.
- An area for location of Support Area facilities; and
- A storage area for clean safety and work equipment.

Decontamination of personnel will be performed as outlined in Section 11.0 before entering the Support Zone. Access of non-essential personnel to the Exclusion and Contamination Reduction Zones will be strictly controlled. Only personnel who are essential to the completion of the task will be allowed access to these areas and only if they are wearing the prescribed level of protection. Entrance of non-contractor or subcontractor personnel must be approved by the Site Safety and Health Officer or the Contracting Officer.
9.0 SAFE WORK PRACTICES

The understanding of basic, precautionary concepts regarding personal health and safety is essential for field personnel assigned to sites where chemical contamination is known or suspected to be present. The Contractor will elaborate in his SHSP all safe work practices. At a minimum the safe work practices to be detailed shall include:

- The number of personnel and equipment on the site shall be minimized, consistent with effective site operations.

- On-site personnel shall use the "buddy" system. No one may work alone, i.e., out of earshot or visual contact with other workers.

- Site activities will be performed to minimize dust production and soil disturbance.

- Contact with surfaces/materials either suspected or known to be contaminated will be avoided to minimize the potential for transfer to personnel, the need for decontamination and cross-contamination.

- All work areas shall be lighted to not less than 5 foot candles. Because some work will be conducted outdoors, portable lighting may be required to support work in the dawn or dusk hours.

- Eating, drinking, chewing gum or tobacco, smoking, or any practice which increases the probability of hand-to-mouth transfer of contaminated material is strictly prohibited in the work area outside the designated clean zone.

- The hands and face must be thoroughly washed upon leaving the work area and prior to engaging in any activity indicated above. Each individual must shower as soon as possible after the removal of protective clothing and equipment after the completion of the daily field activities.

- Medicine and alcohol can potentiate the effects of exposure to toxic chemicals. Due to possible contraindications, use of prescribed drugs should be reviewed with the contractor or subcontractor occupational physician. Alcoholic beverage and illegal drug intake are strictly forbidden during site work activities.

- Any respiratory protective equipment and clothing must be worn by personnel as outlined in this SHSP. Excessive facial hair (i.e., beards, long mustaches or sideburns), which interferes with the satisfactory respirator-to-face seal is prohibited.
- When it is necessary for a visitor to observe the field work, that person will be issued appropriate personal protective equipment, briefed on potential hazards, safety practices, decontamination procedures and site communications. Respiratory equipment and proof of training/fit testing must be supplied by all site visitors to the Site Health and Safety Officer.

- All employees have the obligation to correct or report unsafe work conditions.
10.0 PERSONAL PROTECTIVE EQUIPMENT

10.1 GENERAL PROTECTION LEVELS

Personnel must wear protective equipment when work activities involve known or suspected atmospheric contamination; when vapors, gases, or particulates may be generated; or when direct contact with dermal active substances may occur. Respirators can protect the lungs, the gastrointestinal tract and the eyes against air toxicants. Chemical-resistant clothing can protect the skin from contact with skin-destructive and skin adsorbable chemicals. Good personal hygiene limits or prevents the ingestion of materials.

Equipment designed to protect the body against contact with known or anticipated chemical hazards has been divided into four categories according to the degree of protection afforded:

- **Level A**: Should be selected when the highest level of respiratory skin and eye protection is needed.

- **Level B**: Should be selected when the highest level of respiratory protection is needed, but level of skin protection lower than Level A is required. Level B protection is the minimum level recommended on initial site entries until the hazards have been further defined by on-site studies.

- **Level C**: Should be selected when the types of airborne substances are known, the concentrations have been measured and the criteria for using air-purifying respirators are met.

- **Level D**: Should not be worn on any site with respiratory or skin hazards. This is primarily a work uniform providing minimal protection.

The level of protection selected is based primarily on:

- types and measured concentrations of the chemical substances in the ambient atmosphere and their associated toxicity; and

- potential or measured exposure to substances in air, splashes of liquids or other indirect contact with material due to the task being performed.

In situations where the types of chemicals, concentrations, and possibilities of contact are not known, the appropriate level of protection must be selected based on professional experience and judgement until the hazards may be further characterized. The individual components
of clothing and equipment must be assembled into a full protective ensemble to protect the worker from site-specific hazards, while at the same time minimizing hazards and drawbacks of the personal protective gear itself. Ensemble components outlined in the following subsection are based on the widely used EPA Levels of Protection.

In general:

- All protective head gear shall meet the requirements of the American National Standards Institute (ANSI) Z89.1, Class A or ANSI Z89.2, Class B.

- Persons will be provided with eye and face protective equipment when machines or operations present potential eye or face injury from physical, chemical or radiological agents. Eye and face protective equipment shall meet the requirements in ANSI Z87.1, Practice for Occupational and Educational Eye and Face Protection.

- Persons requiring corrective lenses in eyeglasses, when required by this regulation to wear eye protection, will be protected by one of the following:
  - Eyeglasses whose protective lenses provide optical correction;
  - Goggles that can be worn over corrective lenses without disturbing the adjustment of the spectacles; or
  - Goggles that incorporate corrective lenses mounted behind the protective lenses.

