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WORK PLAN ADDENDUM NUMBER 7 REMEDIATION FOR COMPRESSED GAS CYLINDERS AT BARRANCAS NATIONAL CEMETERY NAS PENSACOLA FL

3/2/2007

CH2MHILL

Work Plan Addendum No. 07

Revision No. 01

Remediation of Compressed Gas Cylinders at Barrancas National Cemetery

Naval Air Station Pensacola

Pensacola, Florida

Contract No. N62467-01-D-0331
Contract Task Order No. 0043

March 2007

PREPARED FOR

NAVFAC
Naval Facilities Engineering Command

Department of the Navy,
Naval Facilities Engineering Command, Southeast
2155 Eagle Drive
North Charleston, South Carolina 29406

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Naval Air Station Pensacola
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Revision No. 01

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Submitted to:

NAVFAC
Naval Facilities Engineering Command

U.S. Naval Facilities Engineering Command Southeast

Prepared by:

CH2MHILL
Constructors, Inc.

115 Perimeter Center Place, N.E.
Suite 700
Atlanta, GA 30346

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March 2007

Prepared/Approved By:

Greg Wilfley, Project Manager _____ Date _____

Approved By:

Michael Halil, Deputy Program Manager _____ Date _____

Client Acceptance:

U.S. Navy Responsible Authority _____ Date _____

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Acronyms

AFCEE	Air Force Center for Environmental Excellence
AHA	Activity Hazard Analysis
CGA	Compressed Gas Association
CH2M HILL	CH2M HILL Constructors, Inc.
CMD	Cylinder Management Device
CMP	Contract Management Plan
CO	Contracting Officer
CO_2	carbon dioxide
COTR	Contracting Officer's Technical Representative
CTO	Contract Task Order
DOT	Department of Transportation
EISOPQAM	Environmental Investigative Standard Operating Procedures and Quality Assurance Manual (EPA)
EPA	U.S. Environmental Protection Agency
FDEP	Florida Department of Environmental Protection
GPS	Global Positioning System
HP	Hewlett Packard
HSP	Health and Safety Plan
IES	Integrated Environmental Services
IRCDQM	Installation Restoration Chemical Data Quality Manual (Navy)
LEL	Lower Explosive Level
MSD	Mass Selective Detector
MSDS	Material Safety Data Sheet
MSR	Monthly Status Report
MTDU	mobile thermal destruction unit
NAS	Naval Air Station
NAVFAC SE	Naval Facilities Engineering Command Southeast
OSHA	Occupational Safety and Health Administration
PM	Project Manager
PMO	Program Management Office
PPE	Personal Protective Equipment
QA	Quality Assurance
QC	Quality Control
RAC	Response Action Contract
RFB	Request for Bid

RFI	Request for Information
ROICC	Resident Officer in Charge of Construction
RPM	Remedial Project Manager
SAP	Sampling and Analysis Plan
SCBA	self-contained breathing apparatus
SOP	Standard Operating Procedure
TGM	Toxic Gas Monitor
USACE	U.S. Army Corps of Engineers

1.0 Introduction

CH2M HILL Constructors, Inc. (CH2M HILL) has been contracted by the Department of Navy, Naval Facilities Engineering Command Southeast (NAVFAC SE) to prepare this work plan addendum for site remediation of compressed gas cylinders at Barrancas National Cemetery, Naval Air Station (NAS) Pensacola, Florida. The work is being performed under Navy Response Action Contract (RAC) No. N62467-01-D-0331, Contract Task Order (CTO) 43 and in accordance with the management approach outlined in the Revised Contract Management Plan (CH2M HILL, 2003).

This work plan addendum fulfills the requirements established in the RAC, and will be used in planning and executing the work for this project at NAS Pensacola.

Based on current knowledge, specific portions of the work can be effectively planned, and where applicable, this work plan addendum presents the details associated with those specific work activities or tasks. Where detailed information regarding work activities is not currently known, a site strategy is provided. In these instances, future plans will be developed to meet the needs of the Navy and the Florida Department of Environmental Protection (FDEP), as necessary.

This work plan addendum is organized into seven sections. A brief description of each section is presented below.

1.0 **Introduction** includes a brief description of the project, the proposed project schedule, project communications and reporting requirements, and project deliverables.

2.0 **Excavation and Remediation Plan** provides the planned approach for performing the work at the NAS Pensacola site.

3.0 **Waste Management Plan** addresses the management and disposal of waste generated during the execution of the excavation work.

4.0 **Environmental Protection Plan** discusses environmental requirements or conditions specific to this site, and task-specific methods that will be employed to address these requirements and eliminate or minimize any potential impacts to the environment while conducting excavation and remediation work.

5.0 **Quality Control Plan** includes the planned quality control requirements for the project.

6.0 **Sampling and Analysis Plan** (SAP) provides the project sample locations, sample collection frequency, and the required laboratory analyses for samples collected during project activities. Standard Operating Procedures (SOPs) outline the sample collection methodology including sample handling, labeling, and required collection of quality assurance (QA) and quality control (QC) samples.

7.0 **References** lists the references cited in this work plan addendum.

The following support documents are presented as appendices to this work plan addendum:

- A Site-Specific Health and Safety Plan Including Activity Hazard
- B Submittal Register and Testing Plan Log
- C Transportation and Disposal Log
- D Cylinder Inventory Form
- E Hazardous Gas Leak Detector Specifications
- F Standard Operating Procedures
- G Project QC Manager's Resume and Appointment Letter
- H Project Schedule

1.1 Site Description

The site containing compressed gas cylinders is located at the Barrancas National Cemetery on NAS Pensacola, just west of Pensacola, Florida. The cylinders were originally discovered during the excavation of a grave site in late 2005. Three cylinders were excavated and relocated to an undeveloped area north of the active cemetery area. The first cylinder excavated was punctured during the excavation and vented its contents to the atmosphere. No injuries occurred during the incident. Among these cylinders, one was marked as containing carbon dioxide (CO_2). The contents of the other two cylinders could not be identified.

In January 2006, an electromagnetic survey was conducted by a CH2M HILL subcontractor, ARM Group, Inc., to locate possible anomalies in the unused portion of the cemetery (approximately 5.5 acres). The survey identified the locations of all ferrous metal objects under the ground surface by using a Model TM-6 magnetometer controller and a cesium-vapor magnetometer sensor array. All the locations were recorded into a global positioning system (GPS) unit. A total of 1,854 magnetic anomalies were located during the survey.

ARM Group, Inc. then generated a model of the magnetic signature of the three excavated gas cylinders and compared it to the anomalies detected at the site. After the analysis, it was determined that 174 of the anomalies were similar to the cylinder model; the remaining 1,680 were not likely to be cylinders and therefore would not be investigated further. In addition, seven areas of anomalies appeared as significantly larger than the cylinder model and thus could be verified as cluster areas of single cylinders. Subsequent discussions with the cemetery and Base personnel indicated that 16 of the 174 anomalies likely to be cylinders are located outside of the area to be utilized by the cemetery and therefore will not be investigated further. Therefore, 158 anomalies remain to be investigated.

This work plan addendum describes the activities to be performed during the excavation of the anomalies likely to be compressed gas cylinders, removal and treatment of any cylinder contents onsite, and disposal of the decommissioned cylinders as scrap metal.

1.2 Objectives

The project objectives are:

- Locate and mark the locations of 158 anomalies and boundaries of the 7 large anomaly areas.
- Excavate each anomaly point to a depth of 6 feet or to the groundwater table, whichever comes first to ensure full removal of any buried containers.
- Analyze the contents of the excavated cylinders onsite.
- Properly treat the contents of the cylinders onsite.
- Decommission each cylinder to render it unusable as a pressurized vessel.

Section 2.0 of this work plan addendum discusses the details of the excavation and remediation of the compressed cylinders at the site.

1.3 Project Schedule

The project is expected to begin in March 2007. A project schedule is provided in Appendix H. The schedule details all tasks, the proposed work breakdown structure for the scope of work, and the duration required to complete site remediation.

CH2M HILL will provide the resources necessary to complete the work within the timeframe presented in the final project schedule. The proposed site operations are 10 days onsite and 4 days offsite. Work will be scheduled as follows: 7:00 am to 17:30 pm for the first 9 days and 7:00 am to 12:00 pm on the last day of the 10-day work period. As an alternative, work operations may be scheduled for five 10-hour days per work period.

A detailed schedule outlining the critical path information will be provided in the form of a Gantt chart that will be attached to the Monthly Status Report (MSR).

The schedule will be resource loaded at the detail level and maintained weekly. A target schedule will be created and used to monitor progress. If activities fall behind schedule, a corrective action plan will be submitted to the Navy Remedial Project Manager (RPM) outlining the proposed remedy to be implemented. The schedule will be updated weekly and will be available at the weekly progress meetings.

Depending on the magnitude of adverse weather and its potential impact to the project schedule, time lost during the schedule work shift may be made up on an accelerated schedule, including working on scheduled off days.

1.4 Communications Plan

A communications matrix outlining the lines of communication for NAVFAC SE and CH2M HILL personnel is presented in Table 1-1.

TABLE 1-1
Communication Matrix
NAS Pensacola, Pensacola, FL

CH2M HILL Position	Navy Direct Report
Ray Tyler, Executive Sponsor	
Sid Allison, Program Manager	Richard Stanley, Contracting Officer (CO)
Mike Halil, Senior Project Manager	Dorothy Okamoto, Contracting Officer's Technical Representative (COTR)
Greg Wilfley, Project Manager	Bill Hill, Remedial Project Manager (RPM)

1.4.1 Project Organization

Table 1-2 lists the key team members who are scheduled to work on the project. The following discussion outlines the processes that will be employed to achieve effective communications among the project team. Overall, project communications procedures will clarify the flow of information that is expected to occur at the project level.

1.4.2 Communications with FDEP and EPA

All communications with the FDEP and the U.S. Environmental Protection Agency (EPA) will be conducted by Navy personnel. In addition to the standard communications, NAS Pensacola team meetings are typically used to disseminate information to the regulators. CH2M HILL will play an active role in the planning efforts that occur as part of the work for this project at NAS Pensacola.

TABLE 1-2
Project Personnel Directory
NAS Pensacola, Pensacola, Florida

Contact	Role	Address	Phone No.	Fax No.	E-mail
Bill Hill	Navy RPM	NAVFAC SE P.O. Box 190010 North Charleston, SC 29419-9010	(843) 820-7324	(843) 820-7465	william.j.hill@navy.mil
Sid Allison/ATL	Program Manager	115 Perimeter Center Place, N.E. Suite 700, Atlanta, GA 30346-1278	(770) 604-9182	(770) 604-9183	salliso2@ch2m.com
Mike Halil/JAX	Senior Project Manager	9428 Baymeadows Road, Suite 300, Jacksonville, FL 32256	(904) 733-8150	(352) 381-3916	mhalil@ch2m.com
Rich Rathnow/ORO	Program Health & Safety Manager	151 Lafayette Drive, Suite 110, Oak Ridge, TN 37830	(865) 483-9032	(865) 481-3541	rrathnow@ch2m.com

TABLE 1-2
Project Personnel Directory
NAS Pensacola, Pensacola, Florida

Contact	Role	Address	Phone No.	Fax No.	E-mail
Theresa Rojas/ATL	Program Quality Control Manager	115 Perimeter Center Place, N.E. Suite 700, Atlanta, GA 30346-1278	(770) 604-9182 EXT 568	(770) 604-9183	trojas@ch2m.com
Nancy Ballantyne/DEN	Program Compliance Coordinator	9191 South Jamaica Street, Englewood, CO 80112	720-286-5561	720-286-9590	nballant@ch2m.com
Lisa Schwan/ATL	Waste Coordinator	115 Perimeter Center Place, N.E. Suite 700, Atlanta, GA 30346-	(770) 604-9182, EXT 561	(770) 604-9183	lschwan@ch2m.com
Greg Wilfley/ATL	Project Manager	115 Perimeter Center Place, N.E. Suite 700, Atlanta, GA 30346-1278	(770) 604-9182 EXT 390	(770) 604-9183	gwilfley@ch2m.com
Tom Broz/ATL	Subcontracts Administrator	115 Perimeter Center Place, N.E. Suite 700, Atlanta, GA 30346-1278	(770) 604-9182 EXT 421	(678) 579-8146	tbroz@ch2m.com
Bethany Garvey/ATL	Project Chemist	115 Perimeter Center Place, N.E. Suite 700, Atlanta, GA 30346-1278	(770) 604-9182 EXT 496	(770) 604-9183	bethany.garvey@ch2m.com
Jeff Winnette	Site Superintendent	115 Perimeter Center Place, N.E. Suite 700, Atlanta, GA 30346-1278	(770) 604-9182 EXT 346	(770) 604-9183	jwinnett@ch2m.com
Phyllis Zerangue/NVR	Project QC Manager	1766 Sea Lark Lane, Navarre, FL32566-7472	(850) 939-8300 EXT 23	(850) 939-0035	pzerangu@ch2m.com
Will Knox/ATL	Site Health & Safety Specialist	115 Perimeter Center Place, N.E. Suite 700, Atlanta, GA 30346-1278	(770) 604-9182	(678) 579-8090	wknox@ch2m.com

ATL - Atlanta, GA; DEN – Denver, CO; JAX – Jacksonville, FL; NVR – Navarre, Florida; ORO – Oak Ridge, TN.

1.4.3 Communications with the Navy

The Project Manager (PM) or his designee(s) will actively communicate with Navy personnel through the use of weekly project status meetings, as well as other needed communications during period of heavy workload.

1.5 Project Control and Reporting

This section provides procedures and guidelines for managing the project schedule, budget, and reporting.

1.5.1 Project Status and Reporting Procedures

The PM will coordinate with the project controls group to determine the status of the project schedule and cost control reports each month. Project team members will provide the PM with project status updates for their areas of responsibility.

Schedule Status Procedures

The PM will coordinate with project team members (Site Superintendent and Project QC Manager) to determine the status of the following information for each scheduled activity:

- Start and end dates
- Project management milestones
- Percent complete
- Logic between activities

Cost Control Status Procedures

The PM will coordinate with project team members (Site Supervisor and Task Managers) regarding status cost control reports as follows:

- **Progress Updates** – Actual progress will be updated weekly by the Site Supervisor using the Weekly Job Status Report generated by the Field Engineer. Committed costs will be updated using the Purchase Requisition Form generated by the Project QC Manager. The updates will reflect progress through Sunday of each week.
- **Engineering Updates** – Committed costs and estimated total cost will be updated monthly for each budgeted activity using the project cost estimate in the Progress Update Report generated by the project controls group. The total cost will be estimated using the task estimate spreadsheet generated by the Site Supervisor. The updates will reflect progress through the final Friday of the month.
- **Labor and Expense Updates** – CH2M HILL labor and expenses to project controls will be updated by Wednesday morning each week.
- **Subcontractor Costs** – Subcontractor costs will be tracked during the weekly meeting.

