MAY 1989

HEALTH AND SAFETY PLAN

REMEDIAL INVESTIGATION / FEASIBILITY STUDY
NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA

VOLUME 2

DEPARTMENT OF THE NAVY
WESTERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
SAN BRUNO, CALIFORNIA 94066-0727

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HEALTH AND SAFETY PLAN
REMEDIAL INVESTIGATION/FEASIBILITY STUDY

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA

Canonie Environmental

CanonieEnvironmental

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May 18, 1989

86-018-02

Ms. Bella Dizon (Code 1813BD)
Department of the Navy
Western Division
Naval Facilities Engineering Command
PO Box 727
San Bruno, CA 94066-0727

Transmittal
Health and Safety Plan
Remedial Investigation/Feasibility Study
Naval Air Station Alameda
Alameda, California

Dear Ms. Dizon:

Enclosed are the remaining 18 copies of the revised final Health and Safety Plan for the Remedial Investigation/Feasibility Study at the Naval Air Station Alameda.

This report completes a portion of the work authorized under contract N62474-85-D-5620 Delivery Orders 001 and 002.

If you have any questions, please call us.

Respectfully submitted,

Claude Carlos White, Jr., P.E.
Project Engineer

James W. Babcock, Ph.D.
Project Supervisor

JWB/RJG/dt

Enclosures

N00236.000351
ALAMEDA POINT
SSIC NO. 5090.3

REVISED FINAL HEALTH AND SAFETY PLAN REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS) VOLUME 2 OF 8

DATED 01 MAY 1989

THIS RECORD CONTAINS MULTIPLE VOLUMES WHICH HAVE BEEN ENTERED SEPARATELY

VOLUME 1 OF 8 – FINAL SAMPLING PLAN, RI/FS DATED 2/1/90 IS ENTERED IN THE DATABASE AND FILED AT ADMINISTRATIVE RECORD NO. **N00236.000785**

VOLUME 1A OF 8 – FINAL SAMPLING PLAN, SOLID WASTE ASSESSMENT TEST PROPOSAL ADDENDUM, RI/FS DATED 2/1/89 IS ENTERED IN THE DATABASE AND FILED AT ADMINISTRATIVE RECORD NO. **N00236.000311**

VOLUME 1A OF 8 – FINAL SAMPLING PLAN, SOLID WASTE ASSESSMENT TEST PROPOSAL ADDENDUM, RI/FS DATED 12/1/89 IS ENTERED IN THE DATABASE AND FILED AT ADMINISTRATIVE RECORD NO. **N00236.000789**

N00236.000351
ALAMEDA POINT
SSIC NO. 5090.3

VOLUME 1A OF 8 – FINAL SAMPLING PLAN, SOLID WASTE ASSESSMENT TEST PROPOSAL ADDENDUM, RI/FS DATED 2/1/90 IS ENTERED IN THE DATABASE AND FILED AT ADMINISTRATIVE RECORD NO. **N00236.000786**

VOLUME 1B OF 8 – FINAL AIR SAMPLING PLAN, RI/FS DATED 12/1/88 IS ENTERED IN THE DATABASE AND FILED AT ADMINISTRATIVE RECORD NO. **N00236.000275**

VOLUME 2 OF 8 – FINAL HEALTH AND SAFETY PLAN, RI/FS DATED 12/1/88 IS ENTERED IN THE DATABASE AND FILED AT ADMINISTRATIVE RECORD NO. **N00236.000274**

VOLUME 2 OF 8 – REVISED FINAL HEALTH AND SAFETY PLAN, RI/FS DATED 11/1/89 IS ENTERED IN THE DATABASE AND FILED AT ADMINISTRATIVE RECORD NO. **N00236.000780**

VOLUME 3 OF 8 – FINAL QUALITY ASSURANCE PROJECT PLAN – QUALITY ASSURANCE / QUALITY CONTROL PLAN, RI/FS DATED 5/1/89 IS ENTERED IN THE DATABASE AND FILED AT ADMINISTRATIVE RECORD NO. **N00236.000341**

VOLUME 3 OF 8 – FINAL QUALITY ASSURANCE PROJECT PLAN – QUALITY ASSURANCE / QUALITY CONTROL PLAN, RI/FS DATED 1/1/90 IS ENTERED IN THE DATABASE AND FILED AT ADMINISTRATIVE RECORD NO. **N00236.000782**

VOLUME 4 OF 8 – COMMUNITY RELATIONS PLAN, RI/FS DATED 2/15/89 IS ENTERED IN THE DATABASE AND FILED AT ADMINISTRATIVE RECORD NO. **N00236.000301**

VOLUME 5 OF 8 – FINAL PROJECT MANAGEMENT PLAN/SCHEDULE, RI/FS DATED 2/1/89 IS ENTERED IN THE DATABASE AND FILED AT ADMINISTRATIVE RECORD NO. **N00236.000322**

VOLUME 6 OF 8 – DATA MANAGEMENT PLAN, RI/FS DATED 5/1/89 IS ENTERED IN THE DATABASE AND FILED AT ADMINISTRATIVE RECORD NO. **N00236.000361**

VOLUME 7 OF 8 – FINAL PRELIMINARY PUBLIC HEALTH AND ENVIRONMENTAL EVALUATION PLAN, RI/FS DATED 6/1/89 IS ENTERED IN THE DATABASE AND FILED AT ADMINISTRATIVE RECORD NO. **N00236.000371**

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VOLUME 8 OF 8 – FINAL FEASIBILITY STUDY PLAN, RI/FS DATED 1/1/90 IS ENTERED IN THE DATABASE AND FILED AT ADMINISTRATIVE RECORD NO. **N00236.000783**

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REMEDIAL INVESTIGATION/FEASIBILITY STUDY

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA

1.0 INTRODUCTION

The Work Plan for the Remedial Investigation/Feasibility Study (RI/FS) at Naval Air Station (NAS) Alameda consists of the following planning documents:

Volume 1	Sampling Plan
Volume 1A	Sampling Plan: Solid Waste Assessment Test (SWAT) Proposal addendum
Volume 1B	Air Sampling Plan
Volume 2	Health and Safety Plan
Volume 3	Quality Assurance Project Plan (QAPP) - Quality Assurance/Quality Control Plan (QA/QC)
Volume 4	Community Relations Plan
Volume 5	Project Management Plan/Schedule
Volume 6	Data Management Plan
Volume 7	Public Health and Environmental Evaluation Plan
Volume 8	Feasibility Study Plan

The Health and Safety Plan was prepared by Canonie Environmental Services Corp. (Canonie) on behalf of the Department of the Navy, Western Division, Naval Facilities Engineering Command for the United States (U.S.) Naval Air Station (NAS Alameda) in Alameda, California (Figure 1-1).

This document, Volume 2, outlines the health and safety procedures which will be instituted for the field activities associated with the Remedial Investigation/Feasibility Study (RI/FS) for the NAS Alameda in Alameda, California. The plan has been prepared to conform with the California Department of Health Services (DHS) Site Safety Plan outline and is consistent with federal Occupational Safety and Health Act (OSHA) requirements for hazardous waste site operations under 29 CFR 1910 and the work practices outlined in 29 CFR 1926. The plan is based on existing information regarding the site and upon past experience at other sites.

Site conditions are expected to vary. Specific provisions of this plan will be upgraded/downgraded, as appropriate, depending upon actual field conditions. All changes in the plan must be approved by the site health and safety officer (HSO) prior to implementation. Such changes will be conveyed to all on-site personnel.

All visitors and regulatory personnel are expected to be familiar with, and comply with, all aspects of the Health and Safety Plan. Any personnel who fail to comply with on-site protection levels or other provisions of the plan will be excluded from all active work areas/exclusion areas, as deemed appropriate by the HSO or other on-site Canonie representative.

Canonie will provide all protective equipment necessary for Canonie on-site personnel. All regulatory personnel and visitors brought on-site by regulatory personnel are expected to provide their own protective equipment which equals or exceeds that required by this plan.

1.1 Site Description

NAS Alameda is located in Alameda, California. The station occupies the western tip of the island of Alameda, which lies along the eastern side of the San Francisco Bay. Most of the eastern half of the station is developed with office and industrial facilities. Runways and support facilities occupy the western part of the station.

The specific sites within the station which are included in the RI/FS are listed below.

- o 1943-1956 Disposal Area

- o West Beach Landfill

- Area 97
- Building 360 (Plating, Engine Cleaning, Paint Stripping, and Paint Shops)
- Building 5 (Plating, Paint Stripping, Cleaning, and Paint Shops)
- Building 41 (Aircraft Intermediate Maintenance Department)
- Building 459, 547, and 162 (Service Stations)
- Building 114 (Pest Control Area and Separator Pit)
- Building 410
- Building 400 and 530 (Missile Rework Operations)
- Building 14
- Building 10 (Power Plant)
- Oil Refinery
- Fire Training Area
- Buildings 301 and 389
- Cans C-2 Area
- Seaplane Lagoon
- Station Sewer System (not on-site)

- o Yard D-13

- o Estuary (Oakland Inner Harbor)

A map of the layout of the NAS Alameda which shows the specific sites of the feasibility study outline is included as Figure 1-2.

2.0 RESPONSIBLE PERSONNEL

The key Canonie personnel and their respective responsibilities for this project are listed below:

- Project Manager - James W. Babcock, Ph.D. - The project manager is responsible for oversight of all aspects of the project including health and safety and all on-site activities.

- Site Engineer - C. Carlos White, P.E. - The site engineer is responsible for on-site activities including sampling, quality assurance, and all on-site engineering activities. The site engineer also functions as the alternate on-site safety officer and reports directly to the project manager.

- Site HSO - Tami Renkoski - The site HSO is responsible for the implementation of this plan and oversight of the air monitoring programs on-site. All changes in this plan will be approved and implemented by the HSO.

3.0 JOB HAZARD ANALYSIS

The potential hazards associated with the site activities include both chemical and physical hazards. The chemical hazards involve potential exposure to contaminated soils and ground water. The physical hazards include working around heavy machinery, such as drill rigs and sampling equipment, noise, heat stress, and working in confined areas.

Appendix A indicates the anticipated hazards by the individual locations specified in Section 1.1. The discussion below is a summary of those hazards.

3.1 Chemical Hazards

A wide variety of chemical contaminants have been identified as potentially being present on-site. Heavy metals, pesticides, chlorinated solvents, petroleum products, polychlorinated biphenyls (PCBs), acids, caustics, cyanide, aromatic solvents, aliphatic solvents, and asbestos are included in the contaminant list.

The most common metals identified include:

Lead - Inorganic lead affects the central nervous system, kidneys, blood-forming system, and reproductive system. Routes of exposure include inhalation and ingestion. Symptoms include weakness, pallor, weight loss, wrist/foot drop, abdominal cramps, gingival line. Volatilization depends on the lead-bearing compound. It is not considered a carcinogen. OSHA permissible exposure limit (PEL) is 0.05 milligrams per cubic meter (mg/m^3).

Mercury - Inorganic mercury affects the respiratory system, central nervous system, and the kidneys. Routes of exposure include inhalation, skin absorption, skin contact, and ingestion. Symptoms include headache, cough, chest pains and tightness, breathing difficulties, pneumonitis, mouth sores, loss of teeth, nausea, diarrhea, skin irritation, shaking, insomnia, personality change, and loss of memory. It has a very low vapor pressure. It is not considered a carcinogen. OSHA ceiling level is 0.1 mg/m^3.

Chromium - Chromium affects the respiratory system. Route of exposure is inhalation. Symptoms include histologic fibrosis of the lungs. Volatilization depends upon the compound. The hexavalent state of chromium is a carcinogen. OSHA PEL is 1 mg/m^3.

Cadmium - Cadmium affects the respiratory system, kidneys, prostate, and circulatory system. Routes of exposure are inhalation and ingestion. Symptoms include pulmonary edema, cough, tightness of chest, headache, chills, muscle aches, nausea, diarrhea, emphysema, anemia, and proteinuria. Volatilization depends upon the cadmium-bearing compound. It is considered a carcinogen. OSHA PEL is 0.2 mg/m^3.

Nickel - Nickel affects the skin and respiratory system. Routes of exposure include inhalation, skin contact, and ingestion. Symptoms include eye, skin, and mucous irritation, and allergic reactions. Does not volatilize. It is considered a potential carcinogen for lungs and sinuses. OSHA PEL is 1.0 mg/m^3.

Copper - Copper affects the respiratory system, liver, and kidneys. Individuals with Wilson's Disease are at increased risk. Routes of exposure include inhalation, skin contact, and ingestion. Symptoms include irritation of mucous membranes, dermatitis, metallic taste, and nasal perforation. It is not considered a carcinogen. Does not volatilize. OSHA PEL is 1 mg/m^3.

Zinc - Zinc dust is considered a nuisance respiratory hazard. Route of exposure is inhalation. No reported symptoms. Does not volatilize. It is not considered a carcinogen. No allowable exposure limit has been established.

Barium - Barium affects the cardiovascular system, central nervous system, respiratory system, and the eyes. Routes of exposure include inhalation, skin contact, and ingestion. Symptoms include upper respiratory tract irritation, muscle spasms, slow pulse, eye irritation, and skin burns. Volatilization depends upon compound. It is not considered a carcinogen. OSHA PEL is 0.5 mg/m^3.

Iron - Iron dust is considered a nuisance respiratory hazard. Route of exposure is inhalation. No reported symptoms. Does not volatilize. It is not considered a carcinogen. No allowable exposure limit has been established.

The pesticides known to have been used at the base include:

Chlordane - Chlordane affects the central nervous system, lungs, eyes, liver, kidneys, and skin. Routes of exposure include inhalation, skin absorption, skin contact, and ingestion. Symptoms include blurred vision, confusion, delirium, cough, abdominal pain, nausea, vomiting, diarrhea, irritability, tremor, and convulsions. It has a low vapor pressure. It is not considered a carcinogen. OSHA PEL is 0.5 mg/m^3.

2,4 - D - 2,4 - D affects the skin and the central nervous system. Routes of exposure include inhalation, skin absorption, skin contact, and ingestion. Symptoms include weakness, stupor, hyporeflexia, muscle twitch, convulsions, and dermatitis. It has a vapor pressure equivalent to zero. It is not considered a carcinogen. OSHA PEL is 10 mg/m^3.

DDT - DDT affects the central nervous system, kidneys, liver, and skin. Routes of exposure include inhalation, skin absorption, skin contact, and ingestion. Symptoms include irritation of eyes and skin, weakness of hands, vomiting, headache, convulsions, confusion, dizziness, tremors, and apprehension. It has a very low vapor pressure. It is considered a potential carcinogen. OSHA PEL is 1 mg/m^3.

Diazinon - Diazinon affects the respiratory system, liver, and the central nervous system. Routes of exposure include inhalation, skin absorption, skin contact, and ingestion. Symptoms are similar to malathion exposure. It has a low vapor pressure. It is not considered a carcinogen. It has a Threshold Limit Value (TLV) of 0.1 mg/m^3.

Lindane - Lindane affects the liver, kidneys, central nervous system, respiratory, and blood-forming system. Routes of exposure include inhalation, skin absorption, skin contact, and ingestion. Symptoms include vomiting; restlessness; muscle spasms; convulsions; respiratory failure; irritation of the eyes, nose, and throat; headache; and aplastic anemia. Does not volatilize readily. It is considered a potential carcinogen. OSHA PEL is 0.5 mg/m^3.

Malathion - Malathion affects the respiratory system, liver, and the central nervous system. Routes of exposure include inhalation, skin absorption, skin contact, and ingestion. Symptoms include tightness of chest, wheezing, bluish discoloration of skin, aching in and behind eyes, blurred vision, tearing, runny nose, headache, watering of the mouth, sweating, twitching, weakness, paralysis, arrested breathing, dizziness, confusion, staggering, slurred speech, convulsions, coma, and cholinesterase depression. It has a low vapor pressure. It is not considered a carcinogen. OSHA PEL is 15 mg/m^3.

Warfarin - Warfarin affects the circulatory system. Routes of exposure include inhalation and skin absorption. Symptoms include bleeding difficulties by impairment of clotting. Hematuria, hematomas on arms and legs, back pain, bleeding lips, hemorrhaging, abdominal pain, and vomiting. Warfarin does not volatilize readily. It is not considered a carcinogen. OSHA PEL is 0.1 mg/m^3.

The chlorinated solvents anticipated include:

Trichloroethylene - Trichloroethylene affects the respiratory system, heart, liver, kidneys, central nervous system, and the skin. Routes of exposure include inhalation, skin contact, and ingestion. Symptoms include headaches, vertigo, visual disturbances, tremors, nausea, vomiting, eye irritation, dermatitis, and cardiac arrhythmia. It has a moderate vapor pressure. It is considered a potential carcinogen. OSHA PEL is 100 parts per million (ppm).

1,2-Dichloroethylene - 1,2-Dichloroethylene affects the respiratory system, eyes, and the central nervous system. Routes of exposure include inhalation, skin contact, and ingestion. Symptoms include irritation of the eyes and respiratory system and depression of the central nervous system. It has a high vapor pressure. It is not considered a carcinogen. OSHA PEL is 200 ppm.

Methyl chloroform - Methyl chloroform affects the skin, liver, and cardiovascular system. Routes of exposure include inhalation and skin contact. Symptoms include irritation of the skin, headache, dizziness, drowsiness, reproductive abnormalities, unconsciousness, irregular heart beat, and death. It volatilizes readily. It is not considered a carcinogen. OSHA PEL is 350 ppm.

Carbon tetrachloride - Carbon tetrachloride affects the central nervous system, eyes, liver, kidneys, and skin. Routes of exposure include inhalation, skin absorption, skin contact, and ingestion. Symptoms include central nervous system depression, nausea, vomiting, and skin irritation. It has a moderate rate of vaporization. It is considered a suspected carcinogen. OSHA PEL is 10 ppm.

Methylene chloride - Methylene chloride affects the skin, cardiovascular system, circulatory system, and the respiratory system. Routes of exposure include inhalation, skin contact, and ingestion. Symptoms include irritation or numbness of the skin, mental confusion, light-headedness, nausea, vomiting, unconsciousness, and death. It has a high vapor pressure. It is considered a suspected carcinogen. TLV is 50 ppm.

The petroleum products identified include:

Aviation fuel - Aviation fuel is considered similar to diesel fuel in its toxicological properties. Primary target organ is the skin. Route of exposure is skin contact. Symptoms of exposure include irritation and dermatitis. It has a low vapor pressure. It is not considered a carcinogen. No allowable exposure limit has been established.

Oil - Oil affects the skin when in the mist form. Route of exposure is skin contact. The main symptom is dermatitis. It has a very low vapor pressure. It is not considered a carcinogen. OSHA PEL is 5 mg/m^3 for mist exposure.

Gasoline - Gasoline affects the skin and central nervous system. Routes of exposure include inhalation, skin contact, and ingestion. Symptoms include central nervous system depression, irritation of the skin and mucous membranes, and hypersensitivity. It has a high vapor pressure. It is not considered a carcinogen. TLV is 300 ppm.

Napthalene - Napthalene affects the blood, liver, kidneys, and central nervous system. Routes of exposure include inhalation, skin absorption, skin contact, and ingestion. Symptoms include abdominal cramps, nausea, vomiting, diarrhea, headache, tiredness, confusion, painful urination, dark urine, convulsions, coma, anemia, fever, jaundice, and skin irritation. It has a low vapor pressure. It not considered a carcinogen. OSHA PEL is 10 ppm.

The anticipated acids include:

Hydrochloric - Hydrochloric acid affects the respiratory system, skin, and eyes. Routes of exposure include inhalation, skin contact, and ingestion. Symptoms include inflammation of nose and throat, tearing of the eyes, cough, throat burns, choking, dermatitis, and contact burns to eyes and skin. It is normally a gas. It is not a carcinogen. OSHA PEL 5 ppm ceiling.

Nitric - Nitric acid affects the skin, respiratory system, and the eyes. Routes of exposure include inhalation, skin contact, and ingestion. Symptoms include severe irritation to the eyes, mucous membranes, and respiratory tract; breathing difficulties; pneumonia; and skin and eye burns. The ability to volatilize varies with the acid concentration. It is not considered a carcinogen. OSHA PEL is 5 mg/m^3.