- Use of contact lenses will be avoided. Contact lens use will not be permitted under a full-face respirator. Spectacle kits for insertion into full-face respirator will be provided for MPI personnel as required.

- If excessive noise levels are encountered, particularly around large equipment operation, the Site Health and Safety Officer will provide noise protection as appropriate.

- Persons handling rough, sharp-edged, abrasive materials or where the work subjects the hand to lacerations, punctures, burns, or bruises will use general purpose outer hand protection in addition to the chemical resistant inner and outer gloves specified in Section 10.2.

- Employees will wear clothing suitable for the weather and work conditions. The minimum will be long sleeve shirt, long trousers, and protective work shoes or boots. Canvas tennis or deck shoes are not acceptable.

- Protective steel-toed footwear will be worn by all persons who are engaged in work which requires such protection.
Respiratory protection approved by NIOSH or MSHA shall be provided for all employees subject to harmful concentrations of dusts, gases, fumes, mists, toxic materials, or atmospheres deficient in oxygen.

No person will be permitted in atmospheres containing less than 19.5 percent oxygen unless provided with a source of air meeting USP or Compressed Gas Association Specification G7.1, grade D.

Air purifying respirators will be permitted only where the toxic content of the air is known to be of type and concentration which the mask will effectively remove.

PPE will be inspected regularly and maintained in serviceable and sanitary condition, and before being reissued to another person or returned to storage, will be cleaned, disinfected, inspected, and repaired.

10.2 REQUIRED LEVEL OF PROTECTION

The required levels of protection, based upon current information regarding the contaminants present at the Action Anodizing Plating and Polishing Inc. site and the various tasks to be completed during the investigation are outlined in Table 10-1.
### TABLE 10-1

**REQUIRED LEVELS OF PERSONAL PROTECTION**

<table>
<thead>
<tr>
<th>Task</th>
<th>Respirator</th>
<th>Clothing</th>
<th>Gloves</th>
<th>Boots</th>
<th>Modifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field Management</td>
<td>D</td>
<td>D</td>
<td>--</td>
<td>L or N</td>
<td></td>
</tr>
<tr>
<td>Safety and Health Surveillance</td>
<td>D</td>
<td>D</td>
<td>--</td>
<td>L or N</td>
<td></td>
</tr>
<tr>
<td>Location of Underground Storage Tank</td>
<td>D</td>
<td>D</td>
<td>L/N</td>
<td>L or N</td>
<td></td>
</tr>
<tr>
<td>Drilling:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monitoring Wells</td>
<td>D</td>
<td>D</td>
<td>L/N</td>
<td>L or N</td>
<td>Ear Protection (Optional)²</td>
</tr>
<tr>
<td>Soil Borings</td>
<td>D</td>
<td>D</td>
<td>L/N</td>
<td>L or N</td>
<td></td>
</tr>
<tr>
<td>Excavation to Uncover Septic Tank</td>
<td>D</td>
<td>D</td>
<td>L/N</td>
<td>L or N</td>
<td></td>
</tr>
<tr>
<td>Sampling:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Septic Tank</td>
<td>D</td>
<td>D</td>
<td>L/N</td>
<td>L or N</td>
<td></td>
</tr>
<tr>
<td>Groundwater</td>
<td>D</td>
<td>D</td>
<td>L/N</td>
<td>L or N</td>
<td></td>
</tr>
<tr>
<td>Surface Soil</td>
<td>D</td>
<td>D</td>
<td>L/N</td>
<td>L or N</td>
<td></td>
</tr>
<tr>
<td>Air</td>
<td>D</td>
<td>D</td>
<td>L/N</td>
<td>L or N</td>
<td>Safety Glasses/Face Shield³</td>
</tr>
<tr>
<td>Drainage Pool</td>
<td>D</td>
<td>D</td>
<td>L/N</td>
<td>L or N</td>
<td></td>
</tr>
<tr>
<td>Smoke Testing</td>
<td>D</td>
<td>D</td>
<td>L/N</td>
<td>L or N</td>
<td></td>
</tr>
<tr>
<td>Site Preparations</td>
<td>D</td>
<td>D</td>
<td>L/N</td>
<td>L or N</td>
<td></td>
</tr>
</tbody>
</table>

D = Work uniform  
L = Latex  
L = Latex over safety shoes or boots with steel toes and shanks  
N = Neoprene  
N = Neoprene boots with steel toes and shanks

**Notes:**

1. Should organic vapor levels measured by the HNU or OVA exceed background to 5 units the Site Safety and Health Office is authorized to stop work. Re-entry shall not be permitted without consultation with the MPI Project Manager and Health and Safety Program Manager. Should dry, dusty conditions exist, the Site Safety and Health Officer shall upgrade the level of respiratory protection to Level C, full-face, air purifying cartridge respirators, equipped with organic vapor/dust, fumes and mists combination cartridges. All personnel shall have these respirators available and current medical certification and documentation successful fit of test must be verified by the Site Safety and Health Officer.