Monthly Project Status Reporting Schedule

Monthly project status reports will be prepared by the PM and the project controls group. Project status reports include the following:

- View of project plan and progress
- Planned versus actual project costs
- Schedule
- Change log
- Completed milestones and significant future milestones

The MSR is utilized to communicate the project status to the Navy. The MSR is developed using project management milestones (identified below) and is presented in a P3 format to communicate project status to the Program Management Office (PMO) and NAVFAC SE. The PM will provide comments regarding each top task relating to the scope, schedule, and budget.

The Scheduling, Cost Control, and Cost Variance section of the MSR addresses schedule and cost variances. Any scope changes or scope growth occurring during the reporting period will be addressed in the cost section. Schedule impacts relating to planned versus actual and the rationale for changes to the schedule will be addressed in the schedule section. Indications as to whether costs at completion are within budgeted amounts and an explanation when planned versus actual data are not consistent will be provided in the cost variance section.

Project Management Milestones

The planned/actual top task budgets and milestones will be in the schedule each month. The following milestones have been identified as those needed to conduct reporting to the PMO and NAVFAC SE:

- Phases 1 and 2
  - Request for Bid (RFB) Issued
  - Cost Proposal submitted to NAVFAC SE
  - Negotiations
  - Revised Cost Proposal
  - Phase 3 Award
- Phase 3
  - Work Plan Approval
  - Air Permit Exemption
  - Pre-construction Conference
  - Mobilization for Response Action
  - Response Action Completed
  - Final Inspection
  - Project Acceptance
  - Site Construction Closeout
  - Draft Project Completion Report to NAVFAC SE
  - Final Project Completion Report submitted to NAVFAC SE

1.5.2 Work Breakdown Structure and Cost Codes

The work breakdown structure and cost codes have been provided in the Cost Proposal previously submitted to NAVFAC SE. Work breakdown structure follows the definable feature of work concept and flows along discrete manageable portions of the work.

1.5.3 Change Management

Changes to the project scope, schedule, or budget will be managed through a Request for Information (RFI) process. An RFI will be submitted when information is required from a team member. The purpose of a RFI is to document a specific problem, question, or concern,

and the answer or direction obtained in response to the RFI. The RFI may be originated by any team member (such as construction, engineering, management, or subcontractor).

The procedures for issuing a RFI are:

- List the appropriate distribution.
- Provide a complete description of the problem, question, or concern.
- Use input from engineering, construction, management, project controls and subcontractors, when required, to complete the RFI.
- Request a reasonable response date (typically 5 to 7 days).
- Sign the RFI and submit to document control for distribution.

The recipient will answer and sign the RFI and return it to CH2M HILL.

CH2M HILL will maintain an RFI log that will include the person originating the RFI, person responding, subject matter, and status of the RFI.

1.6 Project Deliverables

Major project deliverables include the MSRs and the Project Completion Report.

1.6.1 Monthly Status Reports

MSRs will be prepared to inform the RPM of the status, progress, and upcoming events of the project. The information required in the MSR is defined in Section 1.5.1 of this work plan addendum. A copy of the MSR will be submitted to the RPM no later than the 20th of the following month.

1.6.2 Project Completion Report

The Project Completion Report will be submitted within 60 days of the completion of demobilization from the project site and/or all waste is properly disposed of. CH2M HILL will submit a draft Project Completion Report to the RPM. This report will include a general description of project activities, summary of analytical data, summary of waste quantities disposed, and supporting documentation.

2.0 Excavation and Remediation Plan

The excavation and remediation entails the following field tasks:

- Mobilization
- Site preparation
- Survey and anomaly locating
- Cylinder excavation
- Cylinder sampling and analysis
- Cylinder management
- Backfill and site restoration
- Waste management
- Field documentation
- Demobilization

2.1 Mobilization

This field activity will consist of mobilization of personnel, equipment, subcontractors, and materials to the NAS Pensacola site and establishment of temporary facilities to conduct the field work. Office supplies, field equipment, and personal protective equipment (PPE) will also be stored in the field office. All equipment and heavy materials will be staged at the project site. Security will be present at the base gate; however, the subcontractor will be responsible for all equipment and materials left at the site.

2.1.1 Site Access

The project site is located inside a guarded area with limited security. Security clearance should be approved by the Navy to obtain an access badge. An access badge should be presented to the guard for daily entrance to the site. Subcontractors will be accompanied by badged CH2M HILL personnel to access the base and throughout their presence onsite.

2.2 Site Preparation

Following mobilization to the site and prior to site excavation, activities will be conducted to set up construction areas and safety zones, and to establish field equipment, utilities, and a mobile laboratory. Construction and roadway signs may also be set up in this phase of the project. In addition, an Air Permit Exemption will be acquired. Refer to Section 5.6 for further discussions regarding air permitting in the state of Florida.

The following subsections discuss details of the site preparation.

2.2.1 Utility Clearance and Work Zone Setup

A utility survey will be conducted at the site to identify possible subsurface utilities in the excavation zone. Locations of subsurface utilities will be marked and avoided.

Site Security

Although the excavation areas are located inside the security guarded area, any visitor can obtain a day pass from the guard to visit the cemetery where the site is located. Field equipment, the cylinder management device (CMD), electrical power generators, mobile laboratory, and chemical storage area will be secured/locked after work hours. CH2M HILL will coordinate with Base Security to set up project-specific security to protect field equipment and facilities.

Work Zone Setup

The locations of project operational areas are shown on Figure 2-1 Site Layout.

Safety Zone

The safety zones will be set up in the areas for chemical storage and in areas where active cylinder extraction, sampling, or processing work is being conducted. Access to chemical storage and the CMD trailer will be restricted and only authorized personnel will be allowed to enter those areas.

Chemical and Waste Storage Area

The chemical and waste storage area will be set up near the processing area (CMD trailer) and will include portable containment berms or drum spill kits. These areas will be readied to receive both chemical feedstock (such as sodium hydroxide) and waste materials.

Excavation Zones

Because there is little or no concern about surface contamination at the site, the Occupational Safety and Health Administration (OSHA) standard three-zone configuration (exclusion, contamination reduction, and support zones) for hazardous waste operations will be used in a modified format as detailed in the project-specific Health and Safety Plan (HSP) (Appendix A). The various zone boundaries will be set in place and marked using a combination of yellow caution tape and highly visible marker flags. The exact zone boundaries will be determined by the Site Supervisor and Site Health and Safety Specialist based on each day's work, and will change as excavation areas are cleared and new areas are established.

2.2.2 Establishment of Field Equipment, Utilities, and Mobile Laboratory

Field equipment, utilities (water and electricity), and a mobile laboratory will be set up and readied for use prior to beginning excavation and remediation activities.

Field Equipment

Field equipment for site excavation and remediation will include the following: air compressor, nitrogen and air compressors, CMD trailer, CMD computer control and video monitor stations, air monitoring instruments, and a meteorological station.

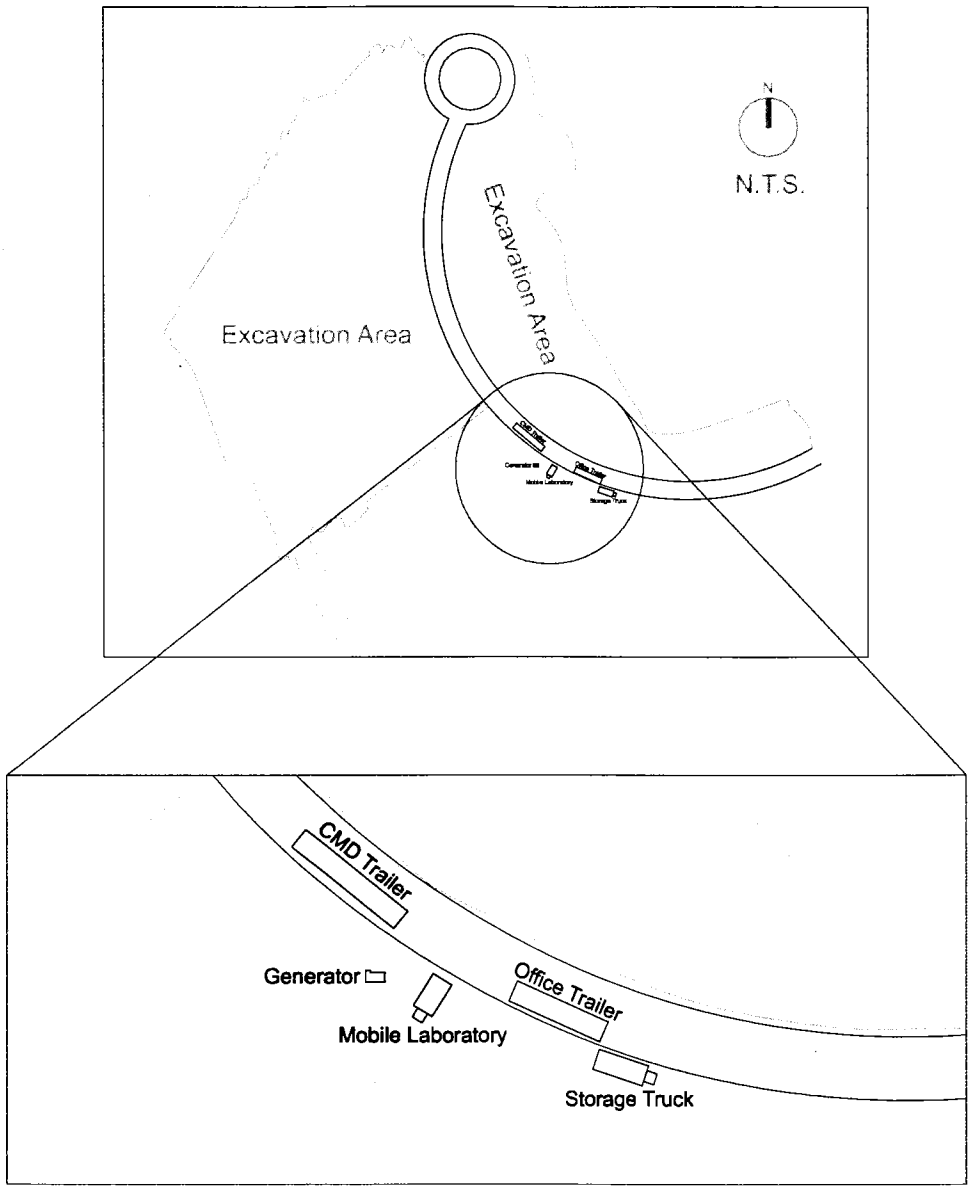


Figure 2-1 Site Layout
NAS Pensacola, Pensacola, FL

Air Compressor, Nitrogen and Breathing Air Generators

Nitrogen will be required for blanketing during CMD operations and for line cleaning when sampling. A pneumatically operated air knife will be utilized to uncover cylinder (see Appendix F). Sampling and cylinder handling operations will be performed in Level B. The air compressor, nitrogen and breathing air generators will be activated as soon as possible after mobilization in order to ensure sufficient time to service, inspect and measure the quality of the respective gases produced.

CMD and Associated Computer Control and Video Monitor Stations

The CMD is an explosion safe device used to sample and de-energize recovered cylinders. The CMD will be inspected and each component will be verified to be in good operational condition. All functions and valves that are remotely operated will be checked for operability. Operation of the CMD is discussed further in Section 2.5.1.

CMD computer control and video monitor stations will be set up in the office trailer. Control lines and video cables will be connected from the processing (CMD) trailer to the monitor stations. Electrical and pneumatic systems will be energized and all monitor and valves will be tested. Testing of each component will be recorded in the daily log.

Air Monitoring Instruments

Air monitoring instruments including a Matheson Toxic Gas Monitor (TGM) and an oxygen/lower explosive limit (LEL) monitor, gas-specific detectors, colorimetric indicator tubes, and photometric indicators will be located in the office trailer. These units will be placed on a designated shelf, plugged into chargers when not in use, and properly calibrated before and after each use. Specifications for the TGM unit are provided in Appendix E.

Meteorological Station

A small meteorological station will be placed on the roof of the office (command) trailer to monitor wind speed, wind direction, and temperature throughout the duration of the project. Wind speed and direction data will be used to guide evacuation or response actions in the case of an emergency situation involving the accidental release of a large quantity of gas. Temperature measurements will be used in determining when the heat stress monitoring program should be implemented.

Utilities

Electricity is not available at the site, thus an electrical power generator will be set up and connected to the CMD trailer, mobile laboratory, and office trailer.

A water source will not be located at the site; however, a storage tank and a delivery system (either a hose or water truck) will be required to meet water demand for the field operation.

Mobile Laboratory

The mobile laboratory will be connected to the site power supply and each of the instruments brought online. The system initialization and stabilization typically requires at

least 24 hours and will be initiated as soon as possible once electrical power has been established at the site.

The mobile laboratory is equipped with mass spectral and infrared detection systems to determine onsite the chemical nature of cylinder contents.

2.2.3 Stormwater Protection and Erosion Controls

It is estimated that the construction activities will disturb less than 1 acre of land. Accordingly, these activities are not subject to FDEP's Generic Permit for Stormwater Discharge from Large and Small Construction Activities. Erosion and sediment controls will be installed prior to any land disturbing activities. These controls will be maintained throughout the duration of the project to control erosion and stormwater run-on and run-off during excavation and site restoration.

2.3 Survey and Anomaly Locating

The 158 anomalies and 7 large areas of anomalies will be located by a geophysical survey subcontractor using a magnetometer. For the seven anomaly cluster areas, all corners and every 5 feet along the boundary will be located. The locations will be marked with pinflags and recorded in a GPS database.