Sulfuric - Sulfuric acid affects the skin, respiratory system, and the eyes. Routes of exposure include inhalation, skin contact, and ingestion. Symptoms include severe irritation to the eyes, mucous membranes, and respiratory tract; eye and skin burns;

and tooth decay. It has a low vapor pressure. It is not considered a carcinogen. OSHA PEL is 1 mg/m^3.

The caustic identified is:

Sodium hydroxide - Sodium hydroxide affects the skin, eyes, and respiratory system. Routes of exposure include inhalation, skin contact, and ingestion. Symptoms include irritation to the eyes, skin, and mucous membranes; contact burns; it is corrosive to the skin. Its vapor pressure is essentially zero. It is not considered a carcinogen. OSHA PEL is 2 mg/m^3.

The aromatic solvents anticipated include:

Benzene - Benzene affects the blood, central nervous system, bone marrow, respiratory system, and eyes. Routes of exposure include inhalation, skin absorption, skin contact, and ingestion. Symptoms include irritation to the eyes, nose, and respiratory system; giddiness; headache; nausea; staggering; fatigue; anorexia; dermatitis; bone marrow depression; and abdominal pain. It has a moderate vapor pressure. It is considered a suspected carcinogen of the blood. OSHA PEL is 1 ppm.

Phenol - Phenol affects the skin, liver, kidneys, central nervous system, and respiratory system. Routes of exposure include inhalation, skin absorption, skin contact, and ingestion. Symptoms include numbness of the skin, burning of the anesthetized tissue, headache, fainting, dizziness, vomiting, diarrhea, dark urine, lack of appetite, and mental disturbances. It has a low vapor pressure. It is not considered a carcinogen. OSHA PEL is 5 ppm.

Toluene - Toluene affects the skin, eyes, liver, kidneys, and central nervous system. Routes of exposure include inhalation, skin absorption, skin contact, and ingestion. Symptoms include irritation of the eyes and skin, fatigue, weakness, confusion, headache, dizziness, drowsiness, numbness, unconsciousness, and death. It has a moderate vapor pressure. It is not considered a carcinogen. OSHA PEL is 200 ppm.

Xylene - Xylene affects the central nervous system, eyes, blood, liver, kidneys, and the skin. Routes of exposure include inhalation, skin absorption, skin contact, and ingestion. Symptoms include dizziness; excitement; drowsiness; incoherence; staggering gait; irritation of eyes, nose, and throat; corneal vacuolization; anorexia; nausea; vomiting; abdominal pain; and dermatitis. It has a low vapor pressure. It is not considered a carcinogen. OSHA PEL is 100 ppm.

The aliphatic solvents anticipated include:

Methyl ethyl ketone - Methyl ethyl ketone (MEK) affects the central nervous system and the lungs. Routes of exposure include inhalation, skin contact, and ingestion. Symptoms include irritation of the eyes and nose, headaches, dizziness, and vomiting. It has a moderate vapor pressure. It is not considered a carcinogen. OSHA PEL is 200 ppm.

Acetone - Acetone affects the respiratory system and skin. Routes of exposure include inhalation, skin contact, and ingestion. Symptoms include irritation of the eyes, nose, and throat; headache; and dermatitis. It has a high vapor pressure. It is not considered a carcinogen. OSHA PEL is 1,000 ppm.

Other contaminants include:

Asbestos - Asbestos affects the respiratory system. Route of exposure is inhalation. Symptoms include interstitial fibrosis, restricted pulmonary function, lung cancer, asbestosis, and mesotheliomia. It has no vapor pressure. It is a carcinogen. National Institute for Occupational Health (NIOSH) Recommended Exposure Limit (REL) is 0.1 fibers per cubic centimeter.

PCB - PCB affects the skin, eyes, and liver. Routes of exposure include inhalation, skin absorption, skin contact, and ingestion. Symptoms include irritation of eyes and skin, acneform dermatitis, jaundice, and dark urine. It has a very low vapor pressure. It is considered a potential carcinogen. OSHA PEL is 0.5 mg/m^3.

Cyanide - Cyanide affects the cardiovascular system, central nervous system, liver, kidneys, the skin. Routes of exposure include inhalation, skin absorption, skin contact, and ingestion. Symptoms include weakness, headache, confusion, nausea, vomiting, incoherence, slow respiration, gasping, asphyxia, and irritation of skin and eyes. Vapor pressure is essentially zero. It is not considered a carcinogen. OSHA PEL is 5 mg/m^3.

HCN - Hydrogen Cyanide

Hospital Wastes - Exact nature of waste is unknown. Potentially, viral, bacteriological, etiological, and radiological wastes may be found in various subsurface areas. There is no way to test for presence of hospital wastes with any direct read device. These wastes pose a possible inhalation and dermal health threat. Their presence shall be reported immediately to site supervisor.

Methane - Methane is a flammable gas. Methane is a simple asphyxiant. Inhalation is the primary route of exposure.

3.2 Physical Hazards

The anticipated physical hazards are due to the nature of the work involved as well as the site activities and conditions.

Material handling hazards exist during the setup and drilling operations. The drill action can also present a mechanical rotation hazard. Conventional safety techniques for material handling and drilling operations will be utilized.

Elevated noise levels are anticipated as a result of the drilling operations and in those areas where aircraft may be in operation. The use of hearing protection will be required during drilling and at all times when working near aircraft operation areas and active aircraft engine test facilities. Noise monitoring will be conducted when information indicates that worker exposure may equal or exceed an 8-hour time weighted average (TWA) of 85 decibels. All work will be done in compliance with 29 CFR 1910.95.

Heat stress is considered a hazard due to the potential for work to be scheduled during summer months, the physical workload associated with construction activities, and the use of personal protective clothing. When ambient temperatures reach 70^{o}F and workers are wearing impervious clothing, work/rest cycles will be scheduled on a regular basis and liquids with electrolytes (such as Gatorade) will be available to replenish body fluids. Because the incidence of heat stress depends upon a variety of factors, all workers, even those not wearing protective equipment, will be observed and encouraged to report any symptoms of heat stress. In addition, all personnel are specifically instructed to take breaks when they feel they are necessary.

Underground utilities locations will be identified prior to the commencement of drilling operations. Overhead utilities will be identified and a minimum distance of 15 feet will be maintained at all times.

Sampling operations for the Seaplane Lagoon and the Estuary may require the use of boats. Work done over or near water will be conducted in accordance with OSHA regulation 29 CFR 1926.106. Communications with land personnel will be maintained at all times.

A potential for fire exists due to the flammable nature of some of the chemical constituents. Combustible gas monitoring during the drilling and sampling activities for certain sites will be conducted. Elevated levels of combustible gases will require that operations cease until adequate ventilation can be provided. The appropriate fire extinguishers will be available in the active work and decontamination areas.

A potential for confined space entry exists during the evaluation of the sewer system and entrance into the crawl space under Building 360. The provisions of the Canonie Confined Space Entrance Program will be implemented in that event. A copy of that program is included in Appendix B.

Radiological wastes are reported to have been disposed of in the West Beach Landfill and the 1943-1956 Disposal Area. These wastes consisted primarily of radium paints. Monitoring for radiation levels will be conducted during the drilling and sampling program. In the event that readings of 2 milliroentgen or greater are found, the Radiological Health/Environmental Health Unit of the California Department of Health Services will be contacted at (916) 739-4213.

It has been reported that inert ordnance were disposed of in the West Beach Landfill and the 1943-1956 Disposal Areas. In addition, buried drums of toxic substances may be present in the Landfill and Disposal Area. The sampling program for these areas will include a survey of the proposed drill site for underground metallic presence. Specific areas identified by the locating service will be avoided during drilling.

4.0 RISK ASSESSMENT SUMMARY

The risks associated with the RI/FS are a result of the hazards present and whether those hazards are adequately controlled. The occupational health risks of chemicals are based on exposure to the body by inhalation or direct skin contact. There are also safety risks associated with chemicals which may be on-site. In addition, occupational safety risks exist as a result of the physical hazards present on the site.

4.1 Health Risks Associated with Inhalation

Of the chemicals identified as being present on the site, the chlorinated, aromatic, aliphatic solvents, and the petroleum products have the greatest potential to volatilize from the soil and/or water samples. In general, the remaining chemicals have very low vapor pressures and would not volatilize readily. For the remaining chemicals, dust generation would be considered the primary method for an inhalation exposure to occur.

Air monitoring and the use of personal protective equipment will be used to control and minimize the potential of chemical inhalation to the workers. The potential of inhalation hazards to the nearby naval personnel and/or community residents is also a consideration. The direct reading air monitoring instrumentation will be used to evaluate the active work area perimeter. Any levels in excess of the specified action levels for Level D will result in the cessation of activity until additional control measures can be implemented.

Based on prior experience, drilling and sampling present a low risk of exposure by inhalation to both volatile and dust contaminants.

4.2 Health Risks Associated with Direct Skin Contact

The pesticides, chlorinated solvents, PCBs, acids, caustics, aromatic solvents, and aliphatic solvents, hospital wastes and HCN present risks associated with skin contact. The handling of the sample has the greatest potential for skin contact. The potential for skin contact during confined space entry into the sewers and crawl spaces is high. Skin contact with any contaminated sludges and muds from the Seaplane Lagoon and the Estuary has a high potential.

The use of personal protective equipment is the primary means of controlling skin contact. A minimum of latex gloves will be utilized at all times. The entry into the sewers or crawl spaces will require full-body protection with Safanex Suits, rain suits with poly-tyveks or equivalent. The potential for contact with the sludges and muds will require the use of rain suits. Direct skin contact with contaminated materials by nearby naval personnel or the community residents is unlikely.

4.3 Safety Risks Associated with Chemicals

The safety risks related to the chemicals on-site include fire hazards, radiation hazards, and the potential for chemical reactions in the event buried drums or ordnance are encountered. The recognition of these potential risks and the precautions to be utilized to minimize those risks were highlighted in Section 3.2.

4.4 Safety Risks Associated with Physical Conditions

The physical hazards of working with heavy machinery, the potential for heat stress and noise exposure, and the methods of sampling from boats are not considered any different from standard construction or industrial operations. Risks will be minimized through the use of properly trained and experienced personnel and through the use of personal protective equipment and work/rest cycles.

5.0 AIR, RADIATION, AND NOISE MONITORING

Direct reading instrumentation for ambient area monitoring will be conducted using any of the following instruments, as appropriate, based on the judgment of the site HSO:

- Organic Vapor Analyzer (OVA)
- Combustible gas/oxygen meter
- Draeger tubes for specific constituents
- Mini-RAM (mini-real-time aerosol monitor) meter
- Radiation Monitoring
- Noise Monitoring

Integrated air sampling, either personnel or area, will be conducted at the discretion of the site HSO based on the operating conditions and the results of direct reading instruments. Any integrated sampling will be conducted in accordance with standardized National Institute for Occupational Safety and Health (NIOSH) methods for sampling and analysis or an acceptable equivalent method. All samples will be analyzed by a laboratory accredited by the American Industrial Hygiene Association.

Maintenance of the monitoring equipment will be conducted in accordance with the manufacturers' recommendations. All monitoring with battery-operated equipment will be initiated with the equipment fully charged. Monitoring equipment will be calibrated according to the manufacturer's specifications prior to each use, or more often as deemed necessary. The calibration will be checked after each use.

Sample collection, handling, and shipment will be in strict accordance with the NIOSH methods and the QAPP procedures in order to maintain sample integrity.

5.1 Work Area Action Levels

The results of the direct reading instrumentation can be used in conjunction with the professional judgment of the site HSO to determine appropriate levels of protection.

Level D protection is appropriate for ambient conditions in which:

a) The sustained OVA readings are less than 1 ppm above background in the breathing zone.

b) Combustible gas levels in the ambient air are less than 0 percent lower explosive limit (LEL). Oxygen levels are maintained at 20.9 percent.

c) Draeger tube readings for specific constituents are below their corresponding TLVs.

d) Radiation monitoring registers activity less than two mRoentgens per hour at three feet above ground.

e) Mini-RAM meter reports airborne concentrations less than one mg/m^3 in the breathing zone.

f) Sound pressure levels are less than 85 decibels on an A-weighted scale (dBA).

Level C protection with full-face respirator is appropriate for ambient conditions in which:

a) The sustained OVA readings are one to five ppm of unquantified organics in the breathing zone above background for five minutes.

b) Combustible gas levels in the ambient air are less than 10 percent LEL. Oxygen levels are maintained at 20.9 percent.

c) Draeger tube readings for specific constituents exceed the TLV but do not exceed 10 times the TLV or reach the IDLH concentrations.

d) Radiation monitoring registers activity less than two mRoentgens per hour at three feet above ground.

e) Mini-RAM meter reports airborne concentrations less than five mg/m^3 in the breathing zone.

Deterioration of operating conditions beyond the upper limits specified above will result in the temporary cessation of activities and a re-evaluation of the work practices. At such time, it may be necessary to implement addition control measures, such as, but not limited to, dust suppression requirements, time restrictions due to radioactive level, or Level B protection for routine activities. The site HSO will decide when and under what conditions operations can be resumed.

Level B protection with supplied air is appropriate for ambient conditions in which:

a) The sustained OVA readings of unquantified organics are 5 to 500 ppm above background in the breathing zone for five minutes.

b) Combustible gas levels in the ambient air are less than 25 percent LEL.

c) Oxygen levels are less than 20.9 percent or the potential for oxygen deficiency exists.

d) Draeger tube readings are less than the IDLH for specific constituents. If concentrations exceed 100 times the TLV or approach the IDLH, withdraw from the area immediately and consult the health and safety officer.

e) Radiation monitoring registers activity less than two mRoentgens per hour at three feet aboveground. If radiation measures greater than two mRoentgens per hour, the DHS, Radiological Health, and Environmental Health Unit (John Hickman) will be notified at (916) 739-4213.

f) Mini-RAM meter reports airborne concentrations greater than five mg/m^3 in the breathing zone.

Level B capabilities will be available at all times during subsurface drilling or other high hazard activities. Level B will be implemented when total organics (sustained OVA readings) reach 5 to 500 ppm above background in breathing zone and mini-RAM dust monitor greater than five mg/m^3.

Hearing protection will be required when sound pressure levels of 85 dBA or greater are indicated from direct-reading sound level metering equipment, and only after noise abatement alternatives such as engineering controls or physical barriers to attenuate noise are considered.

6.0 PERSONNEL PROTECTION

The drilling and sampling program will be carried out in accordance with the following standards from U.S. EPA Standard Operating Safety Guides, 1988 as a source (Appendix J). The use of Level A protection is not anticipated in this project, but references to Level A have been included in Appendix J to preserve continuity of the EPA document.

7.0 WORK ZONES AND SECURITY MEASURES

Only authorized personnel will be allowed in active working areas. Active work areas will be marked off with temporary barriers and plastic tape. An area of 50 feet will be maintained around sampling and drilling activities. If the active work area is inside a building, wall boundaries may reduce the perimeter. Work inside buildings will be scheduled when the least number of naval personnel are required to be in the area.

On-site communications will be chosen based on site conditions and the nature of the work before work begins at that site. This communication may include voice, hand signals, rope signals, and/or radio communication depending on what is applicable.

A decontamination station will be established adjacent to each location specified in Section 1.1. All employees leaving a designated location will pass through the decontamination station.

The HSO will be responsible for ensuring that all personnel entering an active work area comply with the medical and training requirements for the site and have the required level of protective equipment. It is also the responsibility of the HSO to ensure that all personnel leaving a designated location after entering an active work area passes through the decontamination station.

8.0 DECONTAMINATION

All drilling and sampling equipment as well as non-disposable protective equipment coming in contact with potentially contaminated soils or ground water at the site will be decontaminated prior to being removed from the site or being reused.

A personnel decontamination area will be set up outside the active work zone. Disposable clothing and respirator cartridges (if applicable) will be removed and disposed of in 55-gallon barrels at the first station. The second station will have soap and water to wash hard hats; boots; and, if necessary, respirators. Respirators will be cleaned using sanitary wipes after each use. A final station will provide soap and water to wash hands, etc. Water used in decontamination with be collected in 55-gallon barrels. All barrels used in the decontamination area will be labeled and collected on-site for subsequent disposal.

In the event that a site uses Level B protection or higher for a sustained period, a more extensive decontamination area will be designed, based on the specific site. Decontamination of PPE is discussed in detail in Appendix E, Section 2.0.

Storage of PPE will be away from dust, moisture, sunlight, damaging chemicals, extreme temperatures, and impact. PPE will be stored and maintained in the support area (office trailer) for the site. Due to the large geographical area under study, it may become necessary to have several support trailers on-site in order to localize PPE needs.

9.0 GENERAL SITE HEALTH AND SAFETY AND WORK RULES

1. No drinking, gambling, or illegal drugs will be allowed on-site. Anyone reporting to work under the influence of alcohol and/or illegal drugs shall be subjected to disciplinary action. Any employee under a physicians care and/or taking prescribed narcotics must notify the designated site HSO.

2. Personal protective equipment is required in designated areas. Such equipment may include, but is not limited to, respiratory protection, earplugs, hard hat, rainsuits, boots, gloves, and safety glasses.

3. Eating, drinking, smoking, and chewing gum or tobacco are allowed only in the support zone.

4. Changes in work practices or work rules shall be implemented only after approval by the project manager and the designated site HSO.

5. Construction equipment always has the right-of-way over regular vehicles.

6. All employees must clean up at the end of their shift before leaving the site.

7. All protective clothing required will be supplied by the designated site HSO. None of this equipment will be permitted to leave the site until the completion of the project.

8. Employees are responsible to clean and maintain the protective equipment issued to them. Any noted defects in the equipment shall immediately be reported to the designated site HSO.

9. Employees shall listen for warning signals on construction equipment and shall yield to construction equipment.

10. All equipment operators shall pay deliberate attention to watching for workers on the ground who may be in their path and provide warning to these people before moving.

11. All workers shall follow emergency procedures explicitly.

12. Employees must report all injuries and/or illnesses to their supervisor. This includes minor or slight injuries.

9.1 Conditions of Employment

1. All prospective employees must pass a pre-employment physical. Failure to submit to any additional medical surveillance requirements will constitute grounds for dismissal.

2. All employees must participate in the air quality exposure monitoring program by wearing the personal monitors or sampling devices, if required and specified by the site HSO. Any employee refusing to participate in the program or who tampers with a sample will be subject to disciplinary action.

3. No beards or long sideburns shall be allowed since they interfere with respiratory protection. Trimmed sideburns and mustaches are acceptable. All employees must report to work clean-shaven when there is a potential need for the use of respiratory protection.

4. All employees must complete a required training program prior to starting work.

5. All employees are required to use the personal protection specified for their work. This may include, but is not limited to, a cartridge respirator, rainsuit, gloves, boots, hard hat, hearing protection, and safety glasses.

6. All employees must abide by all safety rules and procedures as described in the work rules and/or developed throughout the project.

7. All employees will perform their job assignments according to the "buddy" system with a line of sight with co-workers being maintained at all times.

10.0 EMERGENCY RESPONSE

The on-site HSO will be responsible for coordinating emergency responses. Prior to the initiation of field activities, the HSO will contact any local services which may reasonably be expected to be called upon to respond to emergency situations. Anticipated hazards and/or potential emergency situations will be reviewed. The local services to be contacted include the naval station medical, fire, ambulance, and security personnel, and the local hospital.

On-site emergencies are expected to be within the capabilities of on-site personnel. In the event of a fire, accident, or injury, work activities in the active area will cease while the emergency is brought under control. Minor injuries will be treated at the Industrial Medical Clinic, Building 16, on the station. In the event of a major injury, the station ambulance will be contacted for assistance. Major injuries will be treated at Alameda Hospital. In the event of a fire, the base fire department will be notified.

Because many of the active work sites will be located in remote areas without telephones, a means of maintaining radio contact with station security will be established.

A list of emergency phone numbers and contacts are included in Appendix C. Maps to the medical facilities are included in the figures section as Figures C-1 and C-2. These items will be posted at the job site.