2. This will be assessed by the SHSO and decided based on site specific conditions.

3. When breaking the tips off the detector tubes, safety glasses or a face shield should be worn.
11.0 DECONTAMINATION

11.1 PERSONAL DECONTAMINATION

The degree of decontamination required is a function of both a particular activity and the physical environment within which it takes place. Decontamination procedures will be as described below. Further, all on-site activities will be carried out in such a manner as to avoid contamination of personnel, protective equipment, tools and machinery.

Decontamination for the remediation activities will take place in the area designated as the Contamination Reduction Zone. The area will be clearly marked with flagging tape to segregate it from the Support Zone and the Exclusion Zone. Personnel egress to and from these sites will be limited. This will minimize the potential spread of contaminated material to clean areas.

Under no circumstances is a potentially-contaminated person to exit the site by any means other than through the contaminant reduction area. Upon leaving the site for lunch break or at the end of each work shift, personnel will be required to remove all contaminated protective clothing/equipment. Upon completion of remediation activities, at each time of break, or at the end of each work shift, the work crew will proceed toward the designated decontamination area. To the extent practical, equipment (i.e., shovels, tools, etc.) will remain in the Exclusion Zone. A large plastic sheet will be placed on the ground in the Contaminant Reduction Zone. Disposable towels will be used to contain spilled and splashed water. Prior to removal, boot covers or boots, aprons and outer gloves will be washed in large tubs with a soap and water solution (i.e. Alconox), rinsed with fresh water, and removed. A bristle brush will be used to remove gross soil contamination. A pump sprayer will be utilized for each rinse station. Wash and rinse waters will be contained in storage tanks.

Unsoiled or decontaminated disposable protective equipment will be disposed of as trash. Wash and rinse water will be drummed for storage prior to disposal. Drum contents will be sampled and analyzed prior to disposal. Grossly contaminate equipment will also be drummed for storage prior to disposal.
11.2 DECONTAMINATION OF FIELD EQUIPMENT

When equipment must be removed from the Exclusion Zone, decontamination procedures shall be performed in the Contamination Reduction Zone similar to the personnel decontamination described above. The equipment will be wiped and brushed using soapy water, rinsed using fresh water, and then dried with a disposable paper towel.

11.3 DECONTAMINATION FOR MEDICAL EMERGENCIES

In the event of a minor, non-life threatening injury, personnel should follow the decontamination procedures as outlined above, and then administer first-aid.

In the event of a major injury or other serious medical concern, immediate first-aid is to be administered in lieu of further decontamination efforts unless the environmental conditions would be considered "Immediately Dangerous to Life or Health," in which case all personnel shall evacuate the site.
12.0 EMERGENCY EQUIPMENT AND COMMUNICATIONS

12.1 EMERGENCY EQUIPMENT

Emergency equipment will be readily accessible and distinctly marked. MPI and subcontractor personnel will be familiar with the location and trained in the use of emergency equipment. Emergency equipment that will be available on-site includes:

**Fire Extinguishers**
- Fire extinguishers will be provided by contractor and subcontractors.
- Two Class A, B dry chemical fire extinguishers will be located on site. In addition, fire extinguishers shall be located in the Contamination Reduction Zone.
- Fire extinguishers will be inspected, serviced, and maintained in accordance with the manufacturer's instructions. As a minimum, all extinguishers shall be checked monthly and weighed semi-annually, and recharged if necessary.
- Immediately after each use, fire extinguishers will be either recharged or replaced.
- Fire extinguishers will be suitably placed, distinctly marked, and readily accessible.

**First Aid Kits** - First Aid Kits will conform to Red Cross and other applicable good health standards, and shall consist of a weatherproof container with individually-sealed packages for each type of item. First Aid Kits will be fully equipped before being sent out on each job and will be checked weekly by the Site Health and Safety Officer to ensure that the expended items are replaced. First Aid Kits will be suitably placed, distinctly marked, and readily accessible.

**Eye Wash** - In the event of contamination by dust particles during any remedial activity, an emergency eye wash will be available on-site during all field activities. In such an emergency, the eye will be immediately flushed with large amounts of water, occasionally lifting the lower and upper lids. Professional medical attention should be sought immediately. Emergency eye wash containers will be distinctly marked and located in
areas known to all field personnel. The emergency eye wash will meet minimum requirements of ANSI Z358.1.

12.2 COMMUNICATIONS

Access to a telephone will be provided on site to allow for immediate contact with response personnel in the event of an emergency.
13.0 EMERGENCY INFORMATION/RESPONSE

13.1 EMERGENCY MEDICAL TREATMENT

In the event of a serious medical emergency, victims shall be treated at the Brunswick General Hospital. The Emergency Room Supervisor should be contacted in the case of a serious medical emergency for determination of the appropriate mode of transportation (i.e., by personal vehicle, ambulance, or ambulance after on-site treatment by paramedics). The hospital will be contacted and briefed on the situation, the potential hazards, and the substances involved. In addition, the Suffolk County Police Department, First Precinct will be fully apprised of the proposed remediation activities. Written directions and map of the route to the hospital, provided as Figure 13-1, shall be posted at the site during all activities.