2.4 Cylinder Excavation

2.4.1 Operational Readiness

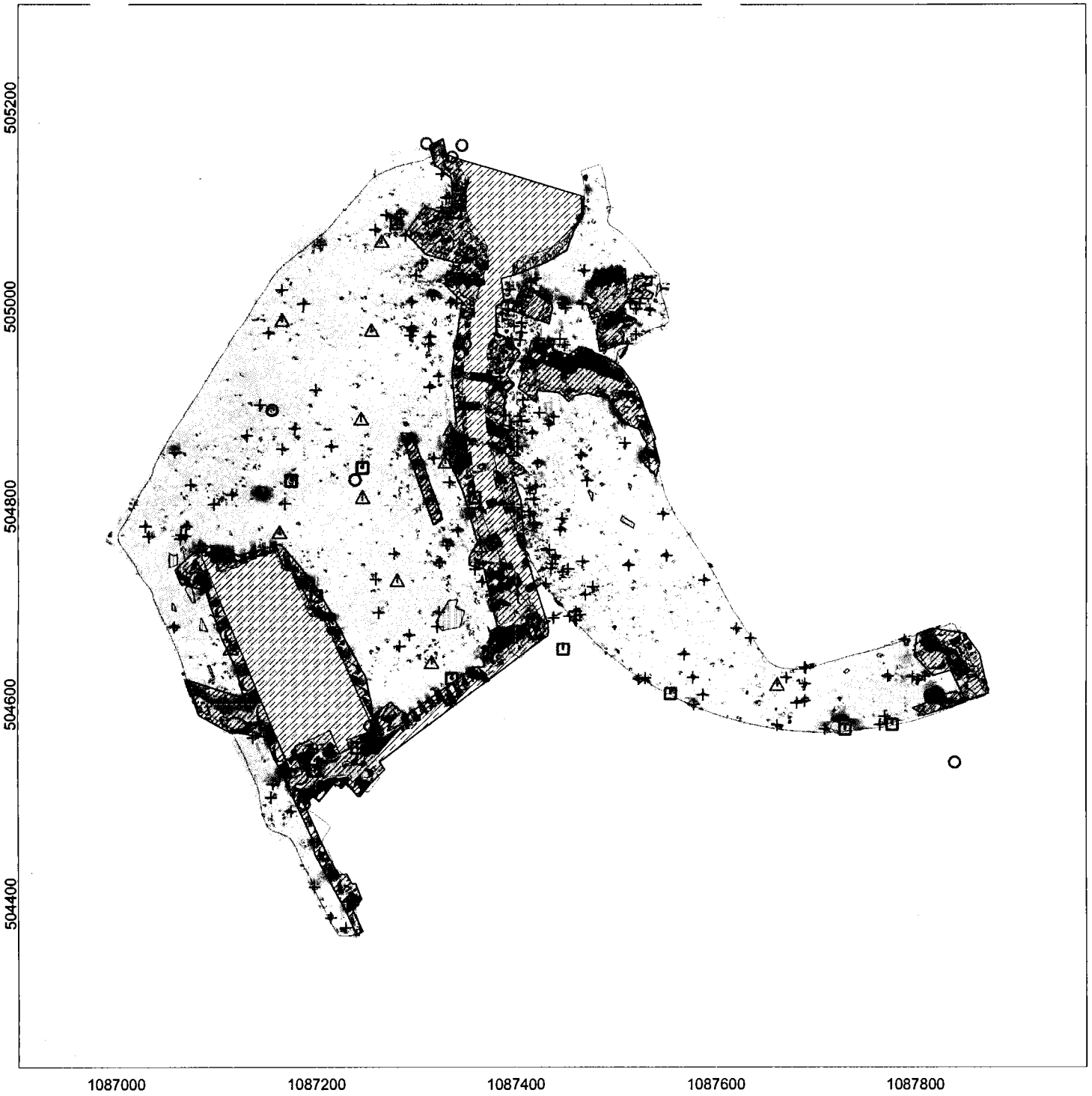
Before excavation, bushes and trees around the anomaly areas will be removed. An access path to the excavation and material laydown area will be prepared during the site preparation phase and will be checked to ensure the configuration is practical for the particular location to be excavated. All equipment will be in place and operational.

2.4.2 Excavation Process

A total of 158 anomalies and 7 large clusters of anomalies are to be investigated and excavated. The approximate locations of these anomalies are showed on Figure 2-2.

First, the anomaly location will be scanned with a magnetometer or fiberglass probe capable of detecting a cylinder up to 2 feet below ground surface. One foot of soil will be excavated mechanically using a trackhoe or backhoe and the process repeated. This operation will continue until the anomaly is exposed, a maximum depth of 6 feet has been excavated, or the groundwater table has been encountered, whichever occurs first. Mechanical excavation will be allowed to a maximum depth of 1 foot before the next 2 feet is scanned. The trackhoe will be equipped with blast protection (Lexan blast shield).

Within 6 inches of a cylinder, gradual excavation using hand tools will be employed and supplemented with the pneumatically operated air knife to uncover the cylinder itself. Overburden will be removed from the excavation using a large vacuum truck.



MAP

Barrancas National Cemetery

Cylinder Target Map

GPS Positioned
TM-6 Quad Magnetometer

LEGEND

- Site Boundary
- Concrete Slab
- Tree(s)
- Existing Graves
- Bench Marks
- Other Obstacles
- Drain / Watering System Covers
- Clustered Anomalies
- Anomaly: Undersize Class
- Anomaly: Potential Cylinder

Map Scale: Scale 1:5.104646

0 1 0
US Feet

Coordinate System: NAD83 FL Nth, US Survey Feet

290
260
230
200
170
140
110
80
50
20
-10
-40
-70
-100
-130
-160
-190
-220
-250
-280

Magnetic Intensity
nT

N

Grid North: 0°0'0"
Mag North: -6°37'12"

Client: CH2MHILL		
Project: BARRANCAS NATIONAL CEMETERY		
Contractor: ARM GROUP INC		
Created by: CP	Verified by: BB	Approved: BB
Date: 2006/01/16	File: Site_Overview.map	
Page number: 1	Scale: *	

CH2MHILL

ARM Group Inc.

Cylinders will be checked immediately for leaks using the TGM and an initial cylinder evaluation will be conducted. The following information will be recorded onto a Cylinder Inventory Form.

- Dimensions and weight (if possible to obtain)
- Label(s)
- Overall structural condition (poor, fair, or good, leaking or perforated)
- Valve structural condition (good, leaking, corroded, damaged, or absent) and presence of a regulator and cap

The Cylinder Inventory Form will be continuously used throughout the sequence of the cylinder processing and information regarding gas analytical results, disposal, and cylinder decommissioning status will be added. A copy of the Cylinder Inventory Form is provided in Appendix D.

After the cylinder assessment, a determination of the safest method of cylinder removal from the excavation will be made. Although in most cases, the cylinder will be extracted using the cylinder grappler, decision logic for determining the safest method for removing cylinders will be developed. Removal of the cylinder from the excavation will be initiated only with concurrence of the CH2M HILL Site Supervisor. Alternative means will be prepared for removal of cylinders when it is determined that the cylinders should not removed from the excavation using the cylinder grappler/backhoe. A cylinder processing decision logic flow diagram is provided as Figure 2-3.

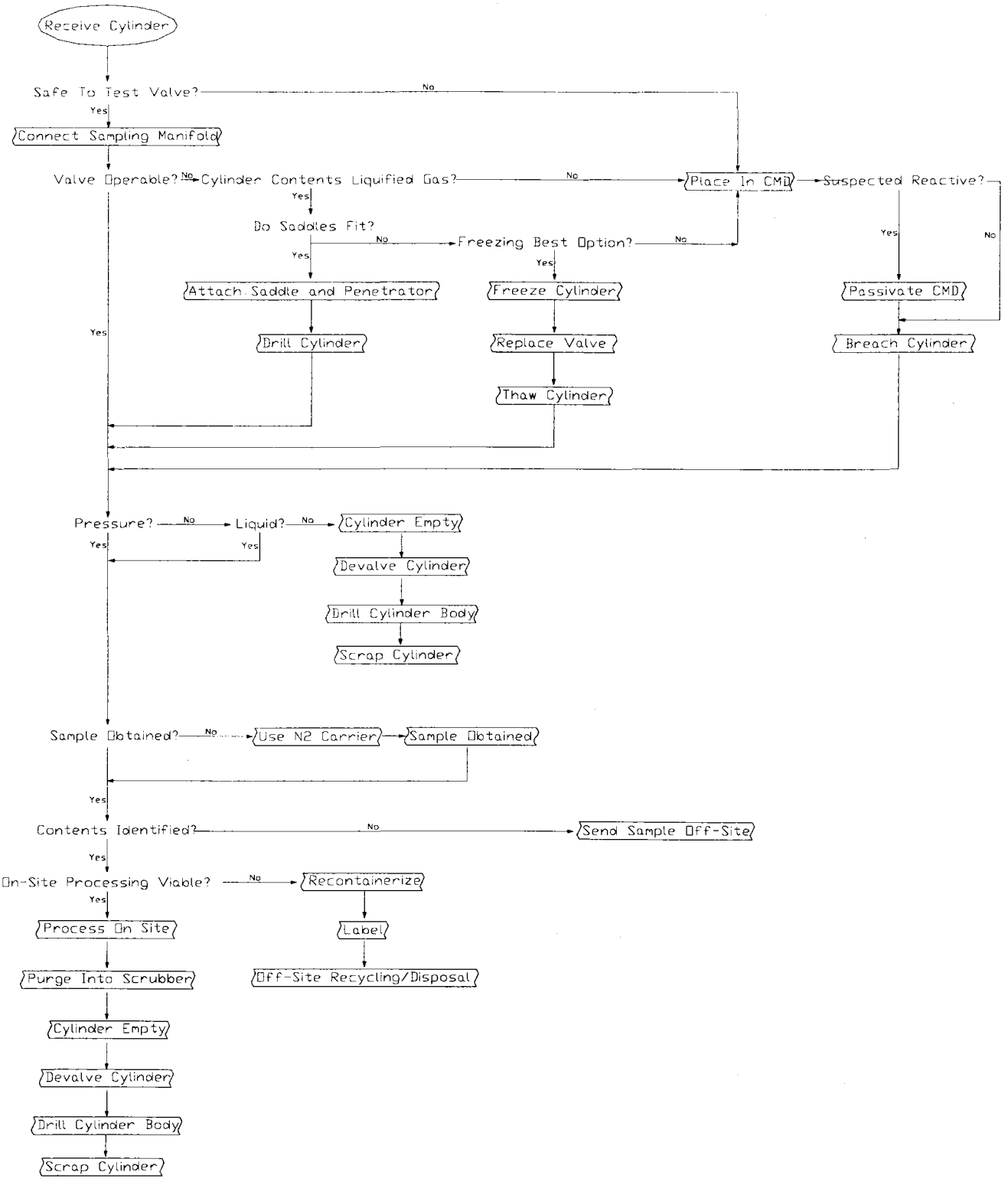
Once removed from the excavation, each cylinder will be placed into a cylinder overpack and relocated to the sampling area. Each overpack container will hold two or three cylinders. Extraction of additional cylinders will not proceed until the next overpack is available for relocation.

Following completion of excavation at each area, the area will be probed and examined using the magnetometer or fiberglass probe to verify no cylinders remain at that particular location. As each anomaly location is verified free of cylinders, it will be marked as cleared on the master site map.

2.4.2 Acetylene Cylinder Handling

Acetylene cylinders will not be placed in an overpack to be transferred to the treatment area because of the potential of these cylinders to auto-detonate, which could happen when the gas is pressurized in a confinement. For the same reason, the acetylene cylinders also should not be sampled in the CMD vessel and sampling manifold (see Section 2.5 of this work plan addendum).

Since acetylene cylinders exhibit a unique cylinder construction, it is relatively easy for a trained cylinder technician to identify and segregate an acetylene cylinder based on its physical configuration. Observations will be made of valving, weight (heavier than normal cylinders), and relief valve configuration to avoid acetylene cylinders being mistakenly placed in overpacks or the CMD. Procedures for venting acetylene cylinders are included in Appendix F.



Source: Integrated Environmental Services

Figure 2-3
Cylinder Processing Decision Logic Diagram
NAS Pensacola, Pensacola Florida

CH2MHILL

2.4.3 Excavation and Trenching

Excavation activities will be conducted in the modified exclusion zone as indicated in Section 2.2.1 of this work plan addendum. All earthmoving equipment for the cylinder excavation will be operated in compliance with OSHA 29CFR1926, Subpart O. Excavated soil, materials, and equipment will be kept at least 2 feet from the edge of the excavation to prevent material from falling into the excavation.

Excavation may reach to a maximum depth of 6 feet; therefore, sloping, benching, shoring, or other protective system should be used to protect site workers. Any trenching and shoring activities will be conducted to meet the requirements in Section V, Chapter 2 of the OSHA Technical Manual. Trenches greater than 4 feet deep will be provided with a ladder, stairway, or ramp for excavation entry and exit.

2.4.4 Personal Protective Equipment

The excavation activities will be conducted in Level B PPE to protect workers since during the excavation the potential exists for damaging a cylinder and initiating a gas release. Level B PPE will include:

- Air-supplied respirator or self-contained breathing apparatus (SCBA)
- Chemical-resistant garments range from semi-permeable (such as conventional Tyvek garments) to fully impermeable suites such as the Trellborg ensembles
- Protective footwear with steel toes
- Chemical-resistant shoe covers
- Hard hat
- Reflective vest
- Inner chemical-resistant gloves
- Outer chemical-resistant gloves
- Hearing protection

Details of PPE requirements are provided in the Health and Safety Plan (Appendix A).

2.4.5 Air Monitoring

A meteorological station will be used to provide real-time wind speed, direction, and temperature. Negligible air emissions are anticipated from the treatment activity; however, the following air monitoring devices will be used to monitor the working environment.

- A TGM will be used immediately to check for leaks when cylinders are uncovered.
- An explosimeter/oxygen meter will also be used when cylinders are excavated, loaded into the overpack, and relocated to the CMD trailer. This practice will not only monitor the surrounding air but also check for overpack leakage.

2.5 Cylinder Sampling and Analysis

All cylinders recovered from the excavation points will be sampled and samples will be analyzed in the mobile laboratory at the site.

2.5.1 Sampling

Sampling – Operable Valves

Whenever possible, cylinders requiring identification will be sampled manually through the cylinder valve. When cylinder valves are operable, samples will be obtained using a specialized stainless steel sampling manifold, which is attached directly to the target cylinder valve using an appropriate Compressed Gas Association (CGA) interface connection.

In preparation for receiving a sample, the manifold is purged of air using a controlled flow of nitrogen, which is directed through all valves and sampling ports. After placing all manifold valves in the proper operating position, the target cylinder valve is opened slowly, allowing a small amount of gas to flow into the front portion of the manifold. The target cylinder valve is then closed and the captured target gas is allowed to flow into the main sampling chamber in the manifold. A pressure gauge attached to the manifold displays a reading, which indicates the amount of gas inside the target cylinder.

Gas trapped in the main sampling chamber is withdrawn by opening a sample withdrawal valve and inserting a specialized syringe that withdraws a small amount of the target gas. A conventional septum prevents gas within the chamber from exiting when the syringe is introduced and withdrawn. Alternatively, a small sample cylinder may be attached to the manifold. With the sample cylinder under vacuum, the cylinder valve is opened and gas held in the manifold flows into the sample cylinder until a pressure approaching atmospheric is reached. Gas remaining in the manifold is purged through the scrubber and the sample cylinder or syringe is disconnected.

The syringe or sample cylinder containing a gas sample is manually transported to the mobile laboratory, where it is connected to a sample introduction manifold that feeds into the laboratory analysis equipment sample cell. The syringe or sample cylinder is purged inside the laboratory using a vacuum pump and small scrubber and returned to the sampling crew for re-use.

Sampling and analysis rates will vary depending on cylinder valve connection condition, complexity of gases found within the target cylinders, and type of gas found. Certain gases such as tungsten hexafluoride have a tendency to deposit a layer of material inside all tubing and valves through which they pass, which requires disassembly and cleaning of the sampling manifold before another sample can be taken. In general, under good conditions, a sampling and analysis rate of 10 to 15 cylinders per day can be tested in the mobile laboratory.