11.0 TRAINING

All personnel on-site will have training and/or prior experience which meets the requirements of 29 CFR 1910.120. The Health and Safety Training Program includes a 40-hour course, annual 8-hour update training, and three days of field experience. An additional 8 hours of training is required for on-site management and supervisory personnel. All technical field personnel are included in the training program. The training program includes the following areas:

- o Chemical hazards
- o Physical hazards (heat stress, noise, radiation, material handling, etc.)
- o Hazard recognition
- o Toxicology
- o Permissible exposure limits
- o Personal protective equipment and protection levels
- o Respiratory protection (20 CFR 1910.134)
- o Air monitoring
- o Confined space entry
- o Corporate policies and site management
- o Supervision of health and safety

- Site control
- Health and safety plans
- Medical monitoring
- OSHA compliance
- Personnel training
- Decontamination
- Drum handling
- Hazardous material sampling
- Practical exercises
- Case histories
- First Aid/CPR

All subcontractor personnel on-site will have to demonstrate compliance with the training provisions specified in 29 CFR 1910.120.

In addition, all on-site personnel will receive site-specific training which includes:

- Site chemical hazards (including acute and chronic effects)
- Site control and decontamination procedures
- Contingency plan

- Protection levels and equipment

- Proper use and maintenance of protective equipment

- Review of health and safety plan

Periodic on-site safety meeting will be held to inform site personnel of changes in the Health and Safety Plan, air monitoring results, and other related information. Scheduling of these meetings will be at the discretion of the site HSO.

All regulatory personnel and visitors needing access to an active work area will be expected to demonstrate compliance with the applicable training requirements.

12.0 MEDICAL SURVEILLANCE

All on-site technical personnel are subject to a medical surveillance program which meets or exceeds the requirements of 29 CFR 1910.120. This includes an annual physical examination which includes:

- o Medical history
- o Physical examination
- o Urinalysis (microscopic, morphology, and dipstick)
- o Blood chemistry (SMAC18 or equivalent)
- o Complete blood count including platelets and differential
- o Pulmonary function test
- o Resting EKG
- o Audiogram

All subcontractor personnel with the potential for chemical exposures are required to have medical monitoring which equals or exceeds the medical program required by 29 CFR 1910.120.

All personnel hired specifically for work on-site receive a preemployment examination which includes a chest X-ray and back X-rays in addition to the examination described above. End-of-employment physicals will be conducted at the discretion of the HSO.

All visitors and regulatory personnel who will enter the active work areas are expected to demonstrate participation in a medical program which is equivalent to or exceeds the requirements of 29 CFR 1910.120.

13.0 DOCUMENTATION

The record-keeping program will consist of the following documents containing the information described:

- Training/Safety Meeting Record - This record will include the date, topics covered, persons attending, and the signature of the person holding the meeting or training session.

- OSHA 200 Log - This record contains the required information for recording on-site injuries and illnesses. This record is generated by the corporate health and safety staff and a copy is maintained on-site.

- Medical Records - Employee medical records are maintained by the examining physician and copies are kept at the Canonie corporate office. No medical records are maintained on-site.

- Air Monitoring - Results of direct reading instrumentation will be noted in the field log. Any full duration monitoring will also be recorded in the field log. Data included is location, time span, calibration method and results, instrumentation used, and weather factors. These logs will contain the name of the person generating this data.

14.0 REGULATORY REQUIREMENTS

The primary OSHA standards which may apply to the work activities at this site include:

29 CFR 1910.120 Hazardous Waste Operations

29 CFR 1910.134 Respiratory Protection

29 CFR 1910.95 Noise

29 CFR 1910.1000 Chemical Exposures

29 CFR 1910.1025 Lead

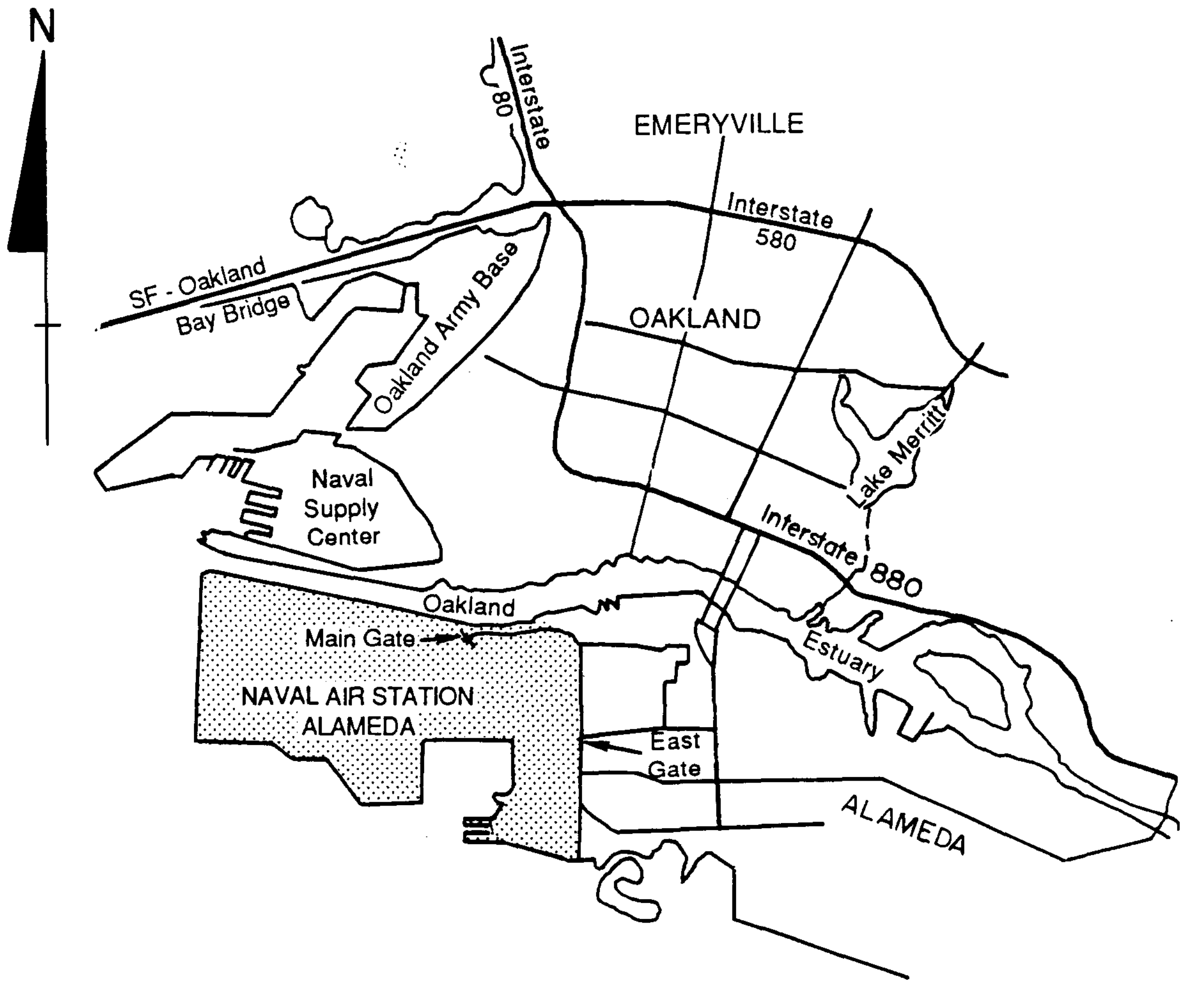
29 CFR 1910.1028 Benzene

FIGURES

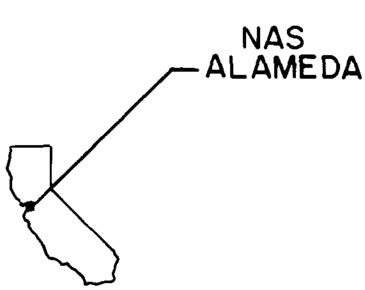
FINAL HEALTH AND SAFETY PLAN
REMEDIAL INVESTIGATION/FEASIBILITY STUDY

DATED 01 MAY 1989

113525



SITE LOCATION



SCALE

6000 0 6000 FEET

SITE LOCATION PLAN
NAVAL AIR STATION
ALAMEDA, CALIFORNIA

PREPARED FOR

WESTERN DIVISION
NAVAL FACILITIES ENGINEERING
COMMAND

Canonie Environmental

DATE: 5-4-88	FIGURE 1-1	DRAWING NUMBER 86-018-A1
SCALE: AS SHOWN		

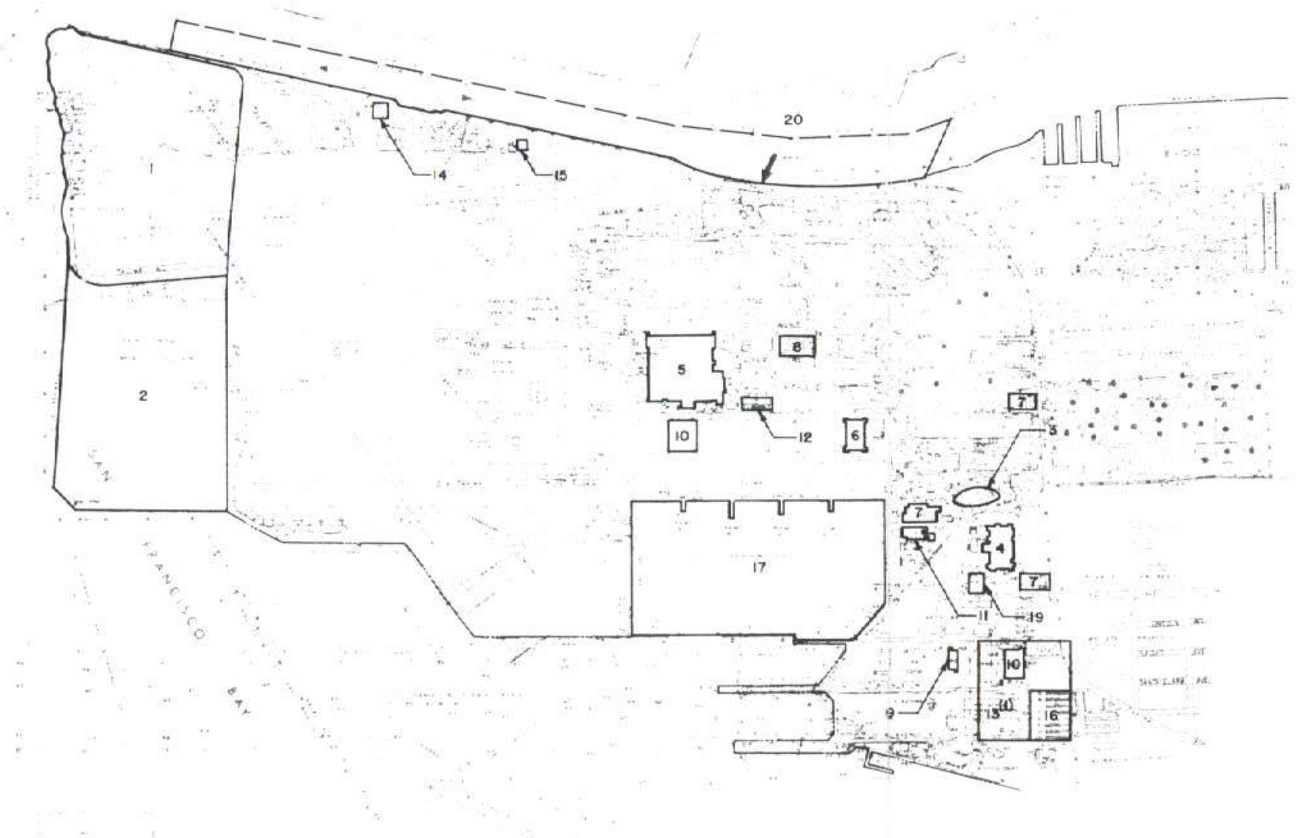
DRAWING NUMBER 86-018-A1

CHECKED BY CCW 10-25-88

APPROVED BY

DRAWN BY LEH 5-4-88

REVISIONS NO. DATE



NOTES:

1. THE AREA OF SITE 13 INCLUDES THE AREAS OF SITES 10 AND 16.

LEGEND:

Site No.	Site Description
1	1943-1956 Disposal Site
2	West Beach Landfill
3	Area 97 (Aviation Gasoline Tanks)
4	Building 360 (Plating Shop, Engine Cleaning Shop, Paint Shop, and Paint Stripping Shop)
5	Building 5 (Plating Shop, Paint Stripping Shop, Cleaning Shop, and Paint Shop)
6	Building 41 (Aircraft Intermediate Maintenance Dept.)
7	Buildings 162, 459, and 547 (Service Stations)
8	Building 114 (Pest Control Area and Separator Pit)
9	Building 410 (Paint Stripping)
10	Buildings 400 and 530 (Missile Rework Operations)
11	Building 14 (Engine Test Cell)
12	Building 10 (Power Plant)
13	Oil Refinery
14	Fire Training Area
15	Buildings 301 and 389 (Storage Area)
16	Cans C-2 Area
17	Seaplane Lagoon
18	Station Sewer System (Not on Site)
19	Yard D-13 (Hazardous Waste Solvents)
20	Estuary (Oakland Inner Harbor)

SCALE
1000 0 1000 2000 FEET

REFERENCE:
U.S. NAVY MAP

REMEDIAL INVESTIGATION/FEASIBILITY STUDY SITES
NAVAL AIR STATION
ALAMEDA, CALIFORNIA

PREPARED FOR

WESTERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
SAN BRUNO, CALIFORNIA

CanonieEnvironmental

DATE: 7-27-88	FIGURE 1-2	DRAWING NUMBER 86-018-E3
SCALE:		

DRAWING NUMBER 86-018-E3
DRAWN BY LEA 7-27-88
CHECKED BY / APPROVED BY
REVISIONS NO. DATE

APPENDIX A

SITE SUMMARIES

APPENDIX A

SITE SUMMARIES

1934-1956 Disposal Area:	Accepted soil, paints, solvents, scrap metals, radiological wastes, and hospital wastes.
Physical Hazards:	Noise from drill rigs and aircraft traffic, heat stress, buried drums, radiation, utilities, and drilling action.
Chemical Hazards:	Metals: copper, lead, zinc, nickel, barium, chromium. Chlorinated solvents: trichloroethylene, 1,2-dichlorothylene. Petroleum products: oil, waste oil.
Initial Protection Level:	Level D with B and C capabilities and film badges.
Air Monitoring:	Organic vapor analyzer (OVA), radiological monitoring by health physicist, mini-real-time aerosol monitor (mini-RAM), combustible gas. Potential integrated samples for lead, nickel, and chromium.

Area 97:	Aviation fuel storage: Five underground tanks no longer in service. Probable leakage from tanks.
Physical Hazards:	Drill action, noise, heat stress, buried drums, radiation, utilities.
Chemical Hazards:	Metals: lead, nickel. Pesticides: lindane. Petroleum products: napthalene. Aromatic solvents: toluene. Aliphatic solvents: acetone.

Initial Protection Level:	Level D with C and B capabilities.
Air Monitoring:	OVA, mini-RAM, combustible gas. Potential integrated samples for lead and nickel.

<u>West Beach Landfill</u>:	Accepted oils, solvents, polychlorinated biphenyls (PCBs), pesticides, scrap metals, radiological wastes, and hospital wastes.
Physical Hazards:	Drill action, noise, heat stress, buried drums, utilities, ordnance, and radiation.
Chemical Hazards:	Metals: lead, nickel, mercury. Pesticides: lindane. Petroleum products: oil, napthalene. Aromatic solvents: toluene. Aliphatic solvents: acetone. Other: PCBs.
Initial Protection Level:	Level D with B and C capabilities and film badges.
Air Monitoring:	OVA, mini-RAM, radiological monitoring by health physicist. Potential integrated samples for lead, nickel, mercury, and PCBs.

<u>Building 41</u>:	Aircraft intermediate maintenance department. Paint stripping operations, storage tanks, previous barrel storage.
Physical Hazards:	Drill action, noise, heat stress, utilities.
Chemical Hazards:	Metals: lead, chromium, zinc, iron. Chlorinated solvents: carbon tetrachloride, methyl chloroform, methylene chloride. Aromatic solvents: benzene, toluene, xylene. Aliphatic solvent: methyl ethyl ketone.

Initial Protection Level:	Level D with B and C capabilities.
Air Monitoring:	OVA, combustible gas, mini-RAM, benzene Draeger tube. Potential integrated samples for lead, chromium, carbon tetrachloride, and benzene.

Building 459, 547, and 162	Service stations: Potential gasoline spills and underground tanks.
Physical Hazards:	Drill action, noise, heat stress, utilities.
Chemical Hazards:	Metals: lead. Petroleum products: oil and gasoline. Aromatic solvents: benzene.
Initial Protection Level:	Level D with B and C capabilities.
Air Monitoring:	OVA, combustible gas. Potential integrated samples for lead and benzene.

Building 114:	Pest control area: Pesticides stored and separator pits for collection from paint stripping operations and spray painting operations.
Physical Hazards:	Drill action, noise, heat stress, utilities.
Chemical Hazards:	Metals: lead, chromium, zinc, iron. Pesticides: chlordane, 2,4-D, DDT, diazinon, lindane, malathion, warfarin. Chlorinated solvents: trichloroethylene, methyl chloroform, carbon tetrachloride, methylene chloride. Aromatic solvents: toluene, xylene. Aliphatic solvents: methyl ethyl ketone.

Initial Protection Level: Level D with B and C capabilities.

Air Monitoring: OVA, mini-RAM.
Potential integrated samples for DDT, lindane, lead, chromium.

Building 5: Naval Rework Facility: Activities included electroplating, painting, paint stripping, and cleanup operations.

Physical Hazards: Drill action, noise, heat stress, utilities, potential for confined space (sewers).

Chemical Hazards: Metals: chromium, nickel, cadmium, copper, lead.
Chlorinated solvents: methyl chloroform, trichloroethylene, carbon tetrachloride, methylene chloride.
Acids: nitric.
Aromatic solvents: toluene, xylene, phenol.
Caustics: sodium hydroxide.
Aliphatic solvents: methyle ethyl ketone.
Other: cyanide.

Initial Protection Level: Level D, Level B for confined space entry.

Air Monitoring: OVA, mini-RAM, Draeger-cyanide, oxygen meter, combustible gas. Potential integrated samples for metals, solvents, and cyanide.

Building 360: Naval Air Rework Facility: Activities included painting, paint stripping, and plating.

Physical Hazards:	Drill action, noise, heat stress, utilities, potential for confined space (sewers and crawl space).
Chemical Hazards:	Metals: chromium, lead, nickel. Chlorinated solvents: methyl chloroform, trichloroethylene, carbon tetrachloride. Caustic: sodium hydroxide. Aromatic solvents: phenol. Other: cyanide, asbestos.
Initial Protection Level:	Level D, Level C minimum for crawl space, Level B for confined space entry.
Air Monitoring:	OVA, mini-RAM, Draeger-cyanide, oxygen meter, combustible gas. Potential integrated samples for metals, asbestos, and cyanide.

<u>Building 410</u>:	Naval Rework Facility: Activities included paint stripping.
Physical Hazards:	Drill action, noise, heat stress, utilities.
Chemical Hazards:	Metals: chromium. Chlorinated solvents: methylene chloride. Petroleum products: oil. Aromatic solvents: phenol.
Initial Protection Level:	Level D with B and C capabilities.
Air Monitoring:	OVA, mini-RAM, oxygen meter, combustible gas meter. Potential integrated samples for chromium.

Buildings 400 and 530:	Missile Rework Operations: Activities included painting, cleaning operations; located next to fuel drainage area.
Physical Hazards:	Drill action, noise, heat stress, utilities, evaluation of sewer entry may require confined space entry.
Chemical Hazards:	Metals: lead, zinc, iron. Chlorinated solvents: trichloroethylene, methyl chloroform, carbon tetrachloride, methylene chloride. Petroleum products: aviation fuel. Aromatic solvents: benzene, toluene, xylene. Aliphatic solvents: methyl ethyl ketone.
Initial Protection Level:	Level D, Level B for confined space entry. Level C capabilities.
Air Monitoring:	OVA, combustible gas. Potential integrated samples for lead, chlorinated solvents, benzene.