13.2 PERSONAL INJURY

In the event of personal injury, emergency first-aid will be applied on site as deemed necessary. Decontaminate as appropriate and transport the individual to the nearest medical clinic if needed. During all field activities, at least one person on the site will be certified in First Aid and CPR.

13.3 PERSONNEL EXPOSURE

- **Skin Contact:** Use copious amounts of soap and water. Wash/rinse affected area for at least 15 minutes. Decontaminate and provide medical attention. Eye wash stations will be provided on site. If necessary, transport to the nearest medical facility.

- **Inhalation:** Move to fresh air and, if necessary, transport to the nearest medical facility.

- **Ingestion:** Decontaminate and transport to the nearest medical facility.
DIRECTIONS AND ROUTE TO BRUNSWICK GENERAL HOSPITAL

DIRECTIONS FROM SITE:

0.7 MILES WEST ON DIXON AVE., TURN LEFT ONTO BROADWAY (ROUTE 110) MAKE FIRST RIGHT, ONTO LOUDEN AVE. TURN RIGHT, INTO THE FIRST DRIVEWAY FOR THE EMERGENCY ROOM ENTRANCE.
13.4 ENVIRONMENTAL ACCIDENT (SPREAD OF CONTAMINATION)

If an IDLH atmosphere does not exist and adequate personal protective equipment is being used, secure spread of contamination whenever possible. The Site Manager and the Site Health and Safety Officer will be notified. Other appropriate emergency response groups and management will be notified as necessary by the Site Health and Safety Officer. The Site Health and Safety Officer or Site Manager will also determine whether an evacuation of the immediate areas is necessary and will announce that decision. If possible, personnel should leave the area through the Contamination Reduction Zone. If this is not possible, personnel should leave via the shortest route possible. In any event, decontamination within the vicinity of the site is essential prior to any emergency transportation or medical treatment.

13.5 ADVERSE WEATHER CONDITIONS

In the event of adverse weather conditions, the Site Manager will determine if work can continue without sacrificing the health and safety of contractor and subcontractor workers. Some of the items to be considered prior to determining if work should continue are:

- Potential for heat stress or cold stress;
- Inclement weather-related working conditions;
- Limited visibility;
- Potential for electrical or dust storms.

13.6 EMERGENCY NUMBERS

The telephone numbers listed on Table 13-1 will be available on site at all times in case of emergency.
<table>
<thead>
<tr>
<th>Service</th>
<th>Phone Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suffolk County Police Department</td>
<td>516-957-4400 **</td>
</tr>
<tr>
<td>First Precinct</td>
<td></td>
</tr>
<tr>
<td>555 Rt. 109 W. Babylon, New York</td>
<td></td>
</tr>
<tr>
<td>Babylon Central Fire &amp; Rescue</td>
<td>516-226-1212 **</td>
</tr>
<tr>
<td>Dispatcher</td>
<td></td>
</tr>
<tr>
<td>Copiaque Fire Station (Substation)</td>
<td>516-842-5554 **</td>
</tr>
<tr>
<td>500 Dixon Ave.</td>
<td></td>
</tr>
<tr>
<td>Copiaque, New York</td>
<td></td>
</tr>
<tr>
<td>Brunswick General Hospital</td>
<td>516-789-7460</td>
</tr>
<tr>
<td>366 Broadway</td>
<td></td>
</tr>
<tr>
<td>Amityville, New York</td>
<td></td>
</tr>
<tr>
<td>Suffolk County Health Dept.</td>
<td>516-451-4635 **</td>
</tr>
<tr>
<td>(between 8:30 - 4:30)</td>
<td></td>
</tr>
<tr>
<td>Poison Control Information</td>
<td>1-800-962-1253</td>
</tr>
<tr>
<td>(Poison Control Center)</td>
<td></td>
</tr>
<tr>
<td>Hazardous Material Emergency</td>
<td>1-800-424-8802</td>
</tr>
<tr>
<td>(USEPA National Response Center)</td>
<td></td>
</tr>
<tr>
<td>Below Ground Utilities</td>
<td>1-800-272-1000</td>
</tr>
<tr>
<td>(Buried Cable)</td>
<td></td>
</tr>
</tbody>
</table>

** Part of the Suffolk County Hazardous Materials Emergency Response Team
14.0 RECORDKEEPING

It will be the responsibility of MPI to establish and assure adequate records for MPI and subcontractor personnel, during the life of the remedial work activities at AAPP of all:

- Medical examination and certificates.
- Hazardous materials health and safety training.
- CPR and first aid training.
- Exposure work-hours and a log of occupational injuries and illness.
- Accident investigations.
- Daily record of all first-aid treatments not otherwise reportable.
- Injuries or illness reports to insurance carrier or state compensation agencies.
- Related reports required by the client.
- Related record and reports required by Local, State, and Federal agencies.
- Related correspondence.