Sampling – Inoperable Valves

The target cylinders that may have been buried for an unknown period of time are likely to have inoperable valves. The condition may arise in cylinders where the valves have become damaged, clogged, corroded, and blocked due to a build-up of solids inside the valve throat. Inoperable valves found on cylinders which contain an unknown material pose a hazard to cylinder handlers and require remediation to either replace the defective valve or access the cylinder contents in an alternate manner.

In this situation, it will be necessary to access the cylinder contents through means other than a normally operable valve. This will be done using one of the devices or techniques patented by the specialty subcontractor. Techniques to address these situations include cylinder re-valving or access using a saddle and tap. The CMD offers the highest level of safety and containment; the cylinder is accessed by drilling a hole into the cylinder sidewall while the cylinder is housed inside a pressure vessel.

A saddle and tap can be used for low pressure cylinders that have sidewalls in good condition. The system works by penetrating the cylinder and allowing its contents to flow out via a valved saddle and penetrator mechanism.

Re-valving involves the use of cryogenic materials to temporarily immobilize cylinder contents while a new valve is fitted on the target cylinder.

2.5.2 Analysis

Samples collected from the cylinder by CMD will be conveyed directly to the onsite (mobile) laboratory. The mobile laboratory consists of a Hewlett Packard (HP) gas chromatograph, an HP mass selective detector (MSD) or mass spectrometer, and a Biorad infrared detector. All of the instruments and control systems are housed in a climate controlled box truck and mounted on shock-proof tables.

The sample from the cylinder is injected into the gas chromatograph connected with the MSD. The compounds in the sample are then separated by the chemical columns in the gas chromatograph to produce sample spectral profiles. The spectral profiles are compared against those in the built-in library of chemical compounds. The best match among the chemicals in the library to the sample being tested is provided by the MSD. Thus, the contents of the sample are identified.

The Biorad infrared detector system allows the sample placed in a windowed chamber (sample cell) to pass through an infrared beam. The relative absorbance and transmission of the infrared beam is analyzed and compared with those stored in the built-in library of chemical compounds. Among the stored chemical information in the library, the infrared system then will provide a "best fit" compound to the sample being tested. Thus, the contents of the sample are identified.

Using both an MSD and infrared detector provides a means of identifying both mono- and di-atomic gases with a high degree of accuracy and relatively fast speed. Approximately 10 to 15 samples per day can be tested in the mobile laboratory.

The mobile laboratory reports will be reviewed by CH2M HILL on the day of analysis for accuracy and to interpret the data. The analytical results will be recorded on the Cylinder Inventory Form (Appendix D).

2.5.3 Personal Protective Equipment

When loading the cylinder to the CMD, the workers will be clothed in Level B PPE with an airline respirator. Other than cylinder loading, activities of the sampling and analysis will not involve direct contact of the site workers with the cylinders and their contents; therefore, those activities will be conducted in Level D PPE.

2.6 Cylinder Management

This section provides methods for treatment of cylinder contents and disposal of cylinders.

2.6.1 Gas Processing

Onsite treatment of cylinder gases will be conducted immediately after sample analytical results are available. The breached cylinder will remain inside of the CMD vessel until the sample results are obtained and the treatment method is determined.

Types of gases that are likely to be found in the cylinders include:

- Poisons, corrosives, or toxics such as chlorine
- Flammables such as acetylene, oxygen or propane
- Atmospheric gases such as compressed air, nitrogen, or carbon dioxide

Treatment will require the use of one or more methods such as venting, neutralization, hydrolysis, chemical oxidation, absorption, and re-containerization. The treatment procedures will result in the target gas losing its hazardous properties and leaving the cylinder carcass safe for disposal as scrap metal.

Onsite Treatment Using Three-Stage Scrubbing System

The proposed method for onsite treatment will require using a three-stage scrubbing system. The system consists of a primary reactor tank, high-vacuum venture scrubber, and high-flow solid media emergency scrubber (dry scrubber). The three-stage scrubbing system is designed and manufactured by Integrated Environmental Services, Inc. (IES). Specifications and SOPs for the scrubber system are provided in Appendices E and F, respectively.

The CMD will be connected with the gas scrubbing system. A vacuum is drawn on the tank headspace via the high-vacuum scrubber to facilitate gas flow into the tank. The cylinder gas will be drawn first into the primary reactor tank that contains liquid reagent (potassium hydroxide) through a dip tube and will bubble up through the reagent while undergoing the neutralization process.

The neutralized gas then flows to the dry scrubber to oxidize and adsorb low concentrations of gases exiting from the vacuum scrubber. The dry scrubber consists of a stainless steel column filled with granular activated alumina impregnated with potassium permanganate. The gas enters through the column bottom and exits at the top after passing the 4-foot thick bed of the dry media.

Exhaust from the dry scrubber leaves the system and will be directly discharged to the atmosphere. The efficiencies for each stage of the scrubbing of fluorine, chlorine/bromine trifluoride, dichlorosilnane, and ammonia were previously tested by IES. Overall efficiencies of greater than 99.9 percent are anticipated based on the quantities of input and output from the third stage (dry) scrubber.

Venting

An additional treatment for the cylinder gas likely will be venting. Venting is applicable to non-radioactive, atmospheric, inert, and non-toxic gases such as nitrogen, argon, and oxygen.

Venting will be conducted from the CMD that houses the breached gas cylinder. The valve in the CMD vessel is opened slowly to release the pressurized contents. Oxygen venting requires the use of supplemental piping (usually a vent stack) to direct the vented gas away from any flammable or organic material.

Acetylene may also be vented if accumulation in concentrations above 10 percent of the LEL can be prevented. The surrounding air must be monitored by using an explosimeter/LEL meter when venting acetylene cylinders. Procedures for venting cylinders and acetylene cylinders are provided in Appendix F.

Personal Protective Equipment

Level B with Trellborg suits is required for handling gases that present both a dermal and respiratory hazard. Level B with Tyvek may be used for those cylinders containing gases that do not present a dermal hazard.

2.1.1 Air Monitoring

An explosimeter/oxygen meter (LEL meter) and TGM will be used to monitor the breathing air quality throughout the gas processing. Colorimetric indicator tubes will be used to test concentration of a particular gas in the air when releasing contents from the cylinder. All of these air monitoring devices will ensure the quality of the breathing air in compliance with OSHA standards.

All cylinders will be decommissioned onsite. The decommissioning process will involve two steps: valve removal and cylinder body perforation. The intent of the decommissioning is to render the cylinders suitable for scrap metal use only.

Decommissioning activities will take place after the target cylinders have been emptied of any contents and purged with an inert gas such as nitrogen or argon. Cylinders from the gas processing (CMD) area will then be moved to the decommissioning area.

The valve of each cylinder will either be unscrewed or sawed off using a portable band saw. The cylinder carcass will be perforated near its base using a conventional drill and marked by a paint marker at the perforation point to assist in the verification process.

Scrap cylinders and valves generated from the decommissioning work will be staged on the site in an area designated by CH2M HILL. Decommissioned cylinders will be logged into its Cylinder Inventory Form as having been decommissioned.

Because they typically have an asbestos-containing core, acetylene cylinders will be handled per CGA guidelines. The cylinders will be vented, devalved, plugged, and transported to a landfill permitted to accept asbestos. Decommissioned acetylene cylinders should not be kept onsite for more than 30 days after they are decommissioned. Detailed requirements for acetylene cylinder management and disposal are provided in Section 3.0.

Personal Protective Equipment

Cylinder decommissioning will be performed using Level D PPE. Eye protection is required when drilling or cutting cylinders is performed. PPE for handling acetylene cylinders will meet the requirements specified in the Health and Safety Plan (Appendix A).

2.7 Risk Management and Emergency Response

Personnel operating the equipment will be experienced and qualified to operate and perform maintenance on the particular equipment. The personnel operating the equipment will be trained in emergency response procedures. In addition, the local Fire Department's HAZMAT team will be notified and will be ready to respond to emergencies. Records of operating and maintenance procedures, safety equipment, material safety data sheets (MSDS) and information about the chemical and equipment safety will be kept onsite while the treatment equipment is onsite.

2.8 Waste Storage and Disposal

The waste materials generated from the cylinder processing will be stored in the waste storage area, as indicated in Section 2.2.1 and as described in Section 3.0 Waste Management Plan. The area will be secured and only accessed by authorized personnel. It will be well contained and protected to prevent runoff from the area by using portable containment berms or drum spill pallets.

Waste materials will be transported and disposed of at an offsite facility. The waste characterization, transportation, and disposal will be conducted in compliance with FDEP and Department of Transportation (DOT) regulations. Requirements are detailed in Section 3.0 Waste Management Plan and Section 6.0 Sampling and Analysis Plan.

2.9 Backfill and Site Restoration

After the cylinder excavation and examination of the area to verify there are no cylinders remaining at that particular location have been completed, the area will be backfilled using the excavated clean soil. Backfill will be placed in loose lifts of maximum 9-inch thickness. The fill material will be placed and compacted across the whole excavation area prior to placement of next lift. The area will be graded to match the surrounding topography and to drain properly. If backfill in addition to the excavated soil is needed, clean soil from the cemetery burial operation may be used pending approval from the base.

After the backfill activities are complete, the area will be re-sodded with perennial grasses to match the surrounding vegetation. Sodding will be performed under favorable weather and soil moisture conditions.

2.10 Demobilization

Following completion of all field activities, all personnel, equipment, temporary facilities, utilities, and subcontractors will be demobilized from the site. Equipment and temporary

facilities will be disassembled and thoroughly cleaned prior to removal from the site, and stormwater and erosion controls will be removed. In addition, any remaining debris or other wastes generated during the work will be removed and properly disposed.

Prior to demobilization, a site inspection will occur with the Navy representative. All items noted on the inspection will be corrected prior to final payment.

3.0 Sampling and Analysis Plan

This SAP describes the tasks and responsibilities of CH2M HILL with respect to the sampling and analysis associated with the work effort described in this work plan addendum. This document is intended as a site-specific guide for use by the field team while performing the project-required sampling and analysis. Any changes to the activities described in this SAP must be documented as a revision to this SAP and approved by the Project Manager and Project Chemist.

Samples will be collected in accordance with EPA Region IV Environmental Investigative Standard Operating Procedures and Quality Assurance Manual (EISOPQAM), November 2001 and FDEP SOPs for Field Activities, DEP-SOP-001/01, February 1, 2004. Where the two documents conflict, the more stringent will apply.

The sampling team will be qualified under the Navy Installation Restoration Chemical Data Quality Manual (IRCDQM), 1999 sampling requirements.

A Navy, U.S. Army Corps of Engineers (USACE)-, or Air Force Center for Environmental Excellence (AFCEE)- and FDEP-approved laboratory will be used for all sample analyses.

3.1 Data Quality Levels for Measurement Data

The data quality levels for each sampling task are listed in Table 3-1. The sampling events, sampling and analytical requirements, and the required level of quality and data packages are listed in Table 3-2. The quantitation, project action, accuracy, precision, and completeness limits by which the data will be evaluated will be provided by the selected laboratory and approved by CH2M HILL's Project Chemist.

TABLE 3-1
Data Quality Levels

Sampling Activity	Data Quality Level Category
Liquid Waste Characterization (offsite laboratory analyses)	Definitive
Solid Waste Characterization (offsite laboratory analyses)	Definitive

TABLE 3-2
Sampling and Analytical Summary

Sample Task	Sample Point	Matrix	Sampling Frequency	Approx No of Samples	Sampling Method	Sampling Equipment	TAT[1]	Data Package Reqmnt	Required Analysis	Analytical Method	Holding Time	Sample Preservtn	Containers
Soil/Solids Characterization Sampling													
Soil/Solids Characterization Sampling	Area around excavated gas cylinders	Soil/ Solids	1 per area	1	Grab	SS spoon, SS bowl	14 day	CCl Level B	TCLP Volatiles	1311/8260B	14 day TCLP extr; 14 day analysis	Cool to 4°C	(1) 4 oz amber glass
									TCLP Semi-Volatiles	1311/8270C	14 day TCLP extr; 7 day extr; 40 day analysis		(4) 8 oz glass
									TCLP Metals	1311/6010B/ 7470A	6 month TCLP extr; 6 month analysis Hg: 28 day TCLP extr; 28 day analysis		
									TCLP Pesticides	1311/8081A	14 day TCLP extr; 7 day extr; 40 day analysis		
									TCLP Herbicides	1311/8151A	14 day TCLP extr; 7 day extr; 40 day analysis		
									PCBs	8082	14 day extr; 40 day analysis		
									Corrosivity	9045C	ASAP		
									Ignitability	1010/1030	ASAP		
Water Characterization Sampling													
Characterization of water removed from gas cyliners	Gas Cylinder	Water	As Required	1	Grab	dip jar	14 days	CCl Level B	TCL Volatiles	8260B	14 days	HCl pH< 2; Cool to 4°C	(2) 40 ml vial
									TCL Semi-volatiles	8270C	7 days ext; 40 days analysis	Cool to 4°C	(4) 1L amber glass
									TCL Pesticides	8081A	7 days ext; 40 days analysis		
									TCL Herbicides	8151A	7 days ext; 40 days analysis		
									PCBs	8082	7 days ext; 40 days analysis		
									TAL Metals	6010B/7470A	180 days; Hg = 28 days	HNO3 pH< 2; Cool to 4°C	(1) 500ml HDPE
									Ignitability	1010	ASAP	none	(1) 250 mL amber glass
									Corrosivity	9045C	ASAP		(1) L amber glass

1. Calendar days

3.2 Sampling Objectives

The sampling objectives for this project are as follows:

- If evidence of leakage is found in the soil around the area of the excavated gas cylinders, collect a soil sample for waste characterization.
- If any liquid is found in the excavated gas cylinders or residual liquid waste remains after decommissioning activities, collect a sample for aqueous waste characterization.

3.3 Soil Disposal Characterization

Solid waste from the site may be in the form of a sample collected from around the area of the excavated gas cylinders. The samples will be collected in the following manner and analyzed in accordance with Table 3-2.

Procedure for Collecting Volatile Fractions

1. Stainless steel spoon will be used to collect the sample from the drum.
2. Fill the appropriate (4-oz jars) sample jars completely full with the sample from the core.
3. Close the jar, label, and package the sample for shipment to the laboratory.

Procedure for Collecting Non-Volatile Samples

1. Stainless steel spoon will be used to collect the sample from the drum.
2. Collect several spoonfuls of the soil into a stainless steel bowl.
3. Homogenize the sample by the quartering techniques using the stainless steel spoon.
4. Fill the appropriate sample jars completely full with the homogenized sample.
5. Close the jar, label, and package the sample for shipment to the laboratory.

A CH2M HILL Level B data package will be required along with appropriate QC samples for required analyses. All analytical data will be submitted by both hard copy and electronic files.

3.4 Water Disposal Characterization

Liquid waste may be found inside recovered gas cylinders. Liquid waste samples will be collected in the following manner and analyzed in accordance with Table 3-2.