Building 14:	Mercury wastes disposed of through waste collection system and disposed of at landfill. Potential for building contamination. May be evaluated by wipe samples.
Physical Hazards:	None.
Chemical Hazards:	Metals: mercury.
Initial Protection Level:	Level D with Level B and C capabilities.

Air Monitoring:	Possible integrated samples for mercury. Mercury vapor analyzer.

Building 10:	Power plant: Stored oil in underground tanks.
Physical Hazards:	Drill action, noise, heat, utilities.
Chemical Hazards:	Petroleum products: oil.
Initial Protection Level:	Level D with level B and C capabilities.
Air Monitoring:	OVA.

Oil Refinery:	Area previously excavated. "Black oil" reported during drilling.
Physical Hazards:	Drill action, noise, heat, utilities.
Chemical Hazards:	Petroleum products: oil. Hydrogen sulfide
Initial Protection Level:	Level D with level B and C capabilities.
Air Monitoring:	OVA, Hydrogen sulfide meter.

Fire Training Area:	Burning of fuels, oils and contraband. Fire extinguisher discharge point.
Physical Hazards:	Drill action, noise, heat stress, utilities.
Chemical Hazards:	Metals.
Initial Protection Level:	Level D with level B and C capabilities.
Air Monitoring:	Mini-RAM and OVA. Potential integrated samples for metals.

<u>Building 301 and 389</u>:	Electrical transformer with PCBs stored on ground.
Physical Hazards:	Drill action, noise, heat stress, utilities.
Chemical Hazards:	PCBs.
Initial Protection Level:	Level D with Level C capabilities.
Air Monitoring:	Potential integrated samples for PCB.

<u>CANS C-2 Area</u>:	Storage of hazardous materials. PCBs used for weed control. A prior combustible gas reading was 24 percent of the lower explosive limit (LEL).
Physical Hazards:	Drill action, noise, heat stress, utilities.
Chemical Hazards:	Metals: lead, zinc, chromium, copper, cadmium, nickel, barium. Chlorinated solvents: trichloroethylene. Pesticides: 2,4-D. Other: PCBs.
Initial Protection Level:	Level D with level C and B capabilities.
Air Monitoring:	OVA, combustible gas. Potential integrated samples for metals.

<u>Seaplane Lagoon</u>:	Receiving waters for disposal of industrial and storm sewers.
Physical Hazards:	Sampling from boats, heat stress, aircraft noise.

Chemical Hazards:	Metals: mercury, lead, chromium, cadmium, zinc, nickel, copper, iron. Pesticides: chlordane, 2,4-D, DDT, diazinon, lindane, malathion, warfarin. Petroleum products: oil. Other: PCBs.
Initial Protection Level:	Level D with rainsuit, flotation device, and ring buoys with 90-foot lines.
Air Monitoring:	None anticipated.

<u>Station Sewer System</u>:	Potential for leakage from wastewater collection system and storm sewer system.
Physical Hazards:	Potential for confined space entry during evaluations.
Chemical Hazards:	Volatile materials.
Initial Protection Level:	Level D, Level B for confined space entry.
Air Monitoring:	OVA, combustible gas, oxygen meter.

<u>Yard D-13</u>:	Hazardous waste storage area: Evaluation for spills and leakage.
Physical Hazards:	Drill action, noise, heat stress, utilities, drum handling.
Chemical Hazards:	Because this was a waste storage area, it is conceivable that any of the chemicals previously identified may be present as a contaminant.

Initial Protection Level:	Level D, full-face Level C for handling drums of liquids with level B capabilities.
Air Monitoring:	OVA, mini-RAM.

Estuary:	Waste materials discharged directly into the Estuary.
Physical Hazards:	Sampling from boats, heat stress, aircraft noise.
Chemical Hazards:	Metals: lead, chromium, cadmium, zinc, nickel, copper, iron. Pesticide: chlordane, 2,4-D, diazinon, Lindane, malathion, warfarin. Petroleum products: oil. Other: PCBs.
Initial Protection Level:	Level D with rainsuit, flotation device, and ring buoys with 90-foot lines.
Air Monitoring:	None anticipated.

APPENDIX B

CONFINED SPACES

APPENDIX B

CONFINED SPACES

1.0 INTRODUCTION

The danger of hazards that are not easily seen, smelled, heard, or felt can represent deadly risks to the employees who work in confined areas.

A confined space or area is one not designed or intended for normal occupancy by employees, with known or potential hazards, and in which the entry or exit may become restricted while occupied. In a confined area, dangerous air contaminants cannot always be prevented or removed by natural ventilation. Whenever an employee works in this type of environment, the chance always exists that a reduced oxygen level, a combustible gas, or a toxic gas may be present.

Since all confined spaces represent a potential hazard, special precautionary measures must be implemented to protect the workers. This section outlines the precautionary measures necessary for each entry into a confined space. With thorough training, quality equipment, clear thinking, and responsible action; the employee who enters a confined space should exit alive and unharmed.

2.0 APPLICATION

Confined spaces include enclosures with limited-access openings such as storage tanks, air receivers, boilers, and reactors. This type of enclosure usually has only a manhole for entering.

Other types of confined spaces are vaults, run-off pits, or other structures with the top open to air but deep enough to require entry to perform the work and assistance for egress in case of emergency. Additional examples include ventilation or exhaust ducts, sanitary and storm sewers, underground tunnels, pipelines, and other similar structures.

By definition, a confined space is any space having a limited means of egress (exit) and subject either to the accumulation of toxic or flammable contaminants or to an oxygen deficient atmosphere. Confined or enclosed spaces include open-top spaces more than four-feet in depth.

Whenever work in a confined space is necessary, always assume that a hazard is present before entry.

3.0 HAZARDS ASSOCIATED WITH CONFINED SPACE ENTRY

When dealing with confined spaces it is important never to trust your senses. What may look like a harmless situation may actually be a potential threat. What may smell strange at first can impair the sense of smell and make you careless. Some of the most deadly gases and vapors have no odor at all (e.g., carbon monoxide).

There are a wide variety of hazards associated with confined-space work. The following list discusses the most common types of conditions which may be encountered.

1. Toxic Vapors: The sources of toxic gases and vapors include evaporation of cleaning agents, the contents of the pit or tank, gradual releases from sludge or scale, leakage from systems not properly disconnected, and decomposition of tank lining or coatings during burning or welding.

   Toxic substances are commonly found in industry as well as being generated by natural processes. Included are all gases and vapors which are known to produce disease, acute discomfort, bodily injury, or death. Two major classes of toxic gases are most often found in confined spaces: irritants and asphyxiants.

   Asphyxiants are gases which cause asphyxiation by displacing the oxygen in the atmosphere. Simple asphyxiant gases are physiologically inert in that they produce no effects on the body, but if present in sufficient quantity, such gases will exclude an adequate oxygen supply. Nitrogen, argon, and carbon dioxide are common simple asphyxiant gases.

Chemical asphyxiants are substances which render the body incapable of utilizing an adequate oxygen supply. Carbon monoxide is one of the most common chemical asphyxiants encountered in industry. It is formed by incomplete combustion of fuels. Carbon monoxide is a by-product of many industrial operations. It is produced in large quantities by internal combustion engines such as automobiles, diesel-powered compressors, and fork lifts. When carbon monoxide is absorbed into the body, it combines with the blood and reduces the blood's ability to cary oxygen to the body tissues and brain.

Irritants are gases which in low concentration are mildly irritating to the respiratory and nervous systems. At higher concentrations, these gases can cause serious damage and even death. Hydrogen sulfide (H_2S) is an example of the type of irritant gas found in confined spaces. At low concentrations, H_2S inflames mucous membranes. At higher concentrations it paralyzes the muscles which control breathing. Exposure to H_2S can also cause olfactory fatigue. This phenomena renders the sense of smell ineffective. Hydrogen sulfide smells like rotten eggs, but after continued exposure the smell is reduced. This does not mean that the concentration has been reduced, but rather that the body's ability to register the smell has been impaired. The danger is still present even though the gas cannot be smelled.

2. <u>Combustible Vapors or Gases</u>: The sources of flammable vapors in a confined space include the contents of a tank, any coating or cleaning solvents used, and leakage from burning or welding equipment lines.

   A large group of naturally occurring gases and vapors fall into the combustible category. Fuels and solvents will burn or explode when mixed with the required amount of air and a source of ignition.

Many flammable gases and vapors are heavier than air. If they flow into a pit or tank opening or other confined area, they present a serious fire and explosion hazard.

Some types of flammable gases are lighter than air. Methane is lighter than air and extremely explosive. It tends to accumulate in high spots or pockets and can present a hazard in storage tanks where access is normally gained at the top of the confined area.

In addition to the fire potential, many combustible gases and vapors are also toxic.

3. Oxygen Deficiency: Oxygen constitutes to 20.9 percent of fresh air. Atmospheres containing less than 19.5 percent oxygen are classified as oxygen deficient.

The danger associated with oxygen-deficient atmospheres is asphyxiation. Since oxygen has no odor, a worker is often unable to detect any problem until it is too late. With oxygen levels below 16 percent, a person feels drowsy and is unable to think clearly. This is usually accompanied by some slight difficulty in breathing and a ringing in the ears. But none of these symptoms are likely to cause alarm. More serious symptoms will follow. Euphoria or a false sense of well-being develops and the worker is lulled into inactivity. If the percentage drops below 12 percent, a person will rapidly lose consciousness and die.

Oxygen deficiency occurs in confined spaces due to oxidation of metals (rusting), bacterial action, combustion, and displacement by other gases.

4. Electric Shock: Sources of potential electric shock include portable lights or electric power tools which are not grounded or protected by a ground fault interrupter, and welding cables or uninsulated electrode holders.

5. Mechanical Equipment: The hazards associated with mechanical equipment while working in confined spaces are due to the inadvertent activation of mixers, conveyors, and motor drives.

6. Corrosives: Some chemicals used while working in confined areas are corrosive to human tissue including the eyes.

7. Physical Hazards: Work in cramped areas increases the workers susceptibility to fatigue, slips and falls, heat exhaustion, and falling objects. These conditions arise from a lack of adequate headroom, working in awkward body positions, oil-covered surfaces, and crowding by fellow workers.

8. Burns: In addition to corrosive chemicals which may be used, uninsulated steam pipes or valves which have not been disconnected present a potential hazard.

9. Eye Injuries: Potential hazards to the eyes include soot and fly ash, corrosive materials, and molten metal from welding or burning.

10. Emotional: working in confined spaces may contribute to feelings of panic, hysteria, claustrophobia, confusion, and disorientation.

It should always be assumed that any one or a combination of the factors here listed will exist when working in a confined space. The physiological and chemical hazards are often compounded by physical factors such as the tendency of gases lighter or heavier than air to pocket in irregular surfaces. Certain gases and chemical compounds have the potential to build up static electricity. Humidity and temperature can also transform a normal environment into a hazardous one.

4.0 ACTIONS PRIOR TO ENTRY

For all confined space work, an entry checklist system shall be implemented. The purpose of the entry checklist is to see that a checklist of precautions be taken before entry. The entry checklist is included at the end of this appendix. The checklist is to be completed by the site superintendent or project engineer, and signed by both the superintendent/engineer and/or the Site Health and Safety Officer prior to entry.

It is the responsibility of the superintendent/engineer to see that adequate steps are taken to eliminate and/or control the potential hazards and to see that all personnel understand the nature of the remaining hazards, and the precautions to follow.

The following steps must be completed prior to entry into a confined space.

1. The superintendent/engineer must complete the entry checklist and advise the Site Health and Safety Officer of scheduled entry. This must include estimates of the number of employees involved, time required to accomplish task, and the nature of the work.

2. The Site Health and Safety Officer must provide for training so that all employees have been made aware of the hazards associated with the job, how the hazards will be controlled, and the proper use of the appropriate respiratory protection (as necessary).

3. If the employee working in a confined space can be injured by an accidental influx of steam, liquid, compressed gas, or actuation of machinery; the energy source must be disconnected and/or locked out and tagged out before entry.

5.0 WORKING IN CONFINED SPACES

1. Testing for flammability levels and oxygen levels must be made before each entry. A general testing procedure to follow consists of a first test taken by inserting the probe into the confined atmosphere through a vent hole or some other opening. Where no openings exist, the entrance cover should be pried open on the downwind side just enough to allow insertion of the probe. The purpose of this initial test is to determine whether any lighter-than-air combustibles have accumulated in the structure. If this first test registers concentrations in the explosive range, additional ventilation is necessary before entry. If the initial test results are below the lower explosive limit, additional testing of the internal atmosphere is necessary. Testing should start at the bottom of the structure and continue adjacent to any pipes, conduits, or cables in the structure. The areas around all irregular surfaces of the interior should be tested. If the atmosphere tests free of combustibles and has an adequate oxygen level, testing for toxic vapors must be conducted. It is important that smoking be prohibited during testing.

   Testing for toxic gas levels should begin with the organic vapor analyzer (OVA). Background levels outside the confined space will need to be obtained. After establishing the background level, the probe can be used to determine levels within the confined space. It is important that levels be measured throughout the depth of the structure. If the confined space registers an OVA reading of 10 parts per million (ppm) above background levels, half-mask respiratory protection with combined organic vapor/acid gas cartridges will be utilized for entry into the confined space. An OVA reading of 50 ppm above background will require the use of full-face respiratory protection with the combined organic vapor/acid gas cartridges. For levels of 100 ppm above background, employees must use either a self-contained breathing apparatus (SCBA) or a supplied-air respirator with a five-minute escape bottle for entry and work in the confined space.

Testing for hydrogen sulfide (H_2S) is also necessary prior to entry. Draeger tubes can determine the concentration of H_2S in the confined space. Hydrogen sulfide has a characteristic "rotten-egg" odor. If this odor has been noticed in the area of the confined space, it should be anticipated that the Draeger tube will record positive. If the Draeger tube records positive for the presence of H_2S, SCBAs or supplied-air respirators with five-minute escape bottles must be worn during the entry and work in the confined space.

2. Means of emergency egress must be provided (ladders, etc.) as necessary.

3. Employees entering the confined space must be provided with all necessary protective equipment such as protective clothing, protective gloves, and boots. Determination of the protective equipment must be made by the Health and Safety Officer based upon the nature of the work required.

4. A minimum of three employees are required to be in attendance for a confined-space entry. In addition to the employee actually entering the confined space, a standby observer is necessary. The observer is to remain at the entrance to the confined space and is not to be sent away to obtain materials or supplies. The standby observer must be physically capable and fully equipped to carry out a rescue. Contact between the standby observer and the worker in the confined space (either visual, voice, or line) must be maintained at all times. Observers must be provided with all equipment (SCBA, etc.) necessary for emergency entrance into the confined space. In the event of an emergency, the standby

observer will indicate to a third employee that assistance is necessary. It is the function and responsibility of the third employee to notify the appropriate site personnel for emergency assistance. After notification of site personnel, the third employee can provide assistance to the rescue.

5. Low-voltage portable lights must be used in spaces without adequate lighting.

6. In flammable atmospheres, measures must be taken to reduce the possibility of sparks. Only explosion-proof electric tools and lights shall be used in potentially flammable atmospheres. Grounding, double insulation, and ground fault interrupters do not prevent sparking. Only non-sparking hand tools can be used in potentially flammable atmospheres.

7. In confined spaces where an accidental influx of steam, liquid, compressed gas, or the actuation of equipment is possible; the energy source must be disconnected and/or locked out/tagged out before entry.

8. Since static charges can ignite flammable vapors, the following condition should be avoided: High-velocity steam flow in a steam lance, high-velocity compressed air for ventilation, high-velocity flow of carbon dioxide fire extinguishers, clothing made of nylon, rayon, or dacron. These conditions can produce static electricity. When ventilating a confined space, the metallic parts of the ventilating device and duct work should be electrically bonded to the confined space being ventilated.

9. No smoking or the carrying of matches into a confined space is allowed.

10. All compressed gas cylinders (other than the respiratory equipment) should remain outside the confined space to help prevent accidental discharge, leakage, or rupture within the spaces.

11. All cutting torches must be removed from a confined space when not in use. Removal will prevent possible gas accumulation by leakage into the area.

12. Safety harnesses attached to a lifeline must be worn when making an entry into a confined space. If it is not practical to keep the lines attached, the harnesses shall be worn and the lines kept ready at the confined space entry point.

13. When doing hot work such as welding, cutting, burning, or other spark-producing operations in a confined space, watch the flammable concentration indicator. If the concentration of flammable vapors exceeds 10 percent of the lower explosive limit (LEL), stop the hot work until the confined space can be further ventilated.

6.0 TRAINING

Prevention of employee injuries is accomplished when employees are properly trained and well equipped to recognize, understand, and control the hazards they could encounter.

All employees involved in entry of confined spaces, including emergency and rescue personnel, must receive instructions regarding the hazards, safety procedures, and the established company procedures which apply to the work.

Employees who work around, but not in, confined spaces must receive warnings which acquaint them with the hazards associated with unauthorized confined-space entry.

Refresher training should be conducted on an annual basis.

Training should consist of:

1. A review of the hazards which may be encountered;

2. Procedures implemented to safeguard against the hazards;

3. Precautions to be followed by the employees;

4. Entry checklist system;

5. Hands-on practice with the necessary instrumentation;

6. Review of the training for air-supplied respiratory equipment.

An employee training sign-off sheet must be filled out for each training session. A sign-off sheet is included at the end of this appendix.