In the event of any accident/incident, the Site Health and Safety Officer will immediately notify the Site Manager, the PMO Health and Safety Manager and Brenda Verdes, MPI Benefits Administrator in White Plains. All accidents will be investigated, reported, and analyzed. Injured persons are responsible for reporting all injuries as soon as possible to the Site Health and Safety Officer.
APPENDIX A
RESUMES OF KEY PERSONNEL
EDUCATION

BSCE (Sanitary Engineering) 1971; Northeastern University

SOCIETIES

Member, American Society of Civil Engineers
Member, National Solid Wastes Management Association
Member, Society for International Development
Past Chairman, New Fairfield Water Pollution Control Authority
Past Chairman, New Fairfield Solid Waste Management Committee
Past Co-Chairman, Woodbury Solid Waste Management Committee

SUMMARY OF EXPERIENCE

Ms. Cointreau has over 17 years' experience in solid waste management and hazardous waste programs. She has rejoined our staff to direct activities in the hazardous waste programs. Formerly, she participated in and directed applied research to develop environmentally acceptable methods of industrial and hazardous solid waste management, including remedial action for contaminated lands and ground waters. Lastly, she has performed about 60 waste management planning assignments in the developing countries of Haiti, Peru, Colombia, India, Sri Lanka, Tunisia, Nigeria, Jordan, Gambia, Senegal, Thailand, The Philippines, Paraguay, Mexico and Indonesia.

DETAILED EXPERIENCE

1987 to Date Malcolm Pirnie, Inc.

As Senior Waste Management Specialist:

- Managing Superfund remedial action design project for the U.S. Army Corps of Engineers' Marathon Battery site in Cold Springs NY. Work involves soil, sediment, water quality and vegetation sampling and analysis; treatability studies; design of dredging, drainage, diking, treatment and transport facilities; design of wetlands restoration and development of long-term monitoring plans.

- Managing remedial investigations in Lakeland MN. Three plumes of ground water contaminated with volatile organic compounds have been identified. Involves ground water, geophysical and soil gas investigations to determine the source(s) of the contamination.

- Developing a health and safety plan for a county's Firemen's Training Center operations with respect to existing contamination from adjacent municipal landfill and past on-site disposal of flammable liquids. Involves sampling air in confined spaces (e.g., sumps, manholes, well head spaces) and in the live-burn training buildings.

(continued)
DetaiLed EXPERIENCE (Continued)

1987 to Date
Malcolm Pirnie, Inc. (continued)

- Consultant for the development of a solid waste management master plan for Bangkok. Compared costs for various collection and transfer options. Assessed market for compost. Developed institutional arrangements to facilitate implementation.

1978-1987
Solid Waste Management Consulting Services, Ltd.

As President:

- Consultant to the Southwest Research Institute to develop a training program for regional EPA and state officials to guide design, operation, and monitoring of land disposal and land treatment of hazardous wastes for the U.S. Environmental Protection Agency, Cincinnati.

- Consultant to Arthur D. Little to develop a computer simulation of alternative remedial action systems for hazardous waste disposal facilities at various arsenal properties for the U.S. Army, Edgewood Arsenal.

- Developed and implemented solid waste master plans, designs and technical specifications for major cities in the following countries: Gambia, Thailand, Jordan, Nigeria, Indonesia, Colombia, India, Paraguay, Peru, Haiti, Senegal, The Philippines, Sri Lanka and Tunisia. Developed a country program for industrial and municipal solid waste management improvement for Mexico. Analyzed case studies from many developing countries as part of writing guidance and state-of-knowledge documents World Bank in solid waste management, recycling and resource recovery. Solid Waste Advisor to the National Environmental Board of Thailand. Solid Waste Advisor to the Department of Environment of Lagos State in Nigeria. Clients included the World Bank, United Nations Development Programme, German Technical Cooperation Agency and U.S. Aid.

1974-1978
Arthur D. Little, Inc.

As Project Manager or Task Manager:

- Conducted research for the U.S. Environmental Protection Agency, Cincinnati, for federally promulgated design guidance on land treatment (also called land cultivation or soil incorporation). Involved in field sampling and laboratory analyses of ground water, soil attenuation and bioaccumulation at existing industrial land treatment sites. Incorporated field interviews and observations to determine environmental and economic impacts. Also included field verification of land treatment of industrial wastes.
1974-1978

Arthur D. Little, Inc. (continued)

- Research contract for the U.S. Environmental Protection Agency, Raleigh-Durham, to support regulation of flue gas desulfurization sludges generated by SO₂ scrubbing. Specifically directed all mine disposal assessment tasks. First phase involved technology review of all mining categories and disposal techniques to select viable disposal options and then assessment of the environmental issues - including ground water contamination, physical stability, and fugitive particulate emissions; second phase involved directing laboratory studies to address principal environmental issues; third phase involved advice and review on the first full-scale mine disposal demonstration in the United States.

- Preliminary design and costing of ground water reclamation system for Rocky Mountain Arsenal’s hazardous waste impoundment, involving alternative configurations of bentonite slurry trenches, ground water collection and recharge wells, and ground water treatment - a pilot of the recommended system is built and operating.