1. Using a dip jar, collect a water sample from its containment.
2. The sample containers for volatile analyses will be filled first. The 40-ml vials will be filled so that there is no headspace in each vial.
3. The sample containers for the remaining analyses will then be filled.
4. Label and package the samples for shipment to the laboratory.

A CH2M HILL Level B data package will be required along with appropriate QC samples for required analyses. All analytical data will be submitted by both hard copy and electronic files.

3.5 Sample Documentation

- Sampling documentation will include the following:
- Numbered Chain-of-Custody Reports
- Sample Log Book which includes the following information:
  - Name of laboratories and contacts to which the samples were sent, turnaround time (TAT) requested, and data results, when possible
  - Termination of a sample point or parameter and reasons
  - Unusual appearance or odor of a sample
  - Measurements, volume of flow, temperature, and weather conditions
  - Additional samples and reasons for obtaining them
  - Levels of protection used (with justification)
  - Meetings and telephone conversations held with the NAVFAC SE, NTR, regulatory agencies, project manager, or supervisor
  - Details of QC samples obtained
  - Sample collection equipment and containers, including their serial or lot numbers
  - Field analytical equipment, and equipment utilized to make physical measurements will be identified
  - Calculations, results, and calibration data for field sampling, field analytical, and field physical measurement equipment
  - Property numbers of any sampling equipment used, if available
  - Sampling station identification
  - Date and Time of sample collection
  - Description of the sample location
  - Description of the sample
  - Sampler(s)' name(s) and company
  - How the sample was collected
  - Diagrams of processes
  - Maps/sketches of sampling locations
  - Weather conditions that may affect the sample (e.g., rain, extreme heat or cold, wind, etc.)

- Sample Labels
- Custody Seals (minimum of two on each shipping container)

3.6 Field Quality Control

Field QC samples are not required for disposal characterization samples.

3.7 Analytical Methods

Samples will be collected for analytical methods summarized in Table 3-2.

Preliminary analytical results will be faxed to Bethany Garvey at the following fax number per the TAT listed in Table 3-2 from day of sample receipt. The final hardcopy data and electronic file will be delivered to Kama White within 14 days of sample receipt.

Bethany Garvey
Laboratory Coordinator
CH2M HILL
115 Perimeter Center Place, Suite 700
Atlanta, GA 30346
770-604-9182 ext 263
EFax: 678-579-8176
Bgarvey@ch2m.com

Kama White
CH2M HILL
115 Perimeter Center Place, Suite 700
Atlanta, GA 30346
(770) 604-9182 ext 564
Efax: (678) 604-9282
Kama.white@ch2m.com

4.0 Waste Management Plan

The scope of this waste management plan addresses the management and disposal requirements for wastes generated during the excavation, identification, disposal of content, and decommissioning of compressed gas cylinders located within the Barrancas National Cemetery. It is anticipated that the following non-hazardous wastes will be generated during these activities:

- Decommissioned compressed gas cylinders and other scrap metal
- Compressed gas cylinder carcasses, potentially containing asbestos
- General construction debris (potentially including, but not limited to, plastic sheeting, sampling materials, and PPE)

4.1 Waste Characterization

Waste will be characterized using process knowledge and/or laboratory analysis as required by the disposal or treatment facility. Uncontaminated wastes and debris, such as general construction debris, will be characterized using process knowledge and classified as municipal solid waste or recycled.

A waste profile typically requires the following information including but not limited to:

- Generator (Navy) information including name, address, contact, and phone number
- Site name including street/mailing address
- Process generating waste
- Source of contamination
- Historical use for area
- Waste composition (95 percent soil, 5 percent debris)
- Physical state of waste (solid, liquid, etc.)
- Applicable hazardous waste codes

A facility approved copy of the waste profile will be received prior to scheduling of offsite transportation of the waste.

4.2 Waste Management

4.2.1 Waste Storage

Drums and/or roll-off containers will be used for the temporary storage of discarded PPE, scrap metal, and other general construction debris. Acetylene cylinders, potentially containing asbestos cores, handled per CGA guidelines and temporarily placed in a secure area, prior to disposal.

Wastes will be removed from the site as soon as possible.

4.2.2 Labels

The labeling of waste containers will be in accordance with 49 CFR 172, 173 and 178. Labels will include the type of waste, location from which the waste was generated, and accumulation start date. Containers used to store/accumulate waste will include one of the following labels:

- "Analysis Pending" or "Waste Material" - Temporary or handwritten label until analytical results are received and reviewed. This label will include the accumulation start date.
- "Non-Hazardous Waste" - Preprinted labels with the following information:
  - Accumulation start date
  - Generator name
  - EPA ID number
  - Waste-specific information (contaminated soil)

Where applicable, the major hazards (flammable, oxidizer, and carcinogen) will be included on the label.

4.2.3 General Waste Management Requirements

Wastes will be accumulated in an area identified or approved by the Navy. If an accumulation area is not designated, CH2M HILL will accumulate wastes in an area that is not accessible to the general public, and that can be secured.

Waste accumulation areas will contain appropriate emergency response equipment. The Health and Safety Plan (Appendix A) identifies the specific emergency response procedures and equipment. Waste accumulation areas will include fire extinguishers (in areas where wastes are known or suspected to be flammable or ignitable), and decontamination equipment. **Spill control equipment (e.g., sorbent pads) will be available in the waste accumulation areas, and where liquids are transferred from one vessel to another.**

All containers will be inspected upon arrival at the site for equipment in disrepair and any contamination or contents. If container contains waste upon arrival or is in disrepair, it will be immediately rejected and documented.

4.2.3.1 Drums/Small Containers

The following guidelines relate to drums and small containers:

- Drums and small containers will be transported to the temporary accumulation areas on wood pallets and will be secured together with non-metallic banding.
- Drums will be inspected and inventoried upon arrival onsite for signs of contamination and/or deterioration.
- Adequate aisle space (e.g., 30 inches) will be provided for containers such as 55-gallon drums to allow the unobstructed movement of personnel and equipment. A row of drums should be no more than two drums wide.
- Each drum will be provided with its own label, and labels will be visible.

- Drums will remain covered except when removing or adding waste to the drum. Covers will be properly secured at the end of each workday.
- Drums will be disposed of with the contents. If the contents are removed from the drums for offsite transportation and treatment or disposal, the drums will be decontaminated prior to re-use or before leaving the site.

4.2.3.2 Roll-off Boxes

- Roll-off boxes will be inspected upon arrival onsite. Any roll-off container arriving with contents or in poor condition shall be rejected.
- When not in use, securely fastened covers will be installed on all roll-off boxes.
- Old labels will be removed and a new, appropriate label applies as discussed above.

4.2.3.3 Soil Stockpiles

It is anticipated that soil stockpiles from each excavation will be non-impacted soils and will not be stockpiled for more than 24 hours.

Excavated material may be stockpiled in a dump truck, adjacent to the excavation and upon removal of the compressed gas cylinders; the material will be dumped back in the excavation and compacted as appropriate. Material may also be placed on the ground adjacent to the excavations, should this occur, a plastic liner will be placed on the ground prior to stockpiling material. After the material is placed back in the excavation, the plastic liner may be re-used or disposed of as general construction debris.

Should the excavated materials be left overnight, provisions will be made to cover the stockpiles.

4.2.3.3.1 Inspection of Waste Storage Areas

Waste accumulation areas will be inspected for malfunctions, deterioration, discharges, and leaks that could result in a release. At least weekly, containers, tanks and roll-off containers will be inspected for leaks, signs of corrosion, or signs of general deterioration.

Deficiencies observed or noted during inspection will be documented and rectified immediately. Appropriate measures may include transfer of waste from leaking container to new container, replacement of liner or cover, or repair of containment berm.

If operations are suspended for more than 7 days, the regulatory compliance manager will be contacted and alternate inspection arrangements will be made. Prior to demobilization, all wastes will be removed from the site.

Inspections will be recorded in the daily Quality Control Report and include any deficiencies and how issue was rectified. Copies of the report will be maintained onsite, and available for review.

4.3 Shipping Documentation

Prior to offsite disposal of waste, CH2M HILL shall provide the Navy with a waste approval package for each waste stream. This package will include a waste profile naming the U.S.

Navy as the generator of the waste, analytical summary table(s) applicable to the waste, LDR notification for any hazardous wastes, a completed waste manifest, and any other applicable information necessary for the Navy to complete its review of the disposal package and signature as the generator.

The signed profile will then be submitted to the disposal facility for acceptance and approval. Once the approval letter is received from the disposal facility, transportation can be scheduled.

Each load of waste material will be manifested prior to leaving the site. At a minimum, the manifest form will include the following information:

- Generator information including name, address, contact, and phone number, EPA ID number
- Transporter information including name, address, contact and phone number, EPA ID number
- Facility information including name, address, phone number, EPA ID number
- Site name including street/mailing address
- U.S. Department of Transportation (DOT) Proper Shipping Name (e.g., Hazardous Waste Solid, n.o.s., 9, UN 3077, PG III [D008])
- Type and number of container
- Quantity of waste (volumetric estimate)
- CTO or job number
- Profile number
- 24-hour emergency phone number

Additionally, each shipment of waste will also have a weight ticket.

The generator (Navy) and the transporter must sign the manifest prior to the load of waste leaving the site. A copy of the manifest will be retained on site and included with the daily Quality Control Report. The original signed manifest will be returned to the address of the generator. The facility will provide a copy of this signed manifest to CH2M HILL for the final report. The final report will include copies of the facility signed manifest, weight ticket, and the Certificate of Disposal/Destruction/Recycle.

4.4 Transportation

Each transportation vehicle and load of waste will be inspected before leaving the site and documented. The quantities of waste leaving the site will be recorded, at a minimum documented on the Transportation and Disposal (T&D) Log (Appendix C). A contractor licensed for commercial transportation will transport non-hazardous wastes. A copy of the documentation indicating that the selected transporter has appropriate licenses will be received and approved by CH2M HILL prior to transport of waste materials.

4.4.1 Transporter Responsibilities

The transporter will be responsible for weighing loads at a certified scale. For each load of material, weight measurements will be obtained for each full and empty container, dump truck, or tanker truck. Disposal quantities will be based on the difference of weight measurements between the full and empty container, dump truck, or tanker truck. Weights will be recorded on the waste manifest. The transporter will provide copies of weight tickets to CH2M HILL.

The transporter will observe the following practices when hauling and transporting wastes offsite:

- Minimize impacts to general public traffic.
- Repair road damage caused by construction and/or hauling traffic.
- Cleanup waste spilled in transit.
- Line and cover trucks/trailers used for hauling contaminated waste to prevent releases and contamination.
- All personnel involved in offsite disposal activities will follow safety and spill response procedures outlined in the Health and Safety Plan (Appendix A).
- No materials from other projects will be combined with materials from this site.

4.5 Disposal of Waste Streams

Offsite treatment, recycling or disposal facilities will use the waste profile and supporting documentation, such as analytical results and flow-rate data, to evaluate whether the facility will accept a waste. The treatment, recycling or disposal facility will be responsible for providing a copy of the final waste manifest and for a certificate of treatment or disposal for each load of waste received. Wastes are expected to be disposed as follows:

- Asbestos containing waste will be disposed at a non-hazardous landfill permitted to accept asbestos.
- Non-hazardous wastes will be disposed in a facility permitted to accept the types and quantities of contamination (for example, Subtitle D landfills).
- Construction and demolition debris will be sent to municipal landfills, or landfills designated for construction/demolition debris.
- Scrap metal will be recycled.

4.6 Transportation and Disposal Log

The T&D Log is used to track waste from generation to final disposition. Wastes will be logged into the T&D Log the day waste is generated and placed into containers. Transportation of wastes will be inventoried the day of transportation from the site using the T&D Log. Final disposal will be documented on the T&D Log using the Certificate of Disposal or other documentation describing the final disposition of the material. The T&D Log is provided in Appendix C.

5.0 Environmental Protection Plan

The Environmental Protection Plan of the NAS Pensacola Basewide Work Plan addresses general procedures that will be implemented to prevent pollution and protect the environment. The purpose of this plan is to provide specific requirements/procedures to protect the environment during the excavation, identification, disposal of content, and decommissioning of gas cylinders located within Barrancas National Cemetery.

5.1 Regulatory Drivers

Gas cylinders located at Barrancas National Cemetery will be removed to prevent injury and others exposed to this hazard during future excavation or other subsurface activities.

5.2 Spill Prevention

The provisions for spill prevention and control establish minimum site requirements. All spills will be reported to the CH2M HILL site supervisor and/or project manager. Refer to the Health and Safety Plan (Appendix A) for emergency response procedures and further reporting requirements.

All fuel, chemical, and waste storage areas will be properly protected from onsite and offsite vehicle traffic. All tanks (including fuel storage) must be equipped with secondary containment and must also be inspected daily for signs of leaks. Accumulated water must be inspected for signs of contamination (for example, product sheen, discoloration, and odor) before being discarded. Fire protection provisions outlined in the Health and Safety Plan must be adhered to.

Chemical products must be properly stored, transferred, and used. Should chemical product use occur outside areas equipped with spill control materials, adequate spill control materials must be maintained at the local work area.

5.3 Spill Containment and Control

Spill control materials will be maintained in the support zone, at fuel storage and dispensing locations, and at waste storage areas. Incidental spills will be contained with sorbent and disposed of properly. Spilled materials must be immediately contained and controlled. Spill response procedures include:

- Immediately warn any nearby workers and notify supervisor.
- Assess the spill area to ensure that it is safe to respond.
- Evacuate area if spill presents an emergency.
- Ensure any nearby ignition sources are immediately eliminated.

- Stop source of spill.
- Establish site control for spill area.
- Contain and control spilled material through use of sorbent booms, pads, or other material.
- Use proper PPE in responding to spills.

5.4 Spill Cleanup and Removal

All spilled material, contaminated sorbent, and contaminated media will be cleaned up and removed as soon as possible. Contaminated spill material will be contained, labeled, and properly stored until the material is disposed. Contaminated spill material will be managed as waste and disposed according to applicable, federal, state, and local requirements. In the event of a hazardous substance spill or release, the CH2M HILL Site Supervisor will immediately notify the NAS Pensacola Quarterdeck and follow the NAS Pensacola Spill Response Procedures.

5.5 Erosion Control

Throughout the duration of this project, it is anticipated that less than 1 acre will be disturbed; therefore, coverage under FDEP's Generic Permit for Stormwater Discharge from Large and Small Construction Activities is not required. Erosion and sediment controls will be installed prior to, and maintained during land disturbing activities.

5.6 Air Permits

An applicability determination confirms that NAS Pensacola is not subject to the Site Remediation National Emission Standard for Hazardous Air Pollutants regulation in Title 40 of Code of Federal Regulations, Part 63, Subpart GGGGG, because it is not a major source of hazardous air pollutants.