CONFINED SPACE
ENTRY CHECKLIST

Project Number and Name: ______________________________

Job Description: ______________________________

Employees Assigned: ______________________________ Date: ______________

______________________________ Time: ______________

____

____

Precautions to be taken

1. Have employees been trained? ______
2. Combustible Gas level (recorded in percent LEL) ______
3. Oxygen level (recorded in percent of atmosphere) ______
4. Organic Vapor Analyzer reading (ppm total hydrocarbon) above background level ______
5. Draeger tube reading for H_2S ______
6. Mechanical ventilation used ______
7. Electrical equipment grounded and insulated ______
8. Measures implemented to reduce static charged ______
9. Protective equipment necessary ______
   Type of respiratory protection
   - Protective clothing ______
   - Gloves ______
   - Boots ______
10. Emergency Procedures
    - Safety Harnesses/Life lines ______
    - Self contained respiratory protection ______
    - Communications ______
    - Observation ______
    - Fire extinguisher ______

______________________________ Superintendent/Engineer

______________________________ Site Health & Safety Officer

CONFINED SPACE ENTRY
TRAINING SESSION

Date:______________________

Employees attending:

________________________	________________________
________________________	________________________
________________________	________________________
________________________	________________________
________________________	________________________
________________________	________________________
________________________	________________________
________________________	________________________

Session content:

1. Review of potential hazards
2. Safeguard procedures
3. Precautions to be followed by the employees
4. Entry permit system
5. Instrumentation practice
6. Review of training for air-supplied respiratory protection
7. Employee booklets

Instructor: ____

Project Number and Name__________________________________

APPENDIX C

EMERGENCY INFORMATION

APPENDIX C

EMERGENCY INFORMATION

Local Emergency Contacts

	Base Phone	Off-Base Phone
Ambulance	4444	869-4444
Industrial Medical Clinic (Bldg. 16)	3173	869-3173
Fire Department	4333	869-3333
Security	3053	869-3053
Alameda Hospital	9-522-3700	522-3700
Emergency Room	9-523-4357	523-4357

Canonie Emergency Contacts

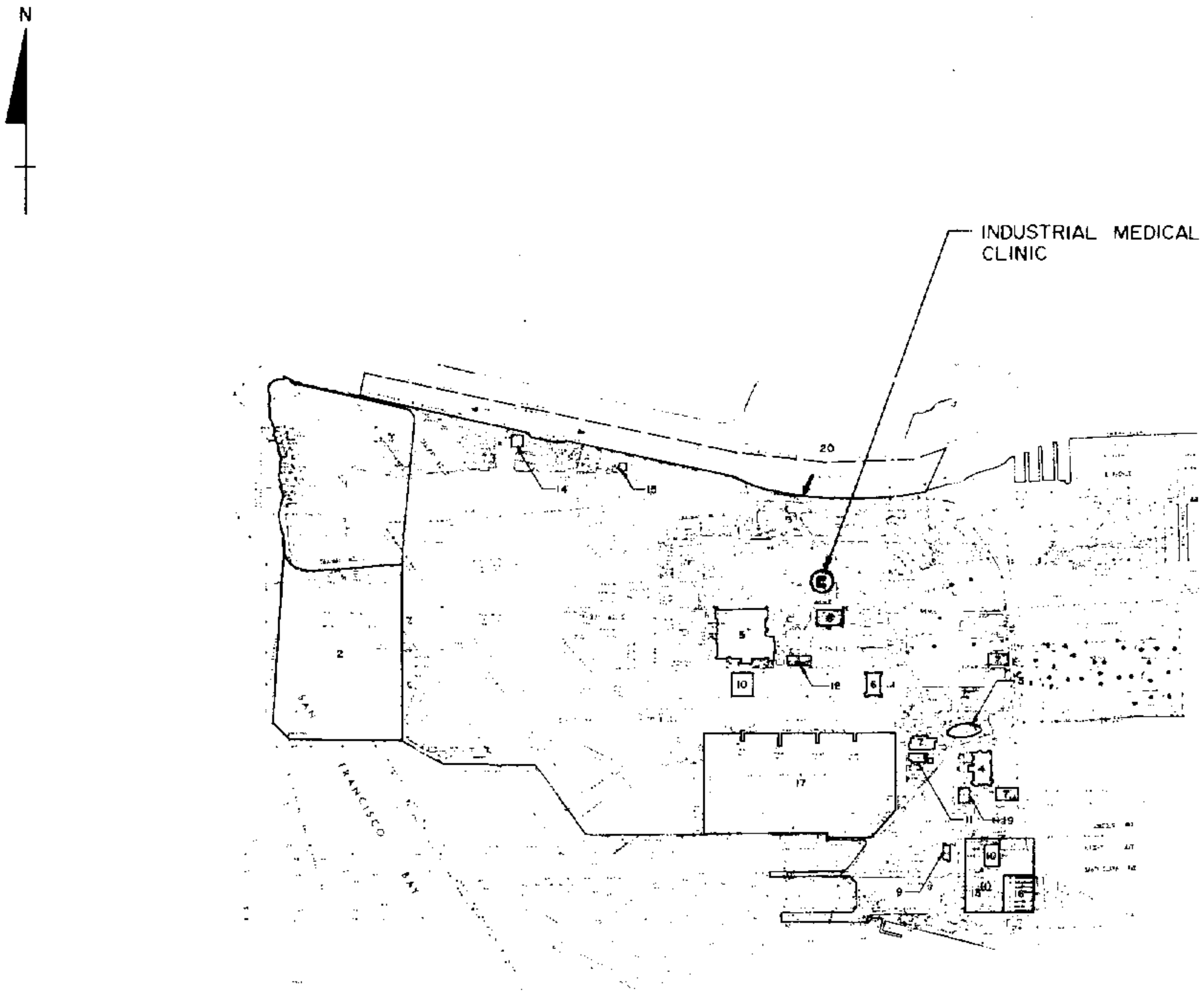
James Babcock	(415) 573-8012
Tami Renkoski	(219) 926-8651
Richard K. Beres	(415) 573-8012

Hospital Emergency Route

Alameda Hospital:

From the main gate, follow Main Street to Atlantic Avenue. Turn left on Atlantic Avenue heading east.

From the east gate, go straight on to Atlantic Avenue heading east. Take Atlantic Avenue to Webster Street (California Highway 61). Turn right on to Webster Street heading south. Take Webster Street two blocks south to Buena Vista Avenue. Turn left on to Buena Vista Avenue heading east. Take Buena Vista for 1.7 miles east to Willow Street. Turn right on to Willow Street heading south. Take Willow Street nine blocks south to Clinton Avenue. The hospital is at 2070 Clinton Avenue on the southwest corner of Clinton Avenue and Willow Street.



NOTES:

1. THE AREA OF SITE 13 INCLUDES THE AREAS OF SITES 10 AND 16.

LEGEND:

Site No.	Site Description
1	1943-1956 Disposal Site
2	West Beach Landfill
3	Area 97 (Aviation Gasoline Tanks)
4	Building 360 (Plating Shop, Engine Cleaning Shop, Paint Shop, and Paint Stripping Shop)
5	Building 5 (Plating Shop, Paint Stripping Shop, Cleaning Shop, and Paint Shop)
6	Building 41 (Aircraft Intermediate Maintenance Dept.)
7	Buildings 162, 459, and 547 (Service Stations)
8	Building 114 (Pest Control Area and Separator Pit)
9	Building 410 (Paint Stripping)
10	Buildings 400 and 530 (Missile Rework Operations)
11	Building 14 (Engine Test Cell)
12	Building 10 (Power Plant)
13	Oil Refinery
14	Fire Training Area
15	Buildings 301 and 389 (Storage Area)
16	Cans C-2 Area
17	Seaplane Lagoon
18	Station Sewer System (Not on Site)
19	Yard D-13 (Hazardous Waste Solvents)
20	Estuary (Oakland Inner Harbor)

SCALE
1000 0 1000 2000 FEET

REFERENCE:
U.S. NAVY MAP

INDUSTRIAL MEDICAL CLINIC
LOCATION PLAN
NAVAL AIR STATION
ALAMEDA, CALIFORNIA

PREPARED FOR

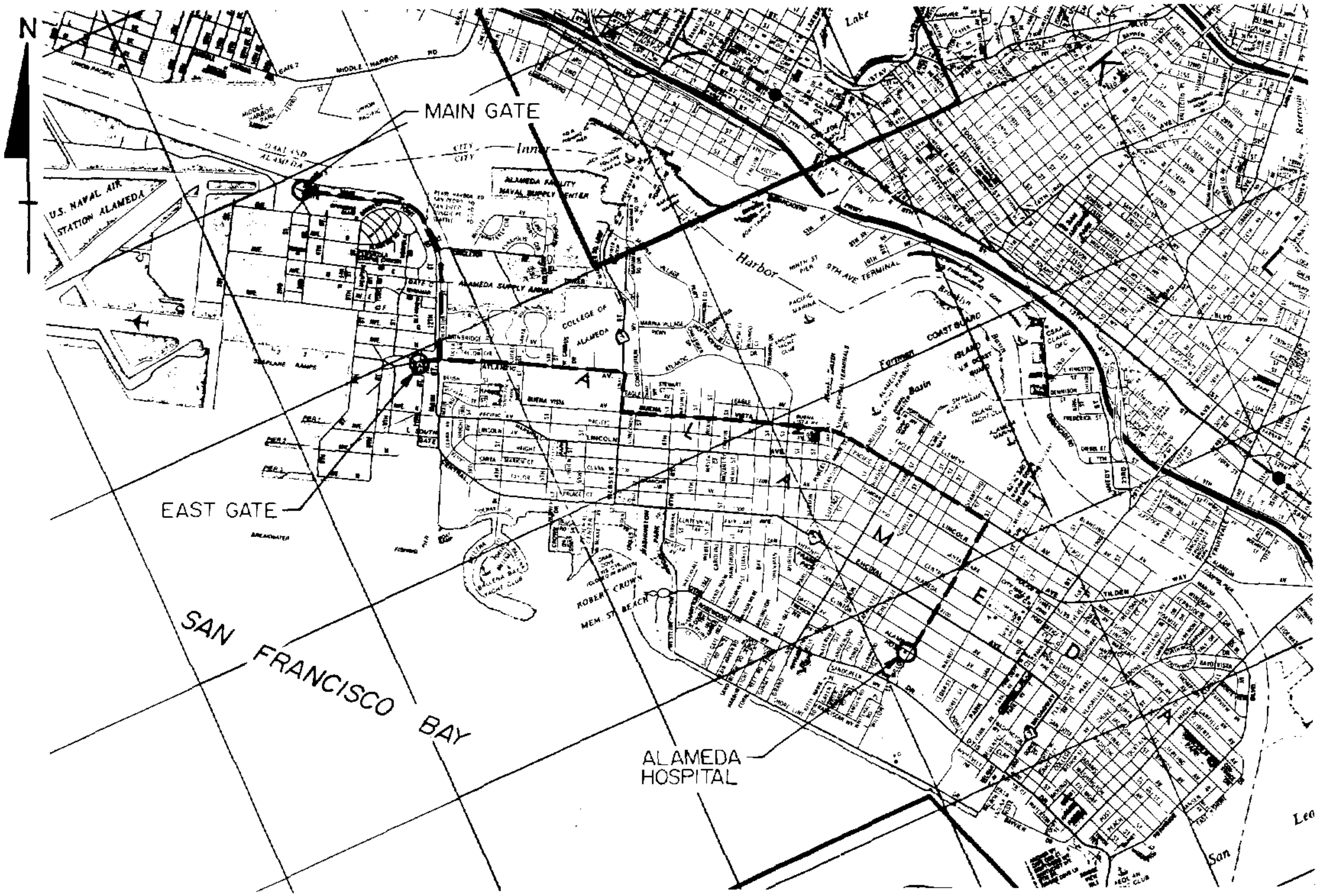
WESTERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
SAN BRUNO, CALIFORNIA

CanonieEnvironmental

DATE: 7-27-88 SCALE: AS SHOWN	FIGURE C-1	DRAWING NUMBER 86-018-E51

REVISIONS	NO.	DATE

DRAWN BY	LEA 7-27-88	CHECKED BY / APPROVED BY	DRAWING NUMBER 86-018-E51



LEGEND:

— — — EMERGENCY ROUTE

SCALE

0 0.5 MILES

EMERGENCY ROUTE TO
ALAMEDA HOSPITAL

PREPARED FOR

WESTERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
SAN BRUNO, CALIFORNIA

Canonie Environmental

DATE: 12-8-88	FIGURE C-2	DRAWING NUMBER 86-018-B50
SCALE: AS SHOWN		

DRAWING NUMBER 86-018-B50

CHECKED BY | APPROVED BY

DRAWN BY JWV 12-8-88

REVISIONS NO. DATE

APPENDIX D

RESPIRATORY PROTECTION PROGRAM

APPENDIX D

RESPIRATORY PROTECTION PROGRAM

1.0 INTRODUCTION

Respiratory protection for hazardous waste sites consists basically of two types of protection: air purifying and atmosphere supply. Each type has unique features which make it suitable for specific uses. After expected atmosphere conditions have been determined, the specific type of respiratory protective equipment may be selected.

In all cases, only respirators approved by the National Institute of Occupational Safety and Health (NIOSH) will be used. The final choice of the respirator to be used rests with the Canonie Environmental Services Corp.'s health and safety staff. Appendix A contains the complete respirator decision logic developed under the Occupational Safety and Health Act (OSHA) standards completion program.

2.0 AIR-PURIFYING RESPIRATORS

Air-purifying respirators consist of a facepiece and an air-purifying device, usually removable cartridges. Air-purifying respirators selectively remove specific airborne contaminants (particulates, gases, vapors, fumes) from ambient air by filtration, absorption, adsorption, or chemical reactions. They are approved for use in atmospheres containing specific chemicals up to designated concentrations.

Air purifying respirators may not be used in atmospheres which are immediately dangerous to life and health (IDLH):

> "Immediately dangerous to life or health" means conditions that pose an immediate threat to life or health or conditions that pose an immediate threat of severe exposure to contaminants, such as radioactive materials, which are likely to have adverse cumulative or delayed effects on health. (30 Code of Federal Regulations (CFR) 11.3 (t)).

The purpose of establishing an IDLH exposure concentration is to see that the worker can escape without injury or irreversible health effects from an IDLH concentration in the event of failure of the respiratory protective equipment. The IDLH is considered a maximum concentration above which only highly reliable breathing apparatus providing maximum worker protection is permitted. Since IDLH values are conservatively set, any approved respirator may be used up to its maximum use concentration below the IDLH.

In establishing the IDLH concentration the following factors are considered:

1. Escape without loss of life or irreversible health effects. Thirty minutes is considered the maximum permissible exposure time for escape.

2. Severe eye or respiratory irritation or other reactions which would prevent escape without injury.

The IDLH concentration should be determined from the following sources:

1. Specific IDLH provided in the literature such as the American Industrial Hygienist Association (AIHA) Hygienic Guides;

2. Human exposure data;

3. Acute animal exposure data;

4. Where such data are lacking, acute toxicological data from analogous substances may be considered.

Air-purifying respirators have limited use at hazardous waste sites and can be used only when the ambient atmosphere contains sufficient oxygen (19.5 percent, 30 CFR Part 11.90 [a]).

Air-purifying respirators operate in the negative-pressure mode except for powered air-purifying respirators (PAPRs) which maintain a positive facepiece pressure (except at maximal breathing rates). There are three types of air-purifying devices:

1. particulate filters;

2. cartridges and canisters which contain sorbents for specific gases and vapors;

3. combination devices.

Their efficiencies vary considerably even for closely related materials.

Cartridges usually attach directly to the respirator facepiece. Combination cartridges contain layers of different sorbent materials and remove multiple chemicals or multiple classes of chemicals from the ambient air. Though approved against more than one substance, these cartridges are tested independently against single substances. Thus, the effectiveness of these cartridges against two or more substances has not been demonstrated. Filters may also be combined with cartridges to provide additional protection against particulates. A number of standard cartridges are commercially available. They are color coded to indicate the general chemicals or classes of chemicals against which they are effective (29 CFR Part 1910.134 [9]).

U.S. Mine Safety and Health Administration (MSHA) and NIOSH have granted approvals for manufacturers' specific assemblies of air-purifying respirators for a limited number of specific chemicals. Respirators should be used only for those substances for which they have been approved. Use of a sorbent shall not be allowed when there is reason to suspect that it does not provide adequate sorption efficiency against a specific contaminant. In addition, it should be noted that approval testing is performed at a given temperature and over a narrow range of flow rates and relative humidities; thus protection may be compromised in nonstandard conditions. The assembly that has been approved by MSHA and NIOSH to protect against organic vapors is tested against only a single challenge substance, carbon tetrachloride; its effectiveness for protecting against other vapors has not been demonstrated.

Most chemical sorbent cartridges are imprinted with an expiration date. They may be used up to that date as long as they were not opened previously. Once opened, they begin to absorb humidity and air contaminants whether or not they are in use. Their efficiency and service life decreases and therefore they should be used immediately. <u>Cartridges should be discarded after use. They should not be used for longer than one shift, or after breakthrough occurs, whichever comes first.</u>

Where a cartridge is being used against gases or vapors, the appropriate device shall be used only if the chemicals(s) have "adequate warning properties" (30 CFR Part 11.150). NIOSH considers a substance to have adequate warning properties when its odor, taste, or irritant effects are detectable and persistent at concentrations below the recommended exposure limit (REL). A substance is considered to have poor warning properties when its oder or irritation threshold is above the applicable exposure limit. Warning properties are essential to safe use of air-purifying respirators because these properties allow detection of contaminant breakthrough, should it occur. Warning properties are not foolproof because they rely on human senses which vary widely among individuals and in the same individual under varying conditions (e.g., olfactory fatigue), facepiece fit, or other malfunctions. OSHA permits the use of air-purifying respirators for protection against specific chemicals with poor warning properties provided that either 1. the service life of the sorbent is known and a safety factor has been applied or 2. the respirator has an approved end-of-service-life indicator.

2.1 Proper Use of Cartridge Respirators

1. Be sure there is no facial hair present to interfere with the facepiece seal.

2. Check to see that the respirator is clean and all parts are intact.

3. Specifically check that cartridges are in place, the adjustable straps are not broken, the exhalation valve is present and intact, the inhalation valves are present and intact, and the plastic lens is not badly scratched or cracked.

NEVER USE THE RESPIRATOR IF THESE PARTS ARE DEFECTIVE OR MISSING.

4. Pull the mesh harness over the lens for Scott-O-Vista Masks. For other full-face masks, pull the head harness over the lens.

5. Be sure the straps are fully extended.

6. Place the chin in first and pull the harness up and over the head. For half-mask respirators, there are two sets of headstraps. Tighten the temple straps first, and then the lower straps. If there is a strap at the top of the mask, tighten that one last, and only if necessary.

7. For the Scott mask, stroke the harness back over the head and adjust the neck straps to tighten the mask. The mask should be snug but not uncomfortably tight on the face.

2.2 Limitations and Restrictions on Cartridge Respirators

Cartridge respirators should never be used when contaminants in the air exceed the ratings for the cartridges, or in an atmosphere containing less than 19.5 percent oxygen.

Facial hair and eyeglass frames will interfere with the seal of a full-face piece and decrease the protection level of the mask. Special eyeglass holders will be provided to adapt glasses to fit inside the mask. Frames for glasses cannot be more that five inches wide. Contact lenses are never to be worn in areas requiring the use of respiratory protection.

2.3 Fit Test

Every time a respirator is worn, it must be fit tested by the methods described below.

2.3.1 Negative Pressure Test

1. Remove the cartridges from the respirator.

2. Put the respirator on and adjust it to fit properly.

3. Cover the cartridge ports with the hands and breathe in gently. The mask should collapse slightly and there should be no air entering mask through the face seal. Hold your breath for five seconds. If the mask remains sealed, go on to the next fit test.

4. If air enters through the face seal, adjust the mask again and repeat the test until no air leaks in.

2.3.2 Positive Pressure Test

1. Put the cartridges back on.

2. Remove the cover from the exhalation port (if there is one).

3. Cover the exhalation port with the hand.

4. Exhale slightly while covering the port.

5. The mask should expand slightly, but no air should leak out from around the seal.

6. If there is leakage, adjust the mask and repeat the test until there is no more leakage.

2.3.3 Amyl Acetate Test

1. After checking the respirator for all the proper parts, put on the respirator and adjust the fit.

2. Perform the negative and positive pressure tests.

3. While wearing the respirator, the safety officer will wave a vial of amyl acetate (which smells like bananas) near the face seal.

4. Move your head from side to side and up and down, speak normally, saying your name and address.

5. If any odor is detected, adjust the fit of the mask and repeat the test until no odor is noted.

3.0 SELF-CONTAINED BREATHING APPARATUS (SCBA)

A self-contained breathing apparatus (SCBA) usually consists of a facepiece connected by a hose and a regulator to an air source (compressed air, compressed oxygen, or an oxygen-generating chemical) carried by the wearer. Only positive-pressure SCBAs are recommended for entry into IDLH atmospheres. SCBAs offer protection against most types and levels of airborne contaminants. However, the duration of the air supply is an important planning factor in SCBA use. This is limited by the amount of air carried and its rate of consumption. Also, SCBAs are bulky and heavy, thus they increase the likelihood of heat stress and may impair movement in confined spaces. Generally, only workers handling hazardous materials or operating in contaminated zones require SCBAs. Under MSHA regulations in 30 CFR Part 11.79(a), SCBAs may be approved either 1. for escape only or 2. for both entry into and escape from a hazardous atmosphere. Escape only SCBAs are frequently continuous-flow devices with hoods that can be donned to provide immediate emergency protection. Employers should provide an escape SCBA and see that employees carry it where such emergency protection may be necessary.

Entry-and-escape SCBA respirators give workers untethered access to nearly all areas of the work site. However, this equipment decreases worker mobility, particularly in confined areas, due to both the bulk and weight of the units. Their use is particularly advisable when dealing with unidentified and unquantified airborne contaminants. There are two types of entry-and-escape SCBAs 1. open-circuit and 2. closed-circuit. In an open-circuit SCBA, air is exhaled directly into the ambient atmosphere. In a closed-circuit SCBA, exhaled air is recycled by removing the carbon dioxide with an alkaline scrubber and by replenishing the consumed oxygen with oxygen from a solid, liquid, or gaseous source. These units are also referred to as "rebreathers."