- Design feasibility and environmental assessment studies for U.S. Steel Corporation to obtain the lead permit for the largest proposed iron and steel plant in the United States, planned to be located in Conneaut, Ohio. Directed all on-site hydrogeologic, soils and geotechnical subcontracts. Developed preliminary on-site solid industrial waste disposal designs. Assessed impact issues of water supply, water use, drainage, ground water quality, geologic hazards, mineral resources, shoreline erosion, and surface runoff.

- Review of research for the U.S. Environmental Protection Agency, Raleigh-Durham, on flue gas cleaning to assess the adequacy of ongoing research to support federal regulation and design guidance of flue gas cleaning and subsequent industrial waste disposal. Task involved investigation of research relative to ground water contamination from leachates, physical stability of the sludges, and land use after reclamation.

- Technical and economic assessment for the U.S. Environmental Protection Agency, Washington DC, of seven biological treatment processes for their applicability to hazardous waste streams; namely enzyme treatment, activated sludge, trickling filter, aerated lagoon, waste stabilization pond, anaerobic digestion, and composting.

- Assessment (EIS) of surface and ground water water quality impacts from facility and secondary development of the LOOP and SEADOCK deepwater ports, including development of materials storage facilities and waste disposal facilities. This was for the U.S. Coast Guard.
DETAILED EXPERIENCE (Continued)

1974-1978 Arthur D. Little, Inc. (continued)

As Consultant:

- For the U.S. Environmental Protection Agency, Washington DC, provided conceptualization and economic analyses of underground barrier and dewatering systems at hazardous waste impoundments to prevent ground water contamination, including bentonite slurry trench, grout cutoff wall, infiltration gallery, well points, liners, and surface caps.

- For a large chemical company, performed field evaluations and audits of pollution control practices within industrial chemical company facilities to determine the environmental acceptability of existing operations, to evaluate compliance with existing or prominently pending regulations, and to assess potential liability of existing operations, particularly with respect to hazardous waste disposal.

- For the U.S. Navy, Assessed (EIS) water quality impacts related to distribution, suspension and transformation of heavy metals, complex organics, organic acids and fines from the Navy's maintenance dredging program in the Lower Chesapeake Bay area.

1971-1974 U.S. Army Corps of Engineers

As Project Coordinator/Engineer:

- Coordinated Merrimack River Basin Wastewater and Sludge Management Study, including community relations, environmental assessment, institutional/financial arrangements and preliminary wastewater/sludge treatment design.

1970 Malcolm Pirnie, Inc.

As Engineer:

- Assisted with developing facilities planning reports and designs for wastewater facilities for Naugatuck CT.

PUBLICATIONS AND PRESENTATIONS


PUBLICATIONS AND PRESENTATIONS (Continued)


EDUCATION

BA (Environmental Science) 1978; State University of New York, Purchase
MS (Environmental Engineering, Toxicology) 1984; New Jersey Institute of Technology
Certification, Comprehensive Practice of Industrial Hygiene, 1986.

SOCIETIES

American Industrial Hygiene Association
  Member, Hazardous Waste Committee (1988-)
  Member, Indoor Environmental Quality Committee (1988-)
  Member, Social Concerns Committee (1989-)
  Councilor, New York Metropolitan Chapter (1986-1988)
  Councilor, New York/Connecticut Chapter (1989-)
American Academy of Industrial Hygiene
  Diplomate, American Board of Industrial Hygiene
American Chemical Society
New York Academy of Sciences

RECOGNITION

Recipient, Graduate Fellowship Award sponsored jointly by the Exxon Education

SUMMARY OF EXPERIENCE

Ms. Bobenhausen has over ten years' professional experience in the environmental health sciences. As a certified industrial hygienist, she specializes in industrial process evaluation, toxicological review, completion of summary health and safety fact sheets, assessment of worker exposures by personal and areal monitoring, and development of viable strategies to reduce or eliminate occupational and community hazards. She has performed OSHA-related audits for industrial clients, and has developed and instituted occupational health and safety training programs.

DETAILED EXPERIENCE

1986 to Date

Malcolm Pirnie, Inc.

- Conducts occupational health reviews of industrial operations, including hazard evaluation of primary constituents, product handling/storage and waste management. Prepares hazard summaries, including material safety data sheets for specialized chemicals. Evaluates workplace exposures and interfaces with mechanical engineering staff in design of ventilation and emission controls.

- Develops hazard control/right-to-know training programs for industrial employees and participates as instructor in the firm's health and safety training sessions. Drafts health and safety components of work plans for hazardous waste site reconnaissance.

(continued)
DETAILED EXPERIENCE (Continued)

1986 to Date Malcolm Pirnie, Inc. (continued)
- Assists with regulatory permitting activities. Responsible for assessment of environmental chemical data and preparation of detailed health risk assessments for solid waste-to-energy resource recovery systems, landfills, hazardous waste sites, wastewater discharges and water supplies.

As Associate: Responsibilities included project administration, industrial hygiene services, occupational safety and health audits, health and safety training, environmental sampling plan design, air monitoring for workplace evaluations and indoor air quality, toxicological interpretation and quantitative health risk evaluations. Conducted technical research and review for the firm's expert witness cases.