At the state level, pursuant to Florida Administrative Code 62-4.040(1)(b), FDEP issued the "Conditional Exemption for a Mobile Thermal Destruction Unit [MDTU] for Flares, Pyrotechnics, Tactical Tear Gas Canisters, and Small Load Ammunition of ≤50 Caliber, Including Shot Gun Shells" (DERM-PER-38). This exemption allows the use of a mobile thermal destruction unit (MTDU) during daylight hours and up to 4 days at each location on the facility, until all the material at different locations is destructed. The proposed remediation activity is similar to the use of MTDU, except that very little or negligible emissions are anticipated from the treatment activity. Additionally, no auxiliary emissions are anticipated because the treatment equipment will not use any fuel-burning auxiliary equipment. NAS Pensacola has requested FDEP for an exemption from permitting of proposed activities involving temporary on-site treatment of the contents of excavated gas cylinders, based on this existing conditional exemption.

6.0 Quality Control Plan

This Quality Control Plan details the quality administrators and the project organization for the work to be completed at NAS Pensacola. Specifically, this plan addresses the construction inspections associated with excavation and remediation of compressed gas cylinders.

The Submittal Register, included in Appendix B, documents submittals in accordance with CH2M HILL's Revised Contract Management Plan (CH2M HILL, 2003). CH2M HILL, the Navy, or others will approve submittals as identified in the Submittal Register. Approved submittals will be distributed by CH2M HILL to the appropriate Navy personnel (CO, Resident Officer in Charge of Construction [ROICC] (in duplicate), etc.), the project site, and to the project file.

6.1 QC Organization

The overall responsibility for implementation and enforcement of the Quality Control Plan is assigned to the PM and Project QC Manager. Designated qualified individuals will assume execution responsibility for this plan. These individuals may include the Site Supervisor, Site H&S Specialist, and Project QC Manager. The CH2M HILL Program QC Manager has responsibility for verification of the effectiveness of the project's QC system.

The project organization chart (Figure 6-1) depicts the chain-of-command for this CTO and the individuals responsible for executing the work as indicated. Individual roles and responsibilities of CTO personnel are summarized in Table 6-1.

6.2 Outside Organizations

CH2M HILL assumes overall responsibility for conformance of subcontracted materials and services with quality requirements. However, it is the responsibility of the Subcontractors to plan, manage, and accomplish the work in accordance with the project-specific plans, specifications, and local, state, and federal regulations.

Subcontractors report directly to the Site Superintendent and are responsible for completion of the project-specific activities assigned. Subcontractors are also responsible for reporting to the Site Superintendent, who consults with the Project QC Manager about quality issues. Subcontractors verify that their construction activities and materials comply with the requirements of the project-specific plans and specifications. Subcontractors include those organizations providing materials or services to the project. The subcontractors anticipated for this project are:

- Professional survey services
- Cylinder excavation, sampling, analysis and treatment services
- Waste transportation services
- Landfill

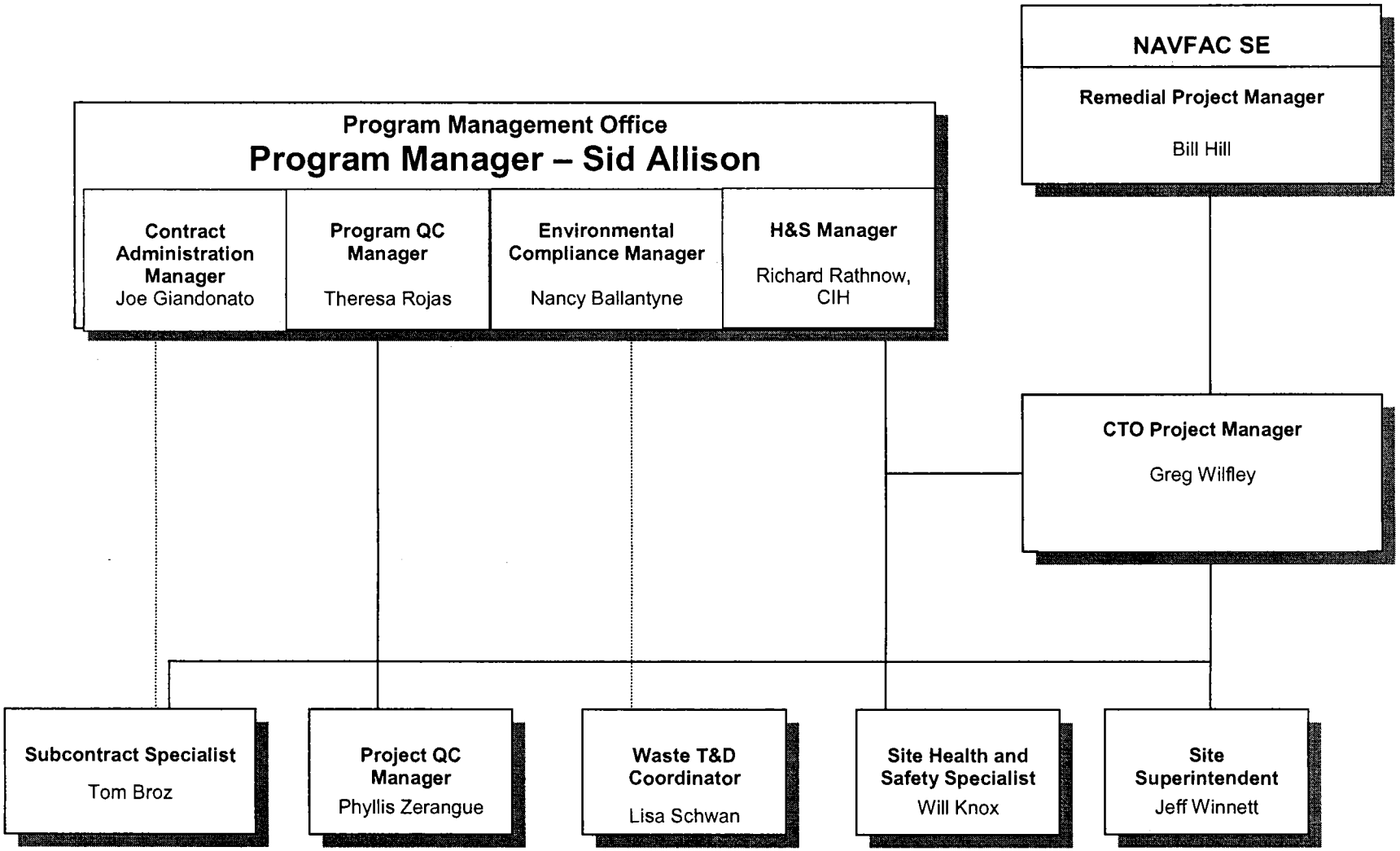


Figure 6-1
Project Organization Chart

TABLE 6-1
Roles, Responsibilities, and Authorities of Key Project Personnel

Role	Responsibility	Authority
Project Manager	• Communication with NAVFAC SE RPM • Management and Technical Direction of work • Overview subcontractor performance • Select project staff • Develop project Work Plan and supporting plans • Meet Performance Objectives • Prepare status reports	• Approve subcontractor selection • Approve invoices to Southern Division • Approve CTO baseline schedule • Stop work at the site for any reason • Approve payment to vendors and suppliers • Approve payment to subcontractors
Site Superintendent	• Responsible for all site activities • Provide direction to subcontractors • Act for Project Manager • Provide daily status reports • Prepare CTO Work Plan • Conduct daily safety meetings • Review subcontractor qualifications • Stop work for unsafe conditions or practices • Monitor and oversee subcontractor compliance with scope of work • Review requests for changes in scope of work • Review technical qualifications of subcontractors • Prepare Field Change Requests	• Stop work for subcontractors • Approve corrective action for site work-arounds • Approve materials and labor costs for site operations • Resolve subcontractor interface issues • Approve daily and weekly status reports • Approve Field Change Requests below ceiling amount
Transportation and Disposal Coordinator	• Develop site specific procedures for transport and disposal practices • Plan and coordinate the transport and disposal of waste • Review subcontractor qualifications • Audit Transportation and Disposal (T&D) subcontractors compliance with contract requirements	• Approve subcontractors daily report of waste material removed from the site • Approve corrective action plans from T&D subcontractor
Project Assistant	• Maintain CTO files and correspondence • Coordinate CTO schedule and monitor deliverables • Maintain change management records • Maintain Action Tracking System log	• Submit Action Tracking System log • Assign correspondence log numbers
Project QC Manager/ QC Inspector(s)	• Monitor and report on subcontractor quality and quantities • Audit subcontractors offsite fabrication	• Stop work for non-compliant operations • File daily quantities report • File Lessons Learned Log Sheet

TABLE 6-1
Roles, Responsibilities, and Authorities of Key Project Personnel

Role	Responsibility	Authority
	• Maintain Submittal Register • Participate in Continuous Improvement Team • Stop work for non-compliant operations • Maintain Lessons Learned Log	• Approve resumption of work for resolved quality issues
Site Health and Safety Specialist	• Monitor and report on subcontractor safety and health performance • Record and report safety statistics • Conduct needed site safety and health orientation • Maintain Environmental Log • Stop work for unsafe practices or conditions	• Stop work for unsafe practices or conditions • Approve subcontractor site specific health and safety plan • Set weekly safety objectives • Approve resumption of work for resolved safety issues
Subcontract Specialist	• Prepare bid packages • Purchase disposable materials • Maintain subcontract log	

6.3 Submittal Procedures and Initial Submittal Register

CH2M HILL will implement a submittal process for submittals to the Navy. Each submittal will include a transmittal form, properly identifying each submittal. The Project QC Manager is responsible for the completeness and accuracy of the submittals and will be assisted in this task by the Project Manager.

The Project QC Manager will review submittal packages in detail for completeness and compliance with contract requirements for documentation. Exceptions will be noted and expressly stated. This procedure will ensure that field data are adequate for their intended use and meet the contract requirements. Each member of the project QC team in the chain of command is responsible for preparation and review of pertinent QC material and field log documents.

For deliverables, the Project QC Manager will complete his/her review and submit the information to the Project Manager. Following a final review by the Project Manager, applicable data and information relating to the submittals will be forwarded to the Navy. The Project Manager has the authority to sign submittals and present them to the Navy or reject the documents and have them returned to the project team or Subcontractor for revision.

The Submittal Register, included in Appendix B, documents submittals in accordance with the CH2M HILL/NAVFAC SE contract. CH2M HILL, the Navy, or others as appropriate will approve submittals as identified in the Submittal Register. All approved submittals will be distributed by CH2M HILL to the Navy representative, the project site, and the project file.

6.4 Testing Plan and Log

A Testing Plan and Log, included in Appendix B, will be used to record results of field testing. The Testing Plan and Log will be updated as testing is performed and new testing is identified and scheduled.

6.5 Procedures to Complete Rework Items

A rework item list will be developed and maintained at the site by the Project QC Manager. The list is intended to identify and record the status of those items of work that have been deemed as not satisfying contract requirements. The Contractor QC Report includes provisions for reporting rework items identified during initial and follow-up phases of QC inspections. Rework items identified as a consequence of testing and inspections will be discussed during meetings, at which time, resolution of the nonconformance will be planned and agreed upon.

6.6 Documentation Procedures

As an element to the project quality system, CH2M HILL will deliver the following documentation during this project at a minimum:

- Contractor Quality Control Report
- Contractor Production Report
- Preparatory Phase Checklist
- Initial Phase Checklist
- Field Test Reports
- Monthly Summary Report of Field Tests
- Testing Plan and Log
- Rework Item List
- QC Meeting Minutes
- QC Certifications
- Waste Tracking Log

The documentation will typically be submitted as attachments to the Contractor Quality Control Report.

6.7 Construction Inspections

The Project QC Manager will perform inspections of the materials/equipment and overall work activities. The inspections are performed to ensure safe, efficient, high quality work is performed, while meeting the objectives and requirements of the plans and specifications.

6.8 Definable Features of Work

The project tasks for this CTO are grouped into definable features of work, which are work activities that are significant enough to warrant distinct plans and specifications. The definable features of work for this project are:

- Mobilization and Site Preparation
- Survey and Anomaly Locating
- Excavation of Cylinders
- Cylinder Sampling and Analysis
- Cylinder Management
- Backfill and Site Restoration
- Waste Management
- Decontamination and Demobilization

The definable features of work will be inspected in accordance with the three phases of control. The three phases include Preparatory, Initial, and Follow-up. An overview of the inspection provisions is outlined in the subsections that follow.

6.8.1 Mobilization and Site Preparation

As part of the mobilization activity, a pre-construction meeting will be held to review project scope, schedule, communications, and field documentation and reporting. The meeting will verify that site preparation provisions, such as permitting/approvals; utility clearances; demarcation of the work zones; staging of equipment and material; stormwater runoff and erosion controls; and mobile laboratory and CMD as well as other devices to be used at the site, are in place to begin the field activities. Additionally, equipment and materials will be verified functional and in good operational condition prior to starting the excavation.

Preparatory Phase

The preparatory phase will include a review of the relevant activity hazard analyses (AHAs), communications matrix, project schedule, submittal status, work zone layout, and confirmation that appropriate materials and equipment are available. An Air Permit Exemption is in place. Personnel training and medical clearance records will be reviewed.

Initial Phase

Inspections will be made as necessary to ensure construction limits are defined, utilities marked, and material staged in the designated areas. Additionally, equipment will be inspected for operability and proper function. Deficient equipment will not be permitted to operate.

Follow-up Phase

The Project QC Manager will provide continuous oversight of the site preparation activities to verify that the work is completed in accordance with the requirements provided in this work plan addendum. Deficiencies will be documented and corrected.

Task	Inspection Details
Pre-Construction Meeting	• Verify training and medical clearance • Verify Air Permit Exemption in place • Verify designated locations of equipment layout and material staging • Discuss maintaining mark-up drawings and recording field data
Site Preparation	• Review pre-construction and construction quality control submittals to ensure they are approved • Review personnel certifications and licenses for performing particular work • Confirm that field equipment and mobile laboratory are properly setup and calibrated and in operational condition • Confirm that the materials and equipment are stored properly in accordance with the work plan addendum • Review site security measures • Discuss construction schedule • Ensure the erosion controls are installed properly • Review the H&S plan and PPE requirements • Ensure MSDSs are onsite

6.8.2 Survey and Anomaly Locating

Reacquiring anomalies for investigation will be the initial step in the project. Survey of anomalies will be conducted by a surveyor using a magnetometer and hand held GPS.

The preparatory meeting will be performed to ensure the preparedness of the project team to conduct the survey and anomaly locating activities. The project team will review AHAs associated with the work, ensure that the equipment is in good working condition and suitable for the work, review the logistics and specifications of performing the work, and discuss any outstanding items that may affect the start of this activity.

Some of the QC controls that will be inspected and verified are:

- Surveyor qualification/license
- Establishment of temporary control points
- Instrument calibration and accuracy
- Location marking/flagging
- Electronic and hard copy data deliverables
- Drawings and maps

6.8.3 Excavation of Cylinders

The cylinders identified will be excavated by a trackhoe and an air knife as indicated in this work plan addendum.