As required by MSHA/NIOSH 30 CFR Part 11.80, all compressed breathing gas cylinders must meet minimum U.S. Department of Transportation requirements for interstate shipment. (For further information, see 49 CFR Parts 173 and 176.) All compressed air, compressed oxygen, liquid air, and liquid oxygen used for respiration shall be of high purity and must meet all requirement of OSHA 29 CFR Part 1910.134(d). In addition, breathing air must meet or exceed the requirements of Grade D breathing air as specified in the Compressed Gas Association Pamphlet G-71 and American National Standards Institute standard ANSI Z86.1-1973.

Key questions to ask when considering whether an SCBA is appropriate are:

1. Is the atmosphere IDLH or is it likely to become IDLH? If yes, a positive-pressure SCBA should be used. A positive-pressure supplied-air respirator (SAR) with an escape SCBA can also be used.

2. Is the duration of air supply sufficient for accomplishing the necessary tasks? If no, a larger cylinder should be used, a different respirator should be chosen, and/or the work plans should be modified.

3. Will the bulk and weight of the SCBA interfere with task performance or cause unnecessary stress? If yes, use of an SAR may be more appropriate if conditions permit.

4. Will temperature effects compromise respirator effectiveness or cause added stress in the worker? If yes, the work period should be shortened or the mission postponed until the temperature changes.

3.1 Selection

The Scott 2.2 SCBA has been chosen for use at work sites requiring SCBAs. It includes a full-face mask and 30-minute air supply in a backpack harness. The mask is a pressure demand type which maintains a slight positive pressure inside the mask so that contaminated air should not leak into the mask. The SCBA provides the same protection as an airline respirator but is self contained so that a person is not restricted by the airline attached to the air supply.

3.2 Use

1. Before using the SCBA, check to see that all of the major parts are in working order. Specifically, check the mask lens and face seal, all hoses and couplings, and the harness.

2. Be sure the air tank gauge reads full.

3. Check out the equipment by opening the cylinder valve. Push in on the valve knob and rotate it counterclockwise until fully open. The warning signal should sound briefly and shut off.

4. Hold the facepiece to your face and inhale and exhale several times. You should be able to breathe easily without restrictions.

5. Open the purge valve briefly to check its operation. A free flow of air should be noted in the facepiece. Close the purge valve and note that there should no longer be any free airflow in the mask.

6. Test the low-pressure warning signal by closing the cylinder valve knob, pushing it in, and rotating it fully clockwise. Take slow, shallow breaths until the signal sounds. If it does not sound, repeat the test, breathing very slowly.

DO NOT USE THE SCBA IF THE WARNING SIGNAL DOES NOT SOUND, OR IF THE AIR CYLINDER IS NOT FULL.

7. To put the unit on, turn your back to the unit mounted on the wall and slide your arms into the shoulder straps as if putting on a jacket. If wall mounts are not in use, set the SCBA on its end on a table or have a co-worker hold it for you.

8. Step away from the wall, bend over lightly, pull down on the shoulder strap adjustment tabs to tighten the straps, and cinch the unit up on your back.

9. Buckle the waist belt and tighten it like a seatbelt.

10. Now slightly loosen the shoulder straps to allow the weight of the unit to rest on your hips.

11. Put on the facepiece chin first and pull the harness up and over your head. Stroke the harness down over the back of your head and adjust the neck straps to give a snug but comfortable fit.

12. Check to be sure the pressure gauge on the harness reads "full."

13. When working in an Exclusion Area, leave the area as soon as you hear the low-pressure alarm.

14. Before removing the SCBA, be sure to go to a clean area. Close the cylinder valve by reaching behind you and pushing in on the knob and turning it fully clockwise.

15. Now remove the facepiece by pulling it up from the chin and over your head.

16. Loosen the shoulder straps, unbuckle the waist belt, slide the unit off one shoulder, then off the other shoulder.

17. To change cylinders if a new one is needed, close the cylinder valve and separate the high-pressure hose by rotating the coupling counterclockwise, pull the toggle to release the cylinder band clamp, push on the yellow tab of the guarded hook behind the cylinder valve, and lift the cylinder up and out.

18. Slide the flat end and valve on the cradle of a fully charged cylinder upward through the band clamp, move the cylinder back until the hook on the back frame engages in the hanger on the cylinder and valve assembly. Be sure that hook guard latches into place.

19. While in the Exclusion Area, hook directly into the air-line system (if one is available), thus preserving the air supply in the 30-minute cylinder. To do this, fasten the pigtail hose line from the SCBA into an air line from the air trailer. Be sure to tug on the lines to ensure a secure fit.

20. To connect the pigtail and air line, pull back on the coupling collar, slide in the pigtail, and release the collar.

21. To leave the area, open the cylinder valve and disconnect the pigtail. The switch to the bottle supply will occur automatically.

3.3 Limitations

The major limitation stems from the 30-minute supply in the air tank. While the possibility is slim, a hose could rupture or, if a person slips and falls, the unit may be damaged. These occurrences are not likely, but one should be aware of them.

4.0 SUPPLIED-AIR RESPIRATORS (SARs)

Supplied-air respirators (also known as air-line respirators) supply air, never oxygen, to a facepiece via a supply line from a stationary source. SARs are available in pressure-demand positive-pressure and negative-pressure modes. Pressure-demand SARs with escape provisions provide the highest level of protection (among SARs) and are the only SARs recommended for use at hazardous waste sites. SARs are not recommended for entry into an IDLH atmosphere (MSHA/NIOSH 30 CFR Part 11) unless the apparatus is equipped with an escape SCBA.

The air source for SARs may be compressed air cylinders or a compressor that purifies and delivers ambient air to the facepiece. SARs suitable for use with compressed air are classified as "Type C" SARs as defined in MSHA/NIOSH 30 CFR Part 11. All SAR air-line couplings must be incompatible with the outlets of other gas systems used on-site in order to prevent a worker from connecting to an inappropriate compressed gas source [OSHA 29 CFR 1910.134 (d)]. SARs enable longer work periods than SCBAs and are less bulky. However, the air line impairs worker mobility and requires workers to retrace their steps when leaving the area. Also, the air line is vulnerable to puncture from rough or sharp surfaces, chemical permeation, damage from contact with heavy equipment, and obstruction from falling drums, etc. To the extent possible, all such hazards should be removed prior to use. When in use, air lines should be kept as short as possible (300 feet is the longest approved hose length for SARs), and other workers and vehicles should be kept away from the air line.

The use of air compressors as the air source from an SAR at the hazardous waste site is severely limited by the same concern that requires workers to wear respirators; that is, the questionable quality of the ambient air. On-site compressor use is limited by OSHA standards [29 CFR Part 1910.134 (d)].

Key questions to ask when considering SAR use are:

1. Is the atmosphere IDLH or likely to become IDLH? If yes, an SAR/SCBA combination or SCBA should be used.

2. Will the hose significantly impair worker mobility? If yes, the work task should be modified or other respiratory protection should be used.

3. Is there a danger of the air line being damaged or obstructed (e.g., by heavy equipment, falling drums, rough terrain, or sharp objects) or permeated and/or degraded by chemicals (e.g., by pools of chemicals)? If yes, either the hazard should be removed or another form of respiratory protection should be used.

4. If a compressor is the air source, is it possible for airborne contaminants to enter the air system? If yes, have the contaminants been identified and are efficient filters and/or solvents available that are capable of removing those contaminants? If no, either cylinders should be used as the air source or another form of respiratory protection should be used.

4.1 Selection

The Scott air-line respirator includes a full-face mask, and an SAR with an emergency supply of air for escape. The escape bottle is good for approximately five minutes.

4.2 System Description

This unit is a pressure demand type system which provides a constant positive pressure inside the mask so that no outside air should be able to leak into the mask.

The air supply may consist of a trailer containing 24 bottles of air, smaller 2- to 4-unit carts with manifolds for dispensing air, or possibly in vehicles fitted with air supply systems.

4.3 Use

1. Carefully check to see that all the major parts are present and working properly. These include the mask, the exhalation valve, the lens, the hose from the escape bottle, the hose couplings, and the harness.

2. Check all the couplings and connections for damage.

3. Check that the escape bottle gauge reads full.

4. To put on the air-line harness, place the shoulder strap over the right shoulder, buckle the waist belt, and adjust the shoulder strap and belt to fit comfortably.

5. The escape bottle should rest on the left hip.

6. Connect to the air line from the air trailer as follows: put the pigtail on the harness into the fitting, pull back on the collar, insert the air line, release the collar, rotate the collar away from the notched position, and pull on the air line to confirm that it is locked tight.

7. For use in vehicles fitted with supplied air, connect the pigtail airline from the harness into the fitting at the regulator in the vehicle, but only after checking the regulator to confirm that the air supply is full. Again, check the connection to confirm that it is good so that the pigtail does not become separated from the air supply. Check to see that the mask-mounted regulator is properly mounted on the mask.

8. Put the mask on the chin first, then pull the harness up and over the head.

9. Stroke the harness down over the head and adjust the neck straps for a snug but comfortable fit. If necessary, adjust the temple straps.

10. A free flow of air into the mask will occur until the mask is fitted properly on the face.

4.4 Escape

1. If an emergency arises, DO NOT PANIC.

2. Turn on the emergency air supply by pushing in on the valve knob and rotating it fully counterclockwise. Then disconnect the air line from the fixed source.

3. The switch from the air line to the bottle line will occur automatically upon opening the cylinder valve.

REMEMBER, THE EMERGENCY SUPPLY OF AIR IN THE BOTTLE IS ONLY GOOD FOR FIVE MINUTES, SO GET OUT OF THE CONTAMINATED AREA IMMEDIATELY.

4. Once the support area is reached, close the cylinder valve by pushing the knob and rotating it fully clockwise.

5. Remove the mask by lifting it up from the chin and over the head to release the head harness.

6. Unbuckle the waist belt and slide the shoulder strap off the shoulder.

4.5 Limitations

An air-line system may be used in any contaminated environment and provides clean, respirable air to the user. The air supply trailer and vehicle supplies are inspected and recharged daily. They are expected to provide an adequate supply of air for the full workshift.

The possible emergencies which can arise and require emergency egress include loss or depletion of the air supply; a break in the air line, possibly by a vehicle driving over it; and other ruptures in the air line by miscellaneous causes.

5.0 COMBINATION SELF-CONTAINED BREATHING APPARATUS/ SUPPLIED-AIR RESPIRATOR (SCBA/SAR)

A relatively new type of respiratory protection is available that uses a regulator to combine the features of an SCBA with an SAR. The user can operate the respirator in the SCBA or SAR mode through either the manual or automatic switching of air sources. This type of respirator allows entry into and exit from an area while using the self-contained air supply and extended work periods within a contaminated area while connected to the air line. It is particularly appropriate for workers who must travel an extended distance to a work area within a site and remain within that area for relatively long work periods (e.g., drum sampling). In such situations, workers would enter the site using the SCBA mode, connect to the airline during the work period, and shift back to the SCBA mode to leave the site.

The combination SCBA/SAR should not be confused with an SAR with escape provisions. The primary difference is the length of air time provided by the SCBA; the combination system provides up to 60 minutes of self-contained air, whereas the escape SCBA contains much less air, generally enough for only 5 minutes. NIOSH certification of the combination unit allows up to 20 percent of the available air time to be used during entry, while the SAR with escape provision is certified for escape only.

6.0 PROTECTION FACTOR

The level of protection that can be provided by a respirator is indicated by the respirator's protection factor. This number, which is determined experimentally by measuring facepiece seal and exhalation valve leakage, indicates the relative difference that the respirator can maintain between concentrations of substances outside and inside the facepiece. For example, the protection factor for full-facepiece air-purifying respirators is 50. This means, theoretically, that workers wearing these respirators should be protected in atmospheres containing chemicals at concentrations that are up to 50 times higher than the appropriate limits. One source of protection factors for various types of atmosphere-supplying (SCBA and SAR) and air-purifying respirators can be found in American National Standards Institute standard ANSI Z88.2-1980.

At sites where the identity and concentration of chemicals in air are known, a respirator should be selected with a protection factor that is sufficiently high so the wearer will not be exposed to the chemicals above the applicable limits. These limits include the American Conference of Governmental Industrial Hygienists' Threshold Limit Values (TLVs), the NIOSH Recommended Exposure Limits (RELs), and the OSHA Permissible Exposure Limits (PELs). These limits are designed to protect most workers who may be exposed to chemicals day after day throughout their working life. The OSHA PELs are legally enforceable exposure limits and are the minimum limits of protection that must be met.

It should be remembered that the protection provided by a respirator can be compromised in several situations, most notably:

1. If a worker has a high breathing rate;

2. If the ambient temperature is high or low;

3. If the worker has a poor facepiece-to-face seal.

At high breathing rates, positive-pressure SCBAs and SARs may not maintain positive pressure for brief periods during peak inhalation. Also, at high work rates, exhalation valves may leak. Consequently, positive-pressure respirators may offer less protection when working at higher than normal rates.

A similar reduction in protection may result from high or low ambient temperatures. For example, at high temperatures excessive sweat may cause a break in the face-to-facepiece seal. At very low temperatures, the exhalation valve and regulator may become ice-clogged due to moisture in the breath and air. Likewise, a poor facepiece seal--due to such factors as facial hair, missing teeth, scars, lack of or improper fit testing, etc. --can result in the penetration of airborne contaminants.

7.0 CONCLUSION

Ultimately, given that the proper equipment has been chosen, the protection afforded will be dependent upon how carefully the equipment is worn. If the equipment is abused or misused, the potential protection will be decreased. It is up to the individual worker to protect his or her health by using equipment properly.

REFERENCES

Connery, Jan, ed., Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, U.S. Department of Health and Human Services, National Institute for Occupational Safety and Health, U.S. Govenrment Printing Office, Washington, D.C.

APPENDIX E

SAMPLE DONNING AND DOFFING PROCEDURES FOR PERSONAL PROTECTIVE EQUIPMENT

APPENDIX E

SAMPLE DONNING AND DOFFING PROCEDURES FOR PERSONAL PROTECTIVE EQUIPMENT

1.0 SAMPLE DONNING PROCEDURES

1. Inspect the clothing and respiratory equipment before donning.

2. Adjust hard hat or headpiece, if worn, to fit user's head.

3. Open back closure used to change air tank (if suit has one) before donning suit.

4. Standing or sitting, step into the legs of the suit; ensure proper placement of the feet within the suit; then gather the suit around the waist.

5. Put on chemical-resistant safety boots under the feet of the suit. Tape the leg cuff over the tops of the boots.

   o If additional chemical-resistant boots are required, put these on now.

   o Some one-piece suits have heavy-soled protective feet. With these suits, wear short, chemical-resistant safety boots inside the suit.

6. Put sleeves of suit over arms as assistant pulls suit up and over the self-contained breathing apparatus (SCBA). Have assistant adjust suit around SCBA and shoulders to ensure restricted motion of the SCBA.

9. Put on hard hat, if needed.

10. Raise hood over head carefully so as not to disrupt face seal of SCBA mask. Adjust hood to give satisfactory comfort.

11. Begin to secure the suit by closing all fasteners on opening until there is only adequate room to connect the breathing hose. Secure all belts and/or adjustable legbands, headbands, and waistbands.

12. Connect the breathing hose while opening the main valve.

13. Have assistant first ensure that wearer is breathing properly and then make final closure of the suit.

14. Have assistant check all closures.

15. Have assistant observe the wearer for a period of time to ensure that the wearer is comfortable, psychologically stable, and that the equipment is functioning properly.

2.0 SAMPLE DOFFING PROCEDURES

2.1 Egress Doffing

If sufficient air supply is available to allow appropriate decontamination before removal:

1. Remove any extraneous or disposable clothing, boot covers, outer gloves, and tape.

2. Have assistant open the suit completely and lift the hood over the head of the wearer and rest it on top of the SCBA tank.

3. Remove arms, one at a time, from suit. Once arms are free, have assistant lift the suit up and away from the SCBA backpack--avoiding any contact between the outside surface of the suit and wearer's body--and lay the suit out flat behind the wearer. Leave internal gloves on, if any.

4. While sitting (if possible), remove both legs from the suit.

5. Follow procedure for doffing SCBA.

6. After suit is removed, remove internal gloves by rolling them off the hand, inside out.

7. Remove internal clothing and thoroughly cleanse the body.

If the low-pressure warning alarm has sounded, signifying that approximately 5 minutes of air remain:

1. Remove disposable clothing.

2. Quickly scrub and hose off, especially around the entrance/exit zipper.

3. Open the zipper enough to allow access to the regulator and breathing hose;

4. Immediately attach an appropriate canister to the breathing hose (the type and fittings should be predetermined). Although this provides some protection against any contamination still present, it voids the certification of the unit.

5. Follow Steps 1 through 8 of the regular doffing procedure above. Take extra care to avoid contaminating the assistant and wearer.

2.2 Decontamination of PPE

This section employs the use of the NIOSH/OSHA/EPA/USCG Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, October 1985, p.p. 8-18-8-20, as a source.

Clothing Reuse

Chemicals that have begun to permeate clothing during use may not be removed during decontamination and may continue to diffuse through the material towards the inside surface, presenting the hazard of direct skin contact to the next person who uses the clothing.

Where such potential hazards may develop, clothing should be checked inside and out for discoloration or other evidence of contamination (see next section, *Inspection*). This is particularly important for fully-encapsulating suits, which are generally subject to reuse due to their cost. Note, however, that negative (i.e., no chemical found) test results do not necessarily preclude the possibility that some absorbed chemical will reach the suit's interior.

At present, little documentation exists regarding clothing reuse. Reuse decisions must consider the known factors of permeation rates as well as the toxicity of the contaminant(s). In fact, unless extreme care is taken to ensure that clothing is properly decontaminated and that the decontamination does not degrade the material, the reuse of chemical protective clothing that has been contaminated with toxic chemicals is not advisable [4].

Inspection

An effective PPE inspection program will probably feature five different inspections:

- Inspection and operational testing of equipment received from the factory or distributor.
- Inspection of equipment as it is issued to workers.
- Inspection after use or training and prior to maintenance.
- Periodic inspection of stored equipment.
- Periodic inspection when a question arises concerning the appropriateness of the selected equipment, or when problems with similar equipment arise.

Each inspection will cover somewhat different areas in varying degrees of depth. Detailed inspection procedures, where appropriate, are usually available from the manufacturer. The inspection checklists provided in Table 8-9 may also be an aid.

Records must be kept of all inspection procedures. Individual identification numbers should be assigned to all reusable pieces of equipment (respirators may already have ID numbers) and records should be maintained by that number. At a minimum, each inspection should record the ID number, date, inspector, and any unusual conditions or findings. Periodic review of these records may indicate an item or type of item with excessive maintenance costs or a particularly high level of "down-time."

Storage

Clothing and respirators must be stored properly to prevent damage or malfunction due to exposure to dust, moisture, sunlight, damaging chemicals, extreme temperatures, and impact. Procedures must be specified for both pre-issuance warehousing and, more importantly, post-issuance (in-use) storage. Many equipment failures can be directly attributed to improper storage.

Clothing:

- Potentially contaminated clothing should be stored in an area separate from street clothing.
- Potentially contaminated clothing should be stored in a well-ventilated area, with good air flow around each item, if possible.
- Different types and materials of clothing and gloves should be stored separately to prevent issuing the wrong material by mistake.
- Protective clothing should be folded or hung in accordance with manufacturers' recommendations.

Respirators:

- SCBAs, supplied-air respirators, and air-purifying respirators should be dismantled, washed, and disinfected after each use.

Table 8-9. Sample PPE Inspection Checklists

CLOTHING

Before use:

- Determine that the clothing material is correct for the specified task at hand.
- Visually inspect for:
  - —imperfect seams
  - —non-uniform coatings
  - —tears
  - —malfunctioning closures
- Hold up to light and check for pinholes.
- Flex product:
  - —observe for cracks
  - —observe for other signs of shelf deterioration
- If the product has been used previously, inspect inside and out for signs of chemical attack:
  - —discoloration
  - —swelling
  - —stiffness

During the work task, periodically inspect for:

- Evidence of chemical attack such as discoloration, swelling, stiffening, and softening. Keep in mind, however, that chemical permeation can occur without any visible effects.
- Closure failure.
- Tears.
- Punctures.
- Seam discontinuities.