1982-1984 Energy Design Collaborative, Inc.
As Technical Assistant: Provided management, computer and technical assistance on energy-related architectural/engineering projects.

As Senior Analyst: Participated in drafting environmental and public health status report of nationwide uncontrolled waste disposal practices for EPA headquarters, including evaluation of technical reports. Conducted site investigation of several Naval Ordnance sites. Managed hazardous waste, technical and environmental evaluations for a variety of private and public clients.

1976-1980 Westchester Urban County Community Development Program
As Environmental Planner: Assessed impacts of implementing major urban renewal projects, including sewer rehabilitation and flood control plans. Reviewed regulatory compliance of project procedures to permit use of federal Community Development funds. Provided technical support to architectural design staff on variety of environmental and site planning issues.

1974 ITT Rayonier, Olympic Research Division
As Laboratory Technician: Conducted detailed physical and chemical analyses of pulp and paper products. Maintained QA/QC records and reported analytical and QA/QC results to research chemists.

(continued)
PUBLICATIONS AND PRESENTATIONS


Bobenhausen, C., 1983. "Volatile and Particulate Pollutant Levels in Indoor Environments from Use of Kerosene Heaters," presented at 17th Middle Atlantic Regional Meeting, American Chemical Society, White Haven PA.
EDUCATION

BS (Biology) 1976; St. Francis College
MS (Chemical Engineering) 1985; Manhattan College

SUMMARY OF EXPERIENCE

Mr. Logigian has twelve years of experience in environmental and process engineering and has been responsible for the technical evaluation and testing of chemical process systems. He has worked as an environmental engineer preparing and reviewing air permits and evaluating air pollution control equipment.

DETAILED EXPERIENCE

1988 to Date  Malcolm Pirnie, Inc.

- Responsible for numerous aspects of the U.S. Army Corps of Engineers Marathon Battery Superfund site, Cold Spring NY.
  - Served as site Health and Safety officer and logistics coordinator for the Archaeological Cultural Resource Survey for Area I.
  - Served as site Quality Assurance/Quality Control officer during the soil and water sampling programs and field investigations for Area I.
  - Acted as field inspector and Health and Safety officer for the drilling crew during the geotechnical investigations of Area I.
  - Developed the Chemical Quality Management Plan for the bid specifications for the Area I design project.
  - Task manager for the sediment sampling and bulking/settling test phase for the Dike Redesign Study for Area I.
  - Participated in the Stabilization/Solidification pilot study for the Area I remediation design.
  - Participated in developing the Health and Safety Design Analysis and the Health and Safety section for the bid specification for the Mill Creek PA Superfund site.
  - Calculated the fugitive and point source volatile organic emissions from a major process expansion and new process construction. This was part of a prevention of significant deterioration (PSD) permit application request made to the EPA for Pfizer Inc.
DETAILED EXPERIENCE (Continued)

1987-1988 United States Environmental Protection Agency

As Environmental Engineer:
- Conducted compliance inspections of facilities regulated under the Clean Air Act. These on-site inspections involved review of baghouse, ESP and scrubber design and O&M procedures.
- Reviewed state-issued PSD permits for proper implementation of BACT/LAER technology.
- Performed technical evaluations of hazardous waste incinerator systems. Reviewed RCRA hazardous waste incinerator trial burn plans for compliance with federal regulations.

1975-1985 Union Carbide Corp.

As Chemical Engineer and Formerly Chemist:
- Designed, constructed and operated a 15-gallon batch reactor which was then used in a two-year study to demonstrate the feasibility of scaling up the synthesis of certain experimental compounds.
- Designed, constructed and operated a high pressure reactor system for screening syngas catalysts.
- Designed, constructed and operated a high temperature reactor which was then used to define the catalytic properties of over 25 experimental zeolites during a three-year study project.
- Responsible for installation of licensed gas-treating technology at customer plant sites. This involved supervising the installation of licensed gas-treating chemicals into the customer plant and instructing plant personnel in the maintenance and monitoring of the chemical level in the process fluid.
- Synthesized and characterized a novel class of organometallic catalysts for urethane systems.
EDUCATION

BS (Environmental Biology) 1984; Manhattan College
MS (Environmental Engineering) 1989; Manhattan College
Certified in Health and Safety Operations at Hazardous Materials Sites
Completed 8-hour Supervisory Training for Health and Safety Operations at Hazardous Materials Sites

SOCIETIES

Bronx Council for Environmental Quality

SUMMARY OF EXPERIENCE

Ms. Muldoon's experience in environmental sciences ranges from laboratory work to education. Prior to two years of service as an urban park ranger, she served overlapping terms as a laboratory, research and teaching assistant, involved in all aspects of college biology.

DETAILED EXPERIENCE

1988 to Date Malcolm Pirnie, Inc.

- The Meadows, Southeast NY: Developed work plan, conducted and organized program waste load allocation study of Holly Stream in Southeast NY. Compiled and analyzed field sampling data to be inputted into the SINSIM wasteload allocation model.