Preparatory Phase

The preparatory meeting will be performed to ensure that preparedness of the project team to initiate the excavation activities. The project team will review the AHAs associated with the these activities, inspect the equipment to confirm it is in good working condition and suitable for the work to be performed, review the approach for performing the work, verify that applicable permits and utility locates have been performed, verify the communication channel has been set in place, and discuss outstanding items that may affect the start of excavation.

Initial Phase

This phase consists of review the initial work activities to asses whether the work meets the specifications of the work plan addendum and scope of work. Initial site inspections will include the following activities: inspect the stormwater and erosion control measures to verify the systems are functioning properly, monitor excavation activities and accuracy of the reacquisition team, ensure waste management activities are compliant with the procedures outlined in this work plan addendum, and discuss work methodologies with field team to potentially identify revisions to the technical approach to improve efficiencies.

Follow-up Phase

This phase confirms that the excavation activities have been performed in accordance with the work plan addendum. Inspections will be performed routinely as determined by the Project QC Manager; deficiencies will be documented and corrected immediately. Near completion of the field activities, a pre-final inspection will be coordinated with the RPM.

Construction inspections will include, but not limited to the following:

Task	Inspection/Construction Control
Excavation	• Confirm excavations are being conducted a safe distance from underground utility designations • Monitor excavation activities and access the accuracy of the reacquisition • Verify vertical and horizontal control • Measure and record dimensions and physical observations of excavations • Monitor excavation activities and record the condition of the compressed gas cylinders and record condition of cylinders • Monitor closure procedures of a location to ensure that the requirements of the work plan addendum have been met, prior to backfilling • Inspect chemical and waste storage area routinely • Inspect the erosion controls on the site

6.8.4 Cylinder Sampling and Analysis

The excavated cylinders will be sampled by using a CMD and samples will be analyzed by onsite laboratory to determine contents of the cylinders.

Preparatory Phase

The preparation phase will include the following inspection activities: review the project Health and Safety Plan and AHAs associated with the these activities, review the work plan addendum as it relates to these activities, confirm that the equipment is calibrated and properly functioning to perform the assigned tasks, confirm the mobile laboratory is ready for sample analysis, confirm the venting stack of the CMD trailer is out of the breathing zone, and discuss items that may delay the start of this task.

Initial Phase

Initial phase will consist of an assessment of the initial work in accordance with the work plan addendum and specifications of the sampling and analysis. The onsite Project QC Manager will review the records of equipment calibration, sample analysis procedures, and data interpretation. The Project QC Manager will also verify that the Cylinder Inventory

Form (or cylinder database) is updated throughout the process of the cylinder sampling and analysis.

Follow-up Phase

This phase includes the verification that the sampling and analytical methods are acceptable. Inspections will be performed routinely as determined by the Project QC Manager; deficiencies will be documented and corrected immediately.

Inspections for cylinder sampling and analysis will include:

Task	Inspections/Details
Cylinder Sampling & Analysis	• Review H&S Plan and AHAs associated with the sampling and analysis • Verify the equipment is calibrated and in good operational condition • Verify the mobile laboratory is ready for the analysis of the samples and chemical and resources for the laboratory are available • Review the equipment calibration records, sampling and analysis procedure, and data interpretation data • Review the Cylinder Inventory Form • Document and correct deficiencies

6.8.5 Cylinder Management

Sampled cylinders will be treated onsite once the analytical results of the cylinder samples are available and a treatment method is determined. Treated cylinders will be decommissioned and rendered unsuitable for future use as anything but scrap metal.

Preparation Phase

Preparation phase will include following inspection activities: review the Health and Safety Plan and AHAs associated with the gas treatment and cylinder commissioning, review the proposed treatment methods for potential gases, verify the three-stage scrubbing system functional, and verify the chemicals used in the treatment are available and stored properly on the site.

Initial Phase

In this phase, the Project QC Manager will evaluate the performance of the initial work performance in accordance with the work plan addendum and requirements in the scope of work. The Project QC Manager will inspect the treatment equipment for its efficiency, ensure the treated cylinders properly decommissioned and logged in the Cylinder Inventory Form and database, and confirm the area used for storage of the decommissioned cylinders.

Follow-up Phase

The Project QC Manager will continue to ensure the work performed in accordance with the work plan addendum and scope of work. Inspections will be performed routinely as determined by the Project QC Manager; deficiencies will be documented and corrected immediately.

Inspections for the cylinder treatment and decommissioning will include:

Task	Inspections/Details
Gas Processing	• Review the H&S Plan and associated AHAs • Verify the functionality of the treatment equipment • Verify availability of the chemicals to be used in the treatment • Verify the efficiency of the treatment equipment • Review the Cylinder Inventory Form and database and verify the decommissioned cylinders are properly labeled and properly stored • Inspect the storage area for chemical and wastes • Document and correct deficiencies

6.8.6 Backfill and Site Restoration

The excavated areas will be backfilled and sodded to match the surrounding areas.

Preparatory Phase

The project team will review the AHAs associated with the backfill and site restoration activities, inspect the equipment to ensure it is in good working condition and suitable for the work, confirm that it has been adequately decontaminated prior to initiating these activities, review the plan for performing the work, and discuss outstanding items that may affect the start of excavation.

Initial Phase

This phase consists of review of the initial work activities to asses whether the work meets the objectives of the work plan addendum. The Project QC Manager will ensure: the backfill material is properly compacted and suitable for the intended purpose; the sod used as part of the site restoration meets the specifications; final grades match the surrounding area and promote good drain; and proper documentation for these activities is maintained.

Follow-up Phase

This phase includes the verification backfill and site restoration activities performed are acceptable. Inspections will be performed routinely as determined by the Project QC Manager; deficiencies will be documented and corrected immediately. Near completion of the field activities, a pre-final inspection will be coordinated with the RPM.

Inspections will include, but are not limited to the following:

Task	Inspection/Construction Control
Backfill	• Monitor backfill placement and compaction activities. • Verify lift thickness of backfill material. • Verify final grades meet the specifications
Site Restoration	• Verify sod meet specifications • Inspect erosion control measures • Document and correct deficiencies

6.8.7 Waste Management

Liquid and solid wastes may be generated from the gas treatment. These wastes will be characterized, managed, transported, and disposed of in accordance with the SAP and Waste Management Plan of this work plan addendum.

Preparatory Phase

The preparatory phase for transportation and disposal of waste streams includes a review of the disposal facility qualifications; transportation schedule for hauling material offsite; and confirming that the appropriate equipment and materials are available to commence the work activity. Prior to any work, the relevant AHAs will be reviewed and discussed. Temporary storage containers will be inspected prior to acceptance onto the project and labeled.

Initial Phase

This phase includes inspecting the waste transport vehicles prior to accepting on the job. Information provided on the waste manifest must be verified as complete and accurate including, but not limited to, generator name, address and signature, date, type of material being hauled, designated recycling or treatment facility, and volume and/or weight of material. Any discrepancies on waste manifest documents will be corrected.

Follow-up Phase

This phase includes verifying that the designated disposal facility has accepted the waste material at the facility and has sent the required completed manifest to the generator or the generator's technical representative. A field logbook and an electronic log of transportation and disposal shipments will be maintained. Waste storage areas will be visually inspected on a daily basis for releases or signs of corrosion, deterioration, or other conditions. These results of all inspections will be recorded.

Task	Inspections/Details
Waste Management	• Verify qualifications of transporters and disposal facilities • Check manifests • Maintain T&D log • Inspect waste transport vehicles routinely • Inspect waste containers and storage areas on a daily basis

6.8.8 Demobilization

Equipment utilized to perform intrusive work and characterization of the compressed gas cylinders will be decontaminated in accordance with the provisions of the Health and Safety Plan. Pre-final inspection of cleanliness will be performed by the Site Supervisor and the Site Health and Safety Specialist. Final equipment inspections will be performed and documented by the Project QC Manager, or her designee.

Equipment and personnel will demobilize from the site following the completion of the work activities identified in this work plan addendum. The Project QC Manager will verify that the objectives of associated remedial activities have been met. A final inspection will be

conducted to verify completion of all project activities. Findings, should any be identified, will be tracked, resolved, and documented during a final site walk through inspection.

Preparatory Phase

The preparatory phase will include a review of decontamination procedures, the Health and Safety Plan, and relevant AHAs, and site drawings and maps to ensure all data has been captured. Additionally, deliverable requirements will be reviewed and action dates will be established.

Initial Phase

The site superintendent will perform inspections to confirm that the objectives of the decontamination activities have been met and that the rework items, if any, have been completed to the satisfaction of CH2M HILL and the Navy.

Follow-up Phase

The Project QC Manager will provide continuous oversight of the decontamination and demobilization to verify that the work is completed in accordance with the requirements provided in this work plan addendum. Deficiencies will be noted and corrected.

Task	Procedures/Construction Details
Demobilization	• Pre-final site inspection and develop punch-list items • Inspect work areas to ensure all temporary facilities, equipment and resources are safely removed from the site • Completion inspection when work is substantially complete • Punch lists on outstanding items • Project housekeeping and final project cleaning • Final Site Inspections • Orderly Site Demobilization • Compilation of Site Records & Documents • Complete Resolution of Punch-list items

7.0 References

CH2M HILL. 2003. Contract Management Plan. Revision 01. Contract No. N62467-01-D-0331. April.

CH2M HILL. 2000. Basewide Work Plan. Revision 00. Contract No. N62467-98-D-0995. June.

Appendix A

Health and Safety Plan

Health and Safety Plan
Site Remediation of Compressed Gas Cylinders at Barrancas National Cemetery, Naval Air Station Pensacola, Florida

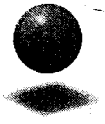
Contract No. N62467-01-R-0331
Contract Task Order No. 0043

Revision 00

Submitted to:

Department of Navy, Naval Facilities Engineering Command Southeast

Prepared by:



CH2MHILL

115 Perimeter Center Place, N.E.
Suite 700
Atlanta, GA 30346

February 2007

Contents

Attachments

Acronyms

°F	degrees Fahrenheit
AHA	Activity Hazard Analysis
ALARA	as low as reasonably achievable
APR	air-purifying respirator
ATL	Atlanta
BBLPS	Behavior Based Loss Prevention System
CH2M HILL	CH2M HILL Constructors, Inc.
CNS	central nervous system
CPR	cardiopulmonary resuscitation
CTO	Contract Task Order
dBA	decibel A-rated
DOT	Department of Transportation
FA	first aid
FID	flame ionization detector
GFCI	ground fault circuit interrupter
HAZCOM	hazard communication
HR	heart rate
HSM	Health and Safety Manager
HSP	Health and Safety Plan
IDLH	immediately dangerous to life and health
IDW	investigation-derived waste
IRF	Incident Report Form
lb	pound
LEL	lower explosive limit
LPO	Loss Prevention Observations
mg/m^3	milligrams per cubic meter
MSDS	Material Safety Data Sheet
mW/cm^2	milliwatt per square centimeter
NAVFAC SE	U.S. Navy Facilities Engineering Command, Southeast
NDG	nuclear density gauge
NLI	Near Loss Investigation
NS	Naval Station
NSC	National Safety Council
NTR	Navy Technical Representative
OSHA	Occupational Safety and Health Administration
PAHs	polynuclear aromatic hydrocarbons
PAPR	powered air-purifying respirator
PDF	personal flotation device
PID	photoionization detector
PPE	personal protective equipment
ppm	parts per million
PTSP	Pre-Task Safety Plan
RMSF	Rocky Mountain Spotted Fever

SAR	supplied-air respirator
SCBA	self-contained breathing apparatus
SHSS	Site Health and Safety Specialist
SOP	standard of practice
STEL	short-term exposure limit
SZ	support zone
T&D	Transportation and disposal
TBD	to be determined
TMCC	truck-mounted crash cushion
TRPHs	total recoverable petroleum hydrocarbons
TSDF	treatment, storage, and disposal facility
UST	underground storage tank
VOCs	volatile organic compounds

This Health and Safety Plan (HSP) will be kept on the site during field activities and will be reviewed as necessary. The plan will be amended or revised as project activities or conditions change or when supplemental information becomes available. The plan adopts, by reference, the Standards of Practice (SOPs) in the CH2M HILL *Corporate Health and Safety Program, Program and Training Manual,* as appropriate. In addition, this plan adopts procedures in the project Work Plan. The Site Health and Safety Specialist (SHSS) is to be familiar with these SOPs and the contents of this plan. CH2M HILL Constructors Inc.'s (CH2M HILL) personnel and subcontractors must sign Attachment 1.

1.0 Project Information and Description

CONTRACT TASK ORDER (CTO) No: 0043

CLIENT: Southern Division, U.S. Navy Facilities Engineering Command (NAVFAC SE)

PROJECT/SITE NAME: Site Remediation of Compressed Gas Cylinders at Barrancas National Cemetery, Naval Air Station (NAS) Pensacola, Florida.

SITE ADDRESS: Barrancas National Cemetery, Naval Air Station (NAS) Pensacola, Florida.

CH2M HILL PROJECT MANAGER: Greg Wilfley

CH2M HILL OFFICE: ATL

DATE HEALTH AND SAFETY PLAN PREPARED: February 15, 2007

DATE(S) OF SITE WORK: March 2007 – March 2008

SITE BACKGROUNG AND SETTING: The site containing compressed gas cylinders is located at the Barrancas National Cemetery on NAS Pensacola, just west of Pensacola, Florida. The cylinders were originally discovered during the excavation of a grave site in late 2005. Three cylinders were excavated and relocated to an undeveloped area north of the active cemetery area. The first one excavated was punctured during the excavation and vented its contents to the atmosphere. No injuries occurred during the incident. Among these cylinders, one was marked as CO_2. The contents of the other two cylinders were unidentifiable.

In January 2006, an electromagnetic survey was conducted by a CH2M HILL Subcontractor, ARM Group, Inc. to locate possible anomalies in the unused portion of the cemetery (approximately 5.5 acres). The survey identified the locations of all ferrous metal objects under the ground surface by using a Model TM-6 magnetometer controller and a cesium-vapor magnetometer sensor array. All the locations were recorded into a global positioning system (GPS) unit. A total of 1,854 magnetic anomalies were located during the survey.

ARM then generated a model of the magnetic signature of the three excavated gas cylinders and compared it to the anomalies detected at the site. After the analysis, it was determined that 174 of the anomalies were similar to the cylinder model and the remaining 1,680 were not likely to be cylinders and therefore would not be investigated further. In addition, seven polygon anomalies that were too large to be reliable modeled were identified. Subsequent discussions with the cemetery and Base personnel indicated that 16 of the 174 anomalies likely to be cylinders are located outside of the area to be utilized by the cemetery and therefore will not be investigated further. Therefore, 158 anomalies remain to be investigated.