GLOVES

- BEFORE USE, pressurize glove to check for pinholes. Either blow into glove, then roll gauntlet towards fingers or inflate glove and hold under water. In either case, no air should escape.

FULLY-ENCAPSULATING SUITS

Before use:

- Check the operation of pressure relief valves.
- Inspect the fitting of wrists, ankles, and neck.
- Check faceshield, if so equipped, for:
  - —cracks
  - —crazing
  - —fogginess

RESPIRATORS

SCBA

- Inspect SCBAs:
  - —before and after each use
  - —at least monthly when in storage
  - —every time they are cleaned
- Check all connections for tightness.
- Check material conditions for:
  - —signs of pliability
  - —signs of deterioration
  - —signs of distortion
- Check for proper setting and operation of regulators and valves (according to manufacturers' recommendations).
- Check operation of alarm(s).
- Check faceshields and lenses for:
  - —cracks
  - —crazing
  - —fogginess

Table 8-9. (cont.)

Supplied-Air Respirators

- Inspect SARs:
  - —daily when in use
  - —at least monthly when in storage
  - —every time they are cleaned
- Inspect air lines prior to each use for cracks, kinks, cuts, frays, and weak areas.
- Check for proper setting and operation of regulators and valves (according to manufacturers' recommendations).
- Check all connections for tightness.
- Check material conditions for:
  - —signs of pliability
  - —signs of deterioration
  - —signs of distortion
- Check faceshields and lenses for:
  - —cracks
  - —crazing
  - —fogginess

Air-Purifying Respirators

- Inspect air-purifying respirators:
  - —before each use to be sure they have been adequately cleaned
  - —after each use
  - —during cleaning
  - —monthly if in storage for emergency use
- Check material conditions for:
  - —signs of pliability
  - —signs of deterioration
  - —signs of distortion
- Examine cartridges or canisters to ensure that:
  - —they are the proper type for the intended use
  - —the expiration date has not been passed
  - —they have not been opened or used previously
- Check faceshields and lenses for:
  - —cracks
  - —crazing
  - —fogginess

- SCBAs should be stored in storage chests supplied by the manufacturer. Air-purifying respirators should be stored individually in their original cartons or carrying cases, or in heat-sealed or resealable plastic bags.

Maintenance

The technical depth of maintenance procedures vary. Manufacturers frequently restrict the sale of certain PPE parts to individuals or groups who are specially trained, equipped, and "authorized" by the manufacturer to purchase them. Explicit procedures should be adopted to ensure that the appropriate level of maintenance is performed only by individuals having this specialized training and equipment. The following classification scheme is often used to divide maintenance into three levels:

- Level 1: User or wearer maintenance, requiring a few common tools or no tools at all.
- Level 2: Shop maintenance that can be performed by the employer's maintenance shop.
- Level 3: Specialized maintenance that can be performed only by the factory or an authorized repair person.

APPENDIX F

SAMPLE INSPECTION CHECKLISTS
FOR PERSONAL PROTECTIVE EQUIPMENT

APPENDIX F

SAMPLE INSPECTION CHECKLISTS FOR PERSONAL PROTECTIVE EQUIPMENT

CLOTHING

<u>Before Use:</u>

1. Determine that the clothing material is correct for the specified task at hand.

2. Visually inspect for:

   o imperfect seams;

   o nonuniform coatings;

   o tears;

   o malfunctioning closures.

3. Hold up to light and check for pinholes.

4. Flex product:

   o observe for cracks;

   o observe for other signs of shelf deterioration.

5. If the product has been used previously, inspect inside and out for signs of chemical attack:

   o discoloration;

   o swelling;

   o stiffness.

During the work task, periodically inspect for:

1. Evidence of chemical attack such as discoloration, swelling, stiffening, and softening. Keep in mind, however, that chemical permeation can occur without any visible effects;

2. Closure failure;

3. Tears;

4. Punctures;

5. Seam discontinuities.

GLOVES

Before Use:

1. Pressurize glove to check for pinholes. Either blow into glove, then roll gauntlet towards fingers; or inflate glove and hold under water. In either case, no air should escape.

FULLY ENCAPSULATING SUITS

Before Use:

1. Check the operation of pressure relief valves.

2. Inspect the fitting of wrists, ankles, and neck.

3. Check faceshield, if so equipped, for:

   o cracks;

   o crazing;

   o fogginess.

RESPIRATORS

Self-Contained Breathing Apparatus (SCBA):

1. Inspect SCBAs:
   - o before and after each use;
   - o at least monthly when in storage;
   - o every time they are cleaned.
2. Check all connections for tightness.
3. Check material conditions for:
   - o signs of pliability;
   - o signs of deterioration;
   - o signs of distortion.
4. Check for proper setting and operation of regulators and valves (according to manufacturers' recommendations).
5. Check operation of alarm(s).
6. Check faceshields and lenses for:
   - o cracks;
   - o crazing;
   - o fogginess.

Supplied-Air Respirators (SARs):

1. Inspect SARs:

   - o daily when in use;
   - o at least monthly when in storage;
   - o every time they are cleaned.

2. Inspect air lines prior to each use for cracks, kinks, cuts, frays, and weak areas.

3. Check for proper setting and operation of regulators and valves (according to manufacturers' recommendations).

4. Check all connections for tightness.

5. Check material conditions for:

   - o signs of pliability;
   - o signs of deterioration;
   - o signs of distortion.

6. Check faceshields and lenses for:

   - o cracks;
   - o crazing;
   - o fogginess.

Air-Purifying Respirators:

1. Inspect air-purifying respirators:

   o before each use to be sure they have been adequately cleaned;

   o after each use;

   o during cleaning.

2. Check material conditions for:

   o signs of pliability;

   o signs of deterioration;

   o signs of distortion.

3. Examine cartridges be sure that:

   o they are the proper type for the intended use;

   o the expiration date has not been passed;

   o they have not been opened or used previously.

4. Check faceshields and lenses for:

   o cracks;

   o crazing;

   o fogginess.

REFERENCES

Connery, Jan, ed., 1985, Occupational Health and Safety Guidance Manual for Hazardous Waste Site Activities, U.S. Department of Health and Human Services, National Institute for Occupational Safety and Health, U.S. Government Printing Office, Washington, D.C.

APPENDIX G

IN-USE MONITORING OF PERSONAL PROTECTIVE EQUIPMENT

APPENDIX G

IN-USE MONITORING OF PERSONAL PROTECTIVE EQUIPMENT

The wearer must understand all aspects of the clothing operation and its limitations. During equipment use, workers should be encouraged to report any perceived problems or difficulties to their supervisor(s). These malfunctions include, but are not limited to:

1. Degradation of the protective ensemble;
2. Perception of odors;
3. Skin irritation;
4. Unusual residues on personal protective equipment;
5. Discomfort:
    - o Resistance to breathing,
    - o Fatigue due to respirator use;
6. Interference with vision or communication;
7. Restriction of movement;
8. Personal responses such as rapid pulse, nausea, and chest pain.

If a supplied-air respirator is being used, all hazards that might endanger the integrity of the air line should be removed from the working area prior to use. During use, air lines should be kept as short as possible, and other workers and vehicles should be excluded from the area.

APPENDIX H

DRUM HANDLING

APPENDIX H

DRUM HANDLING

All handling of containers should be kept to a minimum. Provision for overpacking and spill containment should be made before any drums are moved or sampled. Remote handling equipment such as a backhoe, loader, forklift truck with a drum handler, and hydraulic drum opener should be used whenever possible. Drum carts should be used for all manual handling of drums if the drums cannot be handled remotely.

When opening drums, the following precautions must be followed:

1. If a supplied-air respiratory protection system is used, place a bank of air cylinders outside the work area and supply air to the operators via airlines and escape SCBAs. This enables workers to operate in relative comfort for extended periods of time.

2. Protect personnel by keeping them at a safe distance from the drums being opened. If personnel must be located near the drums, place explosion-resistant plastic shields between them and the drums to protect them in case of denotation. Locate controls for drum opening equipment, monitoring equipment, and fire suppression equipment behind the explosion-resistant plastic shield.

3. If possible, monitor continuously during opening. Place sensors of monitoring equipment, such as colorimetric tubes, dosimeters, radiation survey instruments, explosion meters, organic vapor analyzers, and oxygen meters as close as possible to the source of contaminants, i.e., at the drum opening.

4. Use the following remote-controlled devices for opening drums:

   o Pneumatically operated impact wrench to remove drum bungs.

   o Hydraulically or pneumatically operated drum piercers.

   o Backhoes equipped with bronze spikes for penetrating drum tops in large-scale operations.

5. Do not use picks, chisels, or firearms to open drums.

6. Hang or balance the drum opening equipment to minimize worker exertion.

7. If the drum shows signs of swelling or bulging, perform all steps slowly. Relieve excess pressure prior to opening and, if possible, from a remote location using such devices as a pneumatic impact wrench or hydraulic penetration device. If pressure must be relieved manually, place a barrier such as explosion-resistant plastic sheeting between the worker and bung to deflect any gas, liquid, or solids which may be expelled as the bung is loosened.

8. Open exotic metal drums and polyethylene or polyvinyl chloride-lined (PVC-lined) drums through the bung by removal or drilling. Exercise caution when manipulating these containers.

9. Do not open or sample individual containers within laboratory packs.

10. Reseal open bungs and drill openings as soon as possible with new bungs or plugs to avoid explosions and/or vapor generation. If an open drum cannot be resealed, place the drum into an overpack. Plug any openings in pressurized drums with press-venting caps set to a 5-psi (pounds per square inch) release to allow venting of vapor pressure.

11. Decontaminate equipment after each use to avoid mixing incompatible wastes.

APPENDIX I

EMPLOYEE MONITORING EQUIPMENT CALIBRATION PROCEDURES

APPENDIX I

EMPLOYEE MONITORING EQUIPMENT CALIBRATION PROCEDURES

1.0 INTRODUCTION

Included in this appendix, are standard operating procedures (SOPs) for calibrating the various types of monitoring instruments for this project. Variations may exist for different brands of a particular instrument; when this occurs calibration will follow the procedures dictated by the manufacturer.

2.0 NOISE MONITORING EQUIPMENT CALIBRATION

An acoustical calibrator may be implemented in checking the overall accuracy of sound measuring equipment. It consists of a small, stable sound source that fits over the microphone and generates a predetermined sound level within a fraction of a decibel. If the meter reading deviates from the known level of calibration, it may be adjusted to alleviate this error. The acoustical calibration procedure supplements the electrical calibration incorporated in some meters to check the gain of all electrical components following the microphone. Sound level calibrators should be used only with the microphones for which they are intended in order to avoid errors and microphone damage.

Relevant calibration information such as date, time, location, employee identification (ID) number, type of equipment [brand, serial number (if applicable)] should be noted in the daily site log or by the site safety officer (SSO) to be placed on file.

2.1 Century Organic Vapor Analyzer

Calibration of an OVA when the instrument is used in the survey mode is accomplished according to the following protocol:

1. The "Gas Select" control is preset to the desired dial indication prior to turning on the instrument. The instrument is factory set to read out directly in terms of methane in air.

2. Move the INSTRUMENT Switch to ON and allow five minutes for warm up.

3. To set the audible alarm to a predetermined level, first turn the PUMP switch to ON, then adjust the meter pointer to the desired alarm level, using the CALIBRATE ADJUST (zero) knob. Turn the Alarm Level Adjust Knob on the back of the Readout Assembly until the alarm is just audible. Adjust the speaker volume with the VOLUME Knob. If the earphone is used, plug in and readjust the volume as desired. The instrument is then preset to activate the alarm when the level exceeds that of the setting.

4. Move the CALIBRATE Switch to X10 and adjust the meter reading to zero with the CALIBRATE ADJUST (zero) Knob.

5. Check that the PUMP Switch is ON and observe the SAMPLE FLOW RATE Indicator. Indication should be approximately 2 units.

6. Open the H2 TANK VALVE one turn and observe the reading on the H2 TANK PRESSURE Indicator. (Approximately 150 psi of pressure is required for each hour of operation.)

7. Open the H2 SUPPLY VALVE one-half to one turn and observe the reading on the H2 SUPPLY PRESSURE Indicator.

8. Confirm that the meter is still reading zero (readjust if required).

9. Depress the igniter button. There will be a slight "pop" as the hydrogen ignites and the meter pointer will move upscale of zero. Immediately after ignition, release the igniter button. Do not depress igniter button for more than six seconds. If burner does not ignite, let instrument run for several minutes and try again. After ignition, the meter pointer will indicate the background level of the organic vapor to which it is calibrated. This background level is nulled out using the CALIBRATE ADJUST (zero) Knob.

The OVA is calibrated daily using specially obtained calibration gases purchased from compressed gas manufacturers. A certified cylinder of organic-free air and a certified cylinder of an organic vapor, such as methane, at a known concentration, are purchased for calibration purposes. Each gas is used to fill separate calibration gas bags.

After the OVA has warmed up at the start of each day's use, the OVA is first calibrated to the zero gas standard. The zero gas bag is filled with a quantity of the organic-free gas, and the calibration gas bag is filled with a quantity of the known concentration organic gas. Each bag has a valved sampling tube, allowing the OVA operator to control the flow of the gas from the bag. The OVA is calibrated to the organic-free gas by connecting the tube of the gas bag to the inlet port of the OVA. The valve to the bag is opened, and the OVA meter reading is monitored. The CALIBRATE ADJUST knob is adjusted until the OVA meter reads 0.0. The zero gas is sampled for an additional 15 seconds to verify the zero calibration.

After the zero calibration is established, the zero gas bag valve is closed and the bag detached from the OVA. The known standard gas bag is connected to the inlet port of the OVA, and the valve to the bag is opened. After the meter reading has stabilized, the meter reading is adjusted to read the known concentration of the organic gas by adjusting the GAS SELECT knob on the OVA. The OVA meter reading is observed for 15 seconds to verify that the calibration is maintained. The gas bag valve is then shut, and the gas bag tube disconnected from the OVA.

After completing the calibration with the known standard, the OVA is again connected to the organic-free gas bag, and the zeroing of the OVA meter is checked. The OVA meter should read between 0.0 and 0.2 if calibration has been maintained. If the reading is within this range, a final check is performed by closing the valve to the organic-free gas bag. If the reading on the OVA meter is between 1.0 and 1.8, the OVA may now be used to monitor organic vapors. If either of the readings is not observed, the OVA must be re-calibrated, as described above.

Maintenance of the GC Unit

Maintenance of the GC unit will be conducted in accordance with the manufacturer's instructions. These instructions will be kept on file at the base office for the OVA GC unit and will be strictly observed. Additional copies of the instructions will be included with the OVA GC when shipment is made to the field.

2.2 Gilian Pump Sampling

Gilian pumps are used during solid sorbent, particulate, and metal monitoring. The calibration procedure to be utilized will be the same for all sampling media used during an integrated sampling period. The Gilian pump is calibrated by attaching the pump with the sampling media in-line to a thin film bubble meter via a tygon tube. The pump is started and allowed to operate for five minutes. The pump draws a thin film through a known volume in the test chamber. The time it takes to displace the known volume is used to electronically determine the flow rate at which the pump is operating. The flow rate is shown on a digital readout on the face of the thin film bubble meter. The desired flow rate can be achieved by adjusting the flow valve on the pump. When the desired flow rate is obtained, at least three additional readings, without any further adjustment of the valve will be obtained. These flow rates must remain within five percent of the set flow rate. The in-line sample media can be retained for additional calibrations.

2.3 Combustible Gas Indicator

Calibration of a combustible gas indicator is accomplished according to the following protocol:

1. Make sure instrument is clean and serviceable, especially sample lines and detector surfaces. Check battery charge level. If in doubt, charge battery as described in operating manual. Some

units have charge level meters, while others have only low-charge alarms.

2. Turn unit to ON position, and allow instrument sufficient warm-up time. Verify that sample pump is operable (if so equipped) when analyzer is ON.

3. With the intake assembly in combustible gas-free ambient air, zero the meter by rotating the zero control until the meter reads 0 percent LEL. Calibrate unit against known concentration of a calibration gas by rotating the calibration control (span or gain) until the meter reads the same concentration as the known standard. For those instruments with internal or non-adjustable span, a calibration curve should be prepared, using concentrations in the range expected to be encountered. If necessary, adjust alarm setting to appropriate combustibility setting.

4. Position intake assembly or cell in close proximity to area in question to get accurate reading. If alarm occurs, or if readings reach the action levels designated in the safety plan, personnel should evacuate area. If instrument malfunction occurs, personnel should evacuate area.

Some important factors to keep in mind during use are:

- Slow sweeping motions of intake or cell assembly will help assure that problem atmospheres are not bypassed. Cover an area from floor (ground) to ceiling, or above breathing zone.

- Operation of unit in temperatures outside of recommended operating range may compromise accuracy of readings or damage the instrument.

- o Platinum filament detectors may be poisoned (reduced in sensitivity) by gases such as leaded gasoline vapors (tetraethyl lead), sulfur compounds (mercaptans and hydrogen sulfide), and silicon compounds.

- o Many combustible gas detectors are not designed for use in oxygen-enriched or depleted atmospheres. If this condition is encountered or suspected, personnel should evacuate the area. Specially designed units are available for operation in such atmospheres.

- o An oxygen detector should always be used in conjunction with explosimeters.

- o Accurate data depends on regular calibration and battery charging. See operating manual.

- o More than any other factor, effective utilization of unit requires operator with full understanding of operating principles and procedures for the specific instrument in use.

2.4 Oxygen Meter

Calibration of an oxygen meter is accomplished according to the following protocol:

1. Make sure instrument is clean and serviceable, especially sample lines and detector surfaces. Consult records on instrument maintenance to determine if detector solution should be changed. Some instruments will need this service after as little as 1 to 2 weeks of use.

2. Check battery charge level. If in doubt, charge battery as detailed in operating manual. Some units have charge level indicators while others have alarms that will indicate a low charge.

3. Verify that sample pump is operable (if so equipped) when analyzer is on. Turn instrument on and, using calibration knob on instrument, calibrate against fresh air (20.9 percent O_2) by aligning meter needle at 20.9 percent. If unit is equipped with alarm mode, set alarm at desired level.

4. A quick field check can be accomplished by exhaling into the sensor, this should cause a definite drop in O_2 readings and activate any alarms. Allow for instrument warm-up, if necessary, before entering site to take readings.

5. Position intake assembly or sensor in close proximity to area in question to get accurate reading. If alarm occurs, personnel should evacuate area, unless equipped with supplied air equipment suitable for use in an IDLH atmosphere.

Some important factors to keep in mind during use are:

- Slow sweeping motions may assist in the prevention of bypassing problem areas.

- Operation of instrument in temperatures outside of manufacturer-specified operating range may compromise accuracy of readings or damage unit.

- Presence of known interfering gases, especially oxidants, can affect readings (for example the Edmont Model 60-400 Oxygen Monitor has interferences of the following gases in concentrations greater than 0.25 percent or 2,500 ppm: SO_2, fluorine, chlorine, bromide, iodines and nitrogen oxides). See the operating manual for unit being used.

- The oxygen detector can also be poisoned (decrease in sensitivity) by exposure to various gases. Some detectors are poisoned by concentration of mercaptans and hydrogen sulfide greater than or equal to 1 percent. See operating manual for unit being used.

- When relying on alarm mode for warnings of oxygen deficient atmospheres, a manual check of the alarm function at regular intervals is recommended.

- Wherever applicable, protect instrument with a disposable cover to prevent contamination.

- Most units will have rechargeable battery packs that provide continuous operation for 8 to 12 hours. Recharging batteries prior to expiration of the specified interval will insure operation while on a site.

- More than any other factor, effective utilization of unit requires operator with full understanding of operating principles and procedures for the specific instrument in use.

2.5 Radiation Meter

Calibration of a radiation meter is accomplished in accordance with the following generalized procedures. The specific protocols presented in the instruction manuals accompanying the instrument must be consulted for particular calibration procedures.

1. Choose an instrument or interchangeable detector tube which is correlated to the radioactive constituents anticipated by the investigation work plans for the project.