- Marathon Battery Superfund Project: Investigated railroad transport option for borrow areas to determine feasibility of transporting materials onto the site via railroad. Participated in sediment sampling program in East Foundry Cove.

- Final Clarifier Study, Norwalk CT: Performed hydraulic analysis on the final clarifiers for the City of Norwalk Wastewater Treatment Plant.


- Preferred Plating, Inc.: Assisted in the preparation of the work plan and prepared the health and safety plan for the treatability study.

- On various projects, used the Exposure Analysis Model System for the prediction of toxic fate in aquatic environments.

- Summarized a detailed analysis of the Prince George's County Resource Recovery Project with regard to toxic fate. The analysis was conducted using the Persistence Model.

- Conducted permit sampling for AKZO Chemical Co.

- Participated in a biological survey of the southern Pelham Bay Park shoreline. (continued)
DETAILED EXPERIENCE (Continued)

1988 to Date  
Malcolm Pirnie, Inc. (continued)

- Assisted in writing a number of proposals; designed and implemented spreadsheets for clear and concise presentation of information.
- Compiled narrative of reports for Union County RRF process.
- Compiled and coordinated comments for Albany Landfill EHIS Comment and Response document.
- Incorporated client's comments into Manasquan Water Treatment Plant and Transmission System EIS.
- Wrote and reviewed pertinent sections of Edgeboro Landfill Expansion EHIS.
- Expedited permitting process for Manasquan Water Treatment Plant and Transmission System.

1985-1987  
New York City Department of Parks and Recreation

As Urban Park Ranger:

- Developed and conducted educational programs on New York City parks for grade school children from kindergarten to 12th grade. Also, initiated and conducted programs on park ecology, history and geology for the general public.
- Provided educational, informational and safety services to the general public.
- Acted as staff assistant to a Supervising Urban Park Ranger; performed related work.

1982-1984  
Manhattan College

As Laboratory and Research Assistant (1983-1984): Assisted in literature and laboratory research of hypertoxicity in fish. Conducted standard laboratory techniques such as the Winkler Dissolved Oxygen Test and acidbase titrations.

As Biology Laboratory and Teaching Assistant (1982-1983): Helped the professor prepare and instruct students in the General Biology Laboratory.

As Biology Laboratory Assistant (1982): Refurbished Hudson River Biota Collection.
APPENDIX B

COLD STRESS: TYPES AND SYMPTOMS OF HYPOTHERMIA
SYSTEMIC HYPOTHERMIA

Risk Factors
- medications/drugs
- alcohol
- wetting
- wind
- medical conditions (circulatory problems)
- age

Recognition
mild hypothermia
- subtle behavioral changes
  - decreased worker efficiency
  - decreased level of communication
  - forgetfulness
  - repetitive behavior
  - poor motor skills
  - poor judgement
  - distraction
  - denial
- most thermoregulatory mechanisms intact
  - shivering
  - goose flesh
  - peripheral vasoconstriction (cold pale skin)
  - person feels cold

moderate hypothermia
- conscious
- incapable of functioning effectively
- grossly disoriented mental function
- behavioral changes
  - stupor
  - disorientation
  - hallucinations
  - inappropriate affect
  - bizarre behavior
- some loss of thermoregulatory mechanisms
  - shivering absent
  - goose flesh disappears
  - slowed heart rate
  - dilated peripheral blood vessels
  - diminished feeling of cold

TREATMENT
All Stages
- rewarming
  - passive - conservation of body heat
  - active - applying heat
COLD STRESS

Types
Systemic hypothermia
Local hypothermia

Consider
Air temperature
wind speed
equivalent chill temperature

Warning Signs
Systemic - maximum severe shivering
Local - pain in the extremities

HYPOTHERMIA: Prevention/Recommendations
loose fitting, dry clothing; outer windbreak garment
high calorie diet
avoid bare metal
avoid exposure to moisture
adequate work/rest periods
avoid/limit risk factors
availability of enclosed, heated environment
availability of dry changes of clothes
conduct body temperature monitoring
availability of hypothermia packs
fluid replacement (warm drinks, soup)
buddy system

LOCAL HYPOTHERMIA

Types
Frostnip
superficial frostbite
deep frostbite
trench foot - non-freezing
immersion foot - non-freezing

Risk Factors
duration of exposure
ambient temperature
wind
contact with cold metal or moisture
clothing
race
acclimatization
previous cold injury
host factors (medications, smoking)

Recognition
frostnip
whitened area of skin
slightly burning or painful
superficial frostbite:
- waxy, white skin; firm sensation; some resiliency
- feels warm to victim without pain

deep frostbite:
- skin cold, numb, pale, firm or hard

Treatment:
- frostnip:
  - simple rewarming
- frostbite:
  - transport rather than definitive care as thawing and refreezing can cause severe damage
  - institute basic measures, as follows:

  DO
  - prevent further heat loss and protect from further damage (cover); get victim to protected environment

  DO NOT
  - allow victim to smoke or drink alcohol, rub skin with anything; thaw with warm water or dry heat; walk on thawed foot/use thawed hand; break any blisters; apply heat