2. Turn the selector switch to standby or to the warm-up position and allow the instrument to warm-up for one to two minutes. After warm-up, turn the instrument selector switch to the battery check position and check the battery strength.

3. Turn the range selector switch to the appropriate scale factor (e.g., 100X, 10X, 1X, 0.1X) and check or calibrate instrument with a radioactive check source. Evaluate the instrument response in relation to the calibration source, and tune the instrument response to match the calibration. Note: At a minimum, Coleman-type lantern mantles may be used as a check source, since the mantles are coated with radioactive thorium oxide.

4. Turn audio switch on, if an audio warning signal is desired. Choose a needle response action (fast/slow), and turn the range selector to the most sensitive setting. The instrument is now ready to utilize in radiation surveys.

APPENDIX J

LEVELS OF PROTECTION FOR PERSONNEL

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This appendix consists of Part 6 Levels of Protection, from the United States Environmental Protection Agency's (EPA's) Standard Operating Safety Guides, July 1988.

PART 6

LEVELS OF PROTECTION

I. INTRODUCTION

Response personnel must wear protective equipment when there is a probability of contact with hazardous substances that could affect their health. This includes vapors, gases, or particulates that may be generated by site activities, and direct contact with skin-affecting substances. Full facepiece respirators protect lungs, gastrointestinal tract, and eyes against airborne toxicants. Chemical-resistant clothing protects the skin from contact with skin destructive and absorbable chemicals. Good personal hygiene limits or helps prevent ingestion of material.

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

- Level A: Should be worn when the highest level of respiratory, skin, and eye protection is needed.
- Level B: Should be worn when the highest level of respiratory protection is needed, but a lesser degree of skin protection is needed.
- Level C: Should be worn when a lesser level of respiratory protection is needed than Level B. Skin protection criteria are similar to Level B.
- Level D: Should be worn only as a work uniform and not on any site with respiratory or skin hazards. It provides no protection against chemical hazards.

The Level of Protection selected should be based on the hazard and risk of exposure.

Hazard: Type and measured concentration of the chemical substance in the ambient atmosphere and its toxicity.

Risk: Potential for exposure to substances in air, splashes of liquids, or other direct contact with material due to work being done.

In situations where the type of chemical, concentration, and possibilities of contact are not known, the appropriate Level of Protection must be selected based on professional experience and judgment until the hazards can be better characterized.

Personnel protective equipment reduces the potential for contact with toxic substances. Additionally, safe work practices, decontamination, site entry protocols, and other safety procedures further ensure the health and safety of responders. Together, these provide an integrated approach for reducing harm to response personnel.

III. LEVELS OF PROTECTION

A. Level A Protection

1. Personnel protective equipment

- Pressure-demand, supplied-air respirator approved by the Mine Safety and Health Administration (MSHA) and National Institute for Occupational Safety and Health (NIOSH). Respirators may be:

  -- pressure-demand, self-contained breathing apparatus (SCBA), or

  -- pressure-demand, airline respirator (with an escape bottle for atmospheres with, or having the potential for, Immediately Dangerous to Life and Health (IDLH) contaminant concentrations).

- Fully encapsulating chemical-resistant suit

- Coveralls*, or

- Long cotton underwear*

- Gloves (inner), chemical-resistant

- Boots, chemical-resistant, steel toe and shank. (Depending on suit construction, worn over or under suit boot)

- Hard hat* (under suit)*

- Disposable gloves and boot covers* (Worn over fully encapsulating suit)

- Cooling unit*
- 2-Way radio communications (inherently safe)

(*) optional

2. Criteria for selection

Meeting any of these criteria warrants use of Level A Protection:

- The chemical substance has been identified and requires the highest level of protection for skin, eyes, and the respiratory system.
- Substances with a high degree of hazard to the skin are suspected to be present, and skin contact is possible. Skin contact includes: splash, immersion, or contamination from atmospheric vapors, gases, or particulates.
- Operations must be conducted in confined, poorly ventilated areas until the absence of substances requiring Level A protection is determined.
- Direct readings on field Flame Ionization Detectors (FID) or Photoionization Detectors (PID) and similar instruments indicate high levels of unidentified vapors and gases in the air. (See Appendixes I and II.)

3. Guidance on selection

a. Fully encapsulating suits are primarily designed to provide a gas or vapor tight barrier between the wearer and atmospheric contaminants. Therefore, Level A is generally worn when high concentrations of airborne substances that could severely effect the skin are known or presumed to be present. Since Level A requires the use of a self-contained breathing apparatus more protection is afforded to the eyes and respiratory system.

Until air surveillance data are available to assist in the selection of the appropriate

Level of Protection, the use of Level A may have to be based on indirect evidence of the potential for atmospheric contamination or other means of skin contact with substances having severe skin affecting properties.

Conditions that may require Level A protection include:

- Confined spaces: Enclosed, confined, or poorly ventilated areas are conducive to build up of toxic vapors, gases, or particulates. An entry into an enclosed space does not automatically warrant Level A protection, but should serve as a cue to carefully consider the justification for a lower Level of Protection.

- Suspected or known highly toxic substances: Various substances that are highly toxic, especially through skin absorption, require Level A. Technical grade pesticides, concentrated phenolic compounds, Poison "A" compounds, fuming corrosives, and a wide variety of organic solvents are of this type. Carcinogens, and infectious substances known or suspected to be involved may require Level A protection. Field instruments may not be available to detect or quantify air concentrations of these materials. Until these substances are identified and their concentrations determined, maximum protection is necessary.

- Visible indicators: Visible air emissions from leaking containers or railroad or truck tank cars, as well as smoke from chemical fires and others, indicate high potential for concentrations of substances that could be extreme respiratory or skin hazards.

- Job functions: Initial site entries are generally walk-throughs in which instruments and visual observations are used to make a preliminary evaluation of the hazards.

In initial site entries, Level A should be worn when:

-- there is a probability for exposure to high concentrations of vapors, gases, or particulates.

-- substances are known or suspected of being extremely toxic directly to the skin or by being absorbed.

Subsequent entries are to conduct the many activities needed to reduce the environmental impact of the incident. Levels of Protection for later operations are based not only on data obtained from the initial and subsequent environmental monitoring, but also on the protective properties of suit material as well. The probability of contamination and ease of decontamination must also be considered.

Examples of situations where Level A has been worn are:

- Excavating soil to sample buried drums suspected of containing high concentrations of dioxin.

- Entering a cloud of chlorine to repair a valve broken in a railroad accident.

- Handling and moving drums known to contain oleum.

- Responding to accidents involving cyanide, arsenic, and undiluted pesticides.

b. The fully encapsulating suit provides the highest degree of protection to skin, eyes, and respiratory system given that the suit material resists chemicals during the time the suit is worn. While Level A provides maximum protection, all suit materials may be rapidly permeated and degraded by certain chemicals. These limitations should be recognized when specifying the type of fully encapsulating suit. Whenever possible, the suit material should be matched with the substance it is used to protect against.

B. Level B Protection

1. Personnel protective equipment

   - Pressure-demand, supplied-air respirator (MSHA/NIOSH approved). Respirators may be:

     -- pressure-demand, self-contained breathing apparatus, or

     -- pressure-demand, airline respirator (with escape bottle for IDLH or potential for IDLH atmosphere)

   - Chemical-resistant clothing (includes: overalls and long-sleeved jacket or hooded, one or two-piece chemical-splash suit or disposable chemical-resistant, one-piece suits)

   - Long cotton underwear*, or

   - Coveralls*

   - Gloves (outer), chemical-resistant

   - Gloves (inner), chemical-resistant

   - Boots (outer), chemical-resistant, steel toe and shank

   - Boot covers (outer), chemical-resistant (disposable)*

   - Hard hat (face shield*)

   - 2-Way radio communications (inherently safe)

   (*) optional

2. Criteria for selection

   Meeting any one of these criteria warrants use of Level B protection:

- The type and atmospheric concentration of toxic substances has been identified and requires a high level of respiratory protection, but less skin protection than Level A. These would be:

  -- Atmospheres with IDLH concentrations, but the substance or its concentration in air does not represent a severe skin hazard, or

  -- Chemicals or concentrations involved do not meet the selection criteria permitting the use of air-purifying respirators.

- The atmosphere contains less than 19.5% oxygen.

- It is highly unlikely that the work being done will generate high concentrations of vapors, gases or particulates, or splashes of material that will affect the skin.

- Atmospheric concentrations of unidentified vapors or gases are indicated by direct readings on instruments such as the FID or PID or similar instruments, but vapors and gases are not suspected of containing concentrations of skin toxicants. (See Appendixes I and II.)

3. Guidance on selection

a. Level B does not afford the maximum skin (and eye) protection as does a fully encapsulating suit since the chemical-resistant clothing is not considered gas, vapor, or particulate tight. However, a good quality, hooded, chemical-resistant, one-piece garment, with taped wrist, ankles, and hood does provides a reasonable degree of protection against splashes of liquids and lower concentrations of chemicals in the ambient air.

At most abandoned, outdoor hazardous waste sites, ambient atmospheric gas or vapor levels usually do approach concentrations sufficiently high to warrant Level A protection. In all but a few circumstances, Level B should provide the protection needed for initial reconnaissance.

Subsequent operations require a re-evaluation of Level B protection based on the probability of being splashed by chemicals, their effect on the skin, or the presence of hard-to-detect air contaminants. The generation of highly toxic gases, vapors, or particulates, due to the work being done must also be considered.

b. The chemical-resistant clothing required in Level B is available in a wide variety of styles, materials, construction detail, and permeability. One or two-piece garments are available with or without hoods. Disposable suits with a variety of fabrics and design characteristics are also available. Taping joints between the gloves, boots and suit, and between hood and respirator reduces the possibility for splash and vapor or gas penetration, but is not a gas tight barrier.

These factors and other selection criteria all affect the degree of protection afforded. Therefore, a specialist should select the most effective chemical-resistant clothing based on the known or anticipated hazards and job function.

Level B equipment does provides a high level of protection to the respiratory tract. Generally, if a self-contained breathing apparatus is required, selecting chemical-resistant clothing (Level B) rather than a fully encapsulating suit (Level A) is based on the need for less protection against known or anticipated substances affecting the skin. Level B skin protection is selected by:

- Comparing the concentrations of known or identified substances in air with skin toxicity data.
- Determining the presence of substances that are destructive to or readily absorbed through the skin by liquid splashes, unexpected high levels of gases, vapor, or particulates, or by other means of direct contact.
- Assessing the effect of the substance (at its measured air concentrations or

potential for splashing) on the small areas left unprotected by chemical-resistant clothing. A hooded garment, taped to the mask with boots and gloves taped to the suit, further reduces the area for potential skin exposure.

c. For initial site entry and reconnaissance at an open site, approaching whenever possible from upwind, Level B protection (with good quality, hooded, chemical-resistant clothing) should protect response personnel, providing the conditions described in selecting Level A are known or judged to be absent.

C. Level C Protection

1. Personnel protective equipment

- Air-purifying respirator, full-face, canister-equipped (MSHA/NIOSH approved)
- Chemical-resistant clothing (includes: coveralls or hooded, one-piece or two-piece chemical splash suit or chemical-resistant hood and apron; disposable chemical-resistant coveralls)
- Coveralls*, or
- Long cotton underwear*
- Gloves (outer), chemical-resistant
- Gloves (inner), chemical-resistant
- Boots (outer), chemical-resistant, steel toe and shank
- Boot covers (outer), chemical-resistant (disposable)*
- Hard hat (face shield*)
- Escape mask*
- 2-Way radio communications (inherently safe)

(*) optional

2. Criteria for selection

Meeting all of these criteria permits use of Level C protection:

- Oxygen concentrations are not less than 19.5% by volume.
- Measured air concentrations of identified substances will be reduced by the respirator below the substance's threshold limit value (TLV) and the concentration is within the service limit of the canister.
- Atmospheric contaminant concentrations do not exceed IDLH levels.
- Atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect any body area left unprotected by chemical-resistant clothing.
- Job functions do not require self-contained breathing apparatus.
- Direct readings are a few ppms above background on instruments such as the FID or PID. (See Appendices I and II.)

3. Guidance on selection

a. Level C protection is distinguished from Level B by the equipment used to protect the respiratory system, assuming the same type of chemical-resistant clothing is used. The main selection criterion for Level C is that atmospheric concentrations and other selection criteria permit wearing air-purifying respirators.

The air-purifying device must be a full-face respirator (MSHA/NIOSH approved) equipped with a canister suspended from the chin or on a harness. Canisters must be able to remove the substances encountered. Half-masks or cheek cartridge equipped, full-face masks should be used only with the approval of a qualified health and safety professional.

In addition, a full-face, air-purifying mask can be used only if:

- Substance has adequate warning properties.
- Individual passes a qualitative fit-test for the mask.
- Appropriate cartridge/canister is used, and its service limit concentration is not exceeded.
- Site operations are not likely to generate unknown compounds or excessive concentrations of already identified substances.

b. An air surveillance program is part of all response operations when atmospheric contamination is known or suspected. It is particularly important that the air be thoroughly monitored when personnel are wearing air-purifying respirators. Periodic surveillance using direct-reading instruments and air sampling is needed to detect any changes in air quality necessitating a higher level of respiratory protection.

c. Level C protection with a full-face, air-purifying respirator should be worn routinely in an atmosphere only after the type of air contaminant is identified, concentrations measured and the criteria for wearing air-purifying respirator met. A decision on continuous wearing of Level C must be made after assessing all safety considerations, including:

- The presence of (or potential for) organic or inorganic vapors or gases against which a canister is ineffective or has a short service life.
- The known (or suspected) presence in air of substances with low TLVs or IDLH levels.

- The presence of particulates in air.
- The errors associated with both the instruments and monitoring procedures used.
- The presence of (or potential for) substances in air which do not elicit a response on the instrument used.
- The potential for higher concentrations in the ambient atmosphere or in the air adjacent to specific site operations.

d. The continuous use of air-purifying respirators (Level C) must be based on the identification of the substances contributing to the total vapor or gas concentration and the application of published criteria for the routine use of air-purifying devices. Unidentified ambient concentrations of organic vapors or gases in air approaching or exceeding a few ppm above background require, as a minimum, Level B protection.

D. Level D Protection

1. Personnel protective equipment

- Coveralls
- Gloves*
- Boots/shoes, leather or chemical-resistant, steel toe and shank
- Safety glasses or chemical splash goggles*
- Hard hat (face shield*)
- Escape mask*

2. Criteria for selection

Meeting any of these criteria allows use of Level D protection:

- No contaminants are present.
- Work functions preclude splashes, immersion, or potential for unexpected inhalation of any chemicals.

Level D protection is primarily a work uniform. It can be worn only in areas where there is no possibility of contact with contamination.

III. PROTECTION IN UNKNOWN ENVIRONMENTS

In all incident response, selecting the appropriate personnel protective equipment is one of the first steps in reducing health effects from toxic substances. Until the toxic hazards at an incident can be identified and personnel safety measures commensurate with the hazards instituted, preliminary safety requirements must be based on experience, judgment, and professional knowledge.

Of primary concern in evaluating unknown situations are atmospheric hazards. Toxic concentrations (or potential concentrations) of vapors, gases, and particulates; low oxygen content; explosive potential; and the possibility of radiation exposure all represent immediate atmospheric hazards. In addition to making air measurements to determine these hazards, visual observation and review of existing data can help determine the potential risks from other materials.

Once immediate hazards, other than toxic substances have been eliminated, the initial on-site survey and reconnaissance continues. Its purpose is to further characterize toxic hazards and, based on these findings, refine preliminary safety requirements. As data is obtained from the initial survey, the Level of Protection and other safety procedures are adjusted. Initial data also provide information upon which to base further monitoring and sampling requirements. No one method can determine a Level of Protection in all unknown environments. Each situation must be examined individually.

IV. ADDITIONAL CONSIDERATIONS FOR SELECTING LEVELS OF PROTECTION

Other factors which should be considered in selecting the appropriate Level of Protection are:

A. Heat and Physical Stress

The use of protective clothing and respirators increases physical stress, in particular, heat stress on the wearer. Chemical protective clothing greatly reduces natural ventilation and diminishes the body's ability to regulate its temperature. Even in moderate ambient temperatures, the diminished capacity of the body to dissipate heat can result in one or more heat-related problems.

All chemical protective garments can be a contributing factor to heat stress. Greater susceptibility to heat stress occurs when protective clothing requires the use of a tightly fitted hood against the respirator face piece, or when gloves or boots are taped to the suit. As more body area is covered, less cooling takes place, increasing the probability of heat stress. Whenever any chemical-protective clothing is worn, a heat stress recovery monitoring program must occur. (See Part 7, Stress).

Wearing protective equipment also increases the risk of accidents. It is heavy, cumbersome, decreases dexterity, agility, interferes with vision, and is fatiguing to wear. These factors all increase physical stress and the potential for accidents. In particular, the necessity of selecting Level A protection should be balanced against the increased probability of heat stress and accidents. Level B and C protection somewhat reduces accident probability because the equipment is lighter, less cumbersome, and vision problems are less serious.

B. Air Surveillance

A program must be established for routine, periodic air surveillance. Without an air surveillance program, any atmospheric changes could go undetected and jeopardize response personnel. Surveillance can be accomplished with various types of air pumps and filtering devices followed by analysis of the filtering media; portable real-time monitoring instruments located strategically on-site; personal dosimeters; and periodic walk-through by personnel carrying direct-reading instruments. (See Part 10, Air Surveillance).

C. Decision-Logic for Selecting Protective Clothing

No adequate criteria, similar to the respiratory protection decision-logic, are available for selecting protective clothing. A concentration of a known substance in the air approaching a TLV or permissible exposure limit for the skin does not automatically warrant a fully encapsulating suit. A hooded, high quality, chemical-resistant suit may provide adequate protection. The selection of Level A over Level B is a judgment that should be made by a qualified individual considering the hazards and risk.

<u>Hazards:</u> The physical form of the potential contaminant must be considered. Airborne substances are more likely to contact personnel wearing non-encapsulating suits, which are not considered gas or vapor tight. Liquids contacting the skin are generally considered more hazardous than contact with vapors, gases and particulates.

Effect of the contaminant on skin:

- highly hazardous substances are those that are easily absorbed through the skin causing systemic effects, or that cause severe skin destruction.

- less hazardous substances are those that are not easily absorbed through the skin causing systemic effects, or that do not cause severe skin destruction

<u>Risk:</u> Concentration of the contaminant: The higher the concentration, the higher the probability of injury.

Work function: Site work activities dictate the probability of direct and indirect skin contact.

Instability of the situation: A higher Level of Protection should be considered when there is a probability of a release involving vapor or gases, splashes or immersion in liquids, or through the loss of container integrity.

D. Atmospheric Conditions

Atmospheric conditions such as stability, temperature, wind direction and wind velocity, as well as barometric pressure determine the behavior of contaminants in air or the potential for volatile material being released into the air. These parameters should be considered when determining the need for and Level of Protection required.

E. Work in the Exclusion Zone

For operations in the Exclusion Zone (area of potential contamination), different Levels of Protection may be selected, and various types of chemical-resistant clothing worn. This selection would be based on measured air concentrations, the job function, the potential for skin contact or inhalation of the materials present, and ability to decontaminate the protective equipment used. (See Part 8, Site Control - Work Zones).

G. Escape Masks

Carrying an escape, self-contained breathing apparatus of at least five minute duration, is optional in while wearing Level C or Level D protection. For initial site entry, a specialist should determine, on-a-case-by basis, whether they should be carried, or be strategically located in areas that have higher possibilities for harmful exposure.

V. VAPOR OR GAS CONCENTRATIONS AS INDICATED BY DIRECT-READING INSTRUMENTS

Instruments such as the FID and PID can be used to detect the presence of many organic vapors or gases either as single compounds or mixtures. Dial readings are frequently referred to, especially with unidentified substances, as total vapor and gas concentrations (in ppm). More correctly, they are deflections of the needle on the dial indicating an instrument response and do not directly relate to the total concentration in the air. As a guide to selecting Levels of Protection, based on dial readings, the following values could be used. They must not be used as the sole criteria for selecting Levels of Protection.