DESCRIPTION OF SPECIFIC TASKS TO BE PERFORMED:

The project objectives are:

- Mobilization
- Site preparation
- Locate and mark the locations of 158 anomalies and boundaries of the 7 cluster areas
- Excavate at each anomaly point to a depth of 6 feet or to the groundwater table, whichever comes first to ensure discovery and full removal of any buried containers
- Analyze the contents of the excavated cylinders onsite
- Properly treat the contents of the cylinders onsite
- Decommission each target cylinder to render it unusable as a pressurized vessel
- Backfill and site restoration
- Waste management
- Field documentation
- Demobilization

2.0 Tasks to be Performed Under this Plan

Refer to project documents (i.e., Work Plan) for detailed task information. A health and safety risk analysis (Table 2-1) has been performed for each task and is incorporated in this plan through task-specific hazard controls and requirements for monitoring and protection. Tasks other than those listed below require an approved amendment or revision to this plan before tasks begin.

2.1 Hazwoper-Regulated Tasks

- Mobilization and Site Preparation
- Locate and mark the locations of 158 anomalies and boundaries of the 7 cluster areas
- Excavate at each anomaly point to a depth of 6 feet or to the groundwater table, whichever comes first to ensure discovery and full removal of any buried containers
- Analyze the contents of the excavated cylinders onsite
- Properly treat the contents of the cylinders onsite
- Properly treat the contents of the cylinders onsite
- Decommission each target cylinder to render it unusable as a pressurized vessel
- Backfill and site restoration
- Waste management
- Field documentation
- Demobilization

2.2 Non-Hazwoper-Regulated Tasks

Under specific circumstances, the training and medical monitoring requirements of federal or state Hazwoper regulations are not applicable. It must be demonstrated that the tasks can be performed without the possibility of exposure in order to use non-Hazwoper-trained personnel. **Prior approval from the Health and Safety Manager (HSM) is required before these tasks are conducted on regulated hazardous waste sites.**

Tasks	Controls
• Preparation and Submittal of a Source Removal Report	• Brief on hazards, limits of access, and emergency procedures • Post contaminant areas as appropriate • Sample and monitor as appropriate

TABLE 2-1
Hazard Analysis
(Refer to Section 3 for hazard controls)

Potential Hazards	Project Activities								
	Mobilization and Site Preparation	Survey and Anomaly Locating	Cylinder Excavation	Cylinder Sampling and Analysis	Cylinder Management	Backfill and Site Restoration	Waste Management	Field documentation	Demobilization
Manual Lifting (HS-29)	X	X	X	X	X	X	X		X
Fire Prevention (HS-22)	X	X	X	X	X	X	X		
Electrical Safety (HS-23)	X								
Lockout /Tagout (HS-33)									
Ladders & Stairs(HS-25)									
Compressed Gas Cylinders (HS-63)	X	X	X	X	X				
Buried Utilities	X	X	X			X			
Excavations (HS-32)	X	X	X			X			
Fall Protection (HS-31)		X							
Heavy Equipment (HS-27)	X	X	X	X	X	X			
Confined Space Entry (HS-17)		X							
Concrete & Masonry Work (HS-43)									
Cranes and Hoisting (HS-44)	X	X	X	X	X				
Demolition (HS-45)									
Scaffolding(HS-73)									
Steel erection (HS-62)									
Welding and cutting (HS-22)				X					
Aerial Lifts (HS-41)									
Hand & Power Tools (HS-50)	X	X	X	X	X		X	X	X
Forklifts (HS-48)	X		X	X	X		X		X
Drilling (HS_35)									
Noise (HS-39)	X	X	X	X	X		X	X	X
Pressurized Lines/Equipment			X	X	X				
Pressure Washing/Equip Decon							X		
Vacuum Truck/Pumping Operations				X	X		X		
Suspended Loads	X		X	X	X				
Vehicle Traffic	X		X	X	X	X			X
Haul Truck Operations						X			
Visible Lighting	X	X	X	X	X	X	X	X	
Mechanical Guarding Hazards			X	X	X				
Asbestos Hazard									X
Lead Hazard									
Chemical Hazard-Dermal/Inhalation			X	X	X		X		
Dust Hazard (Silica/Metals)									
Fire/Explosion Hazards			X	X	X		X		

3.0 Hazard Controls

This section provides safe work practices and control measures used to reduce or eliminate potential hazards. These practices and controls are to be implemented by the party in control of either the site or the particular hazard. CH2M HILL employees and subcontractors must remain aware of the hazards affecting them regardless of who is responsible for controlling the hazards. CH2M HILL employees and subcontractors who do not understand any of these provisions should contact the SHSS for clarification.

The health and safety hazards posed by field activities have been identified for each project activity and is provided in the Hazard Analysis Table (Table 2-1) in this section. Hazard control measures for project-specific and general H&S hazards are provided in 3.1 and 3.2 of this section.

Activity Hazard Analysis will be prepared before beginning each project activity posing H&S hazards to project personnel using the AHA form provided in the HSP Attachments as a guide. The AHA shall identify the work tasks required to perform each activity, along with potential H&S hazards and recommended control measures for each work task. In addition, a listing of the equipment to be used to perform the activity, inspection requirements and training requirements for the safe operation of the equipment listed must be identified. **AHAs shall be submitted to the Navy Technical Representative (NTR) for review at least 15 days prior to the start of each project activity phase.**

In addition to the controls specified in this section, Project-Activity Self-Assessment Checklists are contained in Attachment 5. These checklists are to be used to assess the adequacy of CH2M HILL and subcontractor site-specific safety requirements. The objective of the self-assessment process is to identify gaps in project safety performance, and prompt for corrective actions in addressing these gaps. Self-assessment checklists should be completed early in the project, when tasks or conditions change, or when otherwise specified by the HSM. The self-assessment checklists, including documented corrective actions, should be made part of the permanent project records.

Project-activity self-assessments checklist will be completed weekly by the SHSS during the course of the project, completing the applicable checklist depending on the work performed at the time on the project.

3.1 Project-Specific Hazards

3.1.1 Vacuum Truck Operations

- Operate vacuum truck in accordance with API Recommended Practice 2219, "Safe Operations of Vacuum Truck."
- Locate vacuum truck upwind of tank with discharge hose downwind of truck and tank
- Keep vacuum truck operations area free from flammable vapors.

- Bond and ground vacuum truck hoses to truck and well head when conveying free product to prevent static electricity discharges/sparks.
- Perform LEL monitoring at vacuum truck drive motor during free product removal and shutdown vacuum truck operations with 10% LEL reading in the immediate area.
- Keep hands from vacuum hose inlet.
- Wear protective gloves and hearing protection in the immediate vicinity.
- Do not place vacuum hose inlet in a position that may inadvertently contact other workers in the area.

The driller is to verify that all machine guards are in place while the rig is in operation.

The driller is responsible for housekeeping (maintaining a clean work area).

The drill rig should be equipped with at least one fire extinguisher.

If the drill rig comes into contact with electrical wires and becomes electrically energized, do not touch any part of the rig or any person in contact with the rig, and stay as far away as possible. Notify emergency personnel immediately.

3.1.2 Welding/Cutting with Compressed Gas Cylinders

(Reference CH2M HILL, SOP HS-22, *Welding and Cutting*)

- Complete hot work permit.
- Wear appropriate personal protective equipment.
- Remove or combustible materials in the immediate hot work area.
- Station fire watch with fire extinguisher.
- Valve caps must be in place when cylinders are transported, moved, or stored.
- Cylinder valves must be closed when cylinders are not being used and when cylinders are being moved.
- Cylinders must be secured in an upright position at all times.
- Cylinders must be positioned to avoid being struck or knock over; coming in contact with electrical circuits or extreme heat sources; and shielded from welding and cutting operations.
- Cylinders must be secured on a cradle, basket or pallet when hoisted; they may not be hoisted by choker slings.

3.1.3 Working around Material Handling Equipment

- Never approach operating equipment from the rear. Always make positive contact with the operator, and confirm that the operator has stopped the motion of the equipment.

- Never approach the side of operating equipment; remain outside of the swing and turning radius.
- Maintain distance from pinch points of operating equipment.
- Because heavy equipment may not be equipped with properly functioning reverse signal alarms, never turn your back on any operating equipment.
- Never climb onto operating equipment or operate contractor/subcontractor equipment.
- Never ride contractor/subcontractor equipment unless it is designed to accommodate passengers; equipped with firmly attached passenger seat.
- Never work or walk under a suspended load.
- Never use equipment as a personnel lift; do not ride excavator buckets or crane hooks.
- Always stay alert and maintain a safe distance from operating equipment, especially equipment on cross slopes and unstable terrain.

3.1.4 Excavation Activities

(Reference CH2M HILL, SOP HS-32, *Excavation and Trenching*)

- CH2M HILL personnel must notify and be granted authorization from the excavation competent person prior to entering any excavation. CH2M HILL personnel must follow all excavation requirements established by the competent person.
- The competent person must inspect the trench and/or excavation everyday and after everyday hazard increasing event. Documentation of this inspection must be maintained onsite at al times.
- Excavations must be protected from cave-ins by adequate protective systems unless the excavation is less than 5 feet in depth and a competent person determines there is no indication of cave-in or the excavation is made entirely in stable rock that is not fractured.
- Prior to excavating at a location, buried utilities in the area must be identified; refer to Section 2.2.8 "Procedures for locating buried utilities".
- CH2M HILL personnel must not enter any excavation where protective systems are deficient at any time, for any reason. The competent person must be notified of such conditions.
- Refer to CH2M HILL SOP HS-32 "Excavations and Trenching" for more specific details on excavation requirements.

3.1.5 Operating Heavy Equipment

(Reference CH2M HILL, SOP HS-27, *Earthmoving Equipment*)

- CH2M HILL authorizes only those employees qualified by training or previous experience to operate material handling equipment.

- Equipment must be checked at the beginning of each shift to ensure the equipment is in safe operating condition and free of apparent damage. The check should include: service brakes, parking brakes, emergency brakes, tires, horn, back-up alarm, steering mechanism, coupling devices, seat belts and operating controls. All defects shall be corrected before the equipment is placed in service. Documentation of this inspection must be maintained onsite at all times.
- Equipment must be on a stable foundation such as solid ground or cribbing; outriggers are to be fully extended.
- Equipment must not be used to lift personnel; loads must not be lifted over the heads of personnel.
- Equipment, or parts thereof, which are suspended must be substantially blocked or cribbed to prevent shifting before personnel are permitted to work under or between them. All controls shall be in a neutral position, with the motors stopped and brakes set.
- Equipment which is operating in reverse must have a reverse signal alarm distinguishable from the surrounding noise or a signal person when the operators view is obstructed.
- When equipment is used near energized power lines, the closest part of the equipment must be at least 10 feet from the power lines < 50 kV. Provide an additional 4 feet for every 10 kV over 50 kV. A person must be designated to observe clearances and give timely warning for all operations where it is difficult for the operator to maintain the desired clearance by visual means. All overhead power lines must be considered to be an energized until the electrical utility authorities indicate that it is not an energized line and it has been visibly grounded.
- Underground utility lines must be located before excavation begins; refer to Section 3.2.11 "Procedures for Locating Buried Utilities."
- Operators loading/unloading from vehicles are responsible for seeing that vehicle drivers are in the vehicle cab or in a safe area.
- The parking brake shall be set whenever equipment is parked, wheels must be chocked when parked on inclines.
- When not in operation, the blade/bucket must be blocked or grounded; the master clutch must be disengaged when the operator leaves the cab. When equipment is unattended, power must be shut off, brakes set, blades/buckets landed and shift lever in neutral.
- Ladders, stairways or integral prefabricated scaffold ladders must be used to access the platform; scaffold crossbracing may not be used as a means of access.
- CH2M HILL personnel must have completed CH2M HILL's fall protection training when personal fall arrest systems (harness, lanyard, lines, etc.) are required to be used on scaffolding.

- Personnel working from suspended scaffolding are required to wear a full body harness with lanyard attached to an independent lifeline.

3.1.6 Confined Space Entry Activities

(Reference CH2M HILL, SOP HS-17, *Confined Space Entry*)

- Project personnel are not anticipated to enter permit-required confined spaces during field activities. CH2M HILL personnel will enter confined spaces using the Alternative Procedure Permit attached to this plan for each entry.
- CH2M HILL personnel entering a confined spaces must have completed the 8-hour confined space entry training in the Recovery Center.
- Prior to entry, a confined space permit must be completed identifying entry requirements. Entrants must review the permit prior to each entry to verify the requirements have been satisfied.
- The atmosphere in the space must be tested with air monitoring equipment. CH2M HILL personnel must confirm the test results are consistent with acceptable entry conditions.
- Mechanical ventilation (portable blower) shall be applied to the space when these atmospheric conditions are not met during entries. Re-entry may only occur when the above atmospheric conditions are met and mechanical ventilation is continuously applied to maintain these conditions.
- CH2M HILL personnel entering confined spaces requiring respiratory protection must have completed respiratory protection training in the Basic program, received a respirator fit test and completed respirator wearer medical surveillance.
- Refer to CH2M HILL SOP HS-17 "Confined Space Entry" for more specific details on confined space entry requirements.

3.1.7 Forklift Operations

Forklifts may be required for materials movement during project activities. Forklifts present the potential for damage to equipment, materials and personnel by impaling or striking personnel or materials with the forklift tines. Additionally, forklifts may tip if they are incorrectly loaded, driven at excessive speeds or operated with the forks too high.

The following rules apply whenever a forklift is used on the project:

- A rated lifting capacity must be posted in a location readily visible to the operator.
- A forklift truck must not be used to elevate employees unless a platform with guardrails, a back guard, and a kill switch is provided on the vehicle. When guardrails are not possible, fall arrest protection is required.
- The subcontractor operating the forklift must post and enforce a set of operating rules for forklift trucks.
- Only trained and authorized drivers will operate forklifts.

- Stunt driving and horseplay are prohibited.
- Employees must not ride on the forks.
- Employees must never be permitted under the forks (unless forks are blocked).
- The driver must inspect the forklift once a shift and document this inspection.
- The operator must look in the direction of travel and must not move the vehicle until all persons are clear of the vehicle.
- Forks must be carried as low as possible.
- The operator must lower the forks, shut off the engine, and set the brakes (or block the wheels) before leaving the forklift operator's position unless maintenance or safety inspections require the forklift to be running.
- Trucks must be blocked and have brakes set when forklifts are driven onto their beds.
- Extreme care must be taken when tilting elevated loads.
- Every forklift must have operable brakes capable of safely stopping it when fully loaded.
- Forklifts must have parking brakes and an operable horn.
- When the operator is exposed to possible falling objects, industrial trucks must be equipped with overhead protection (canopy).

3.1.8 Cranes and Rigging

- Cranes shall be operated by a certified crane operator.
- The crane's operations manual and load chart specifically designed for the crane shall be on the crane at all times.
- The crane must have a current annual inspection to include load test certification (within the last 12 months) that meet all state and federal safety standards. Documentation of this inspection must be available for review.
- A competent person will inspect the crane daily to ensure it is in safe operating condition.
- All rigging equipment must be inspected by a competent person prior to use for signs of excessive wear; equipment found to be damaged will be tagged and removed from service.
- A pre-lift meeting will be conducted to include all parties involved in that days crane operation.
- Only one person shall signal the crane operator. This person shall be thoroughly familiar with all of the cranes operation and be able to communicate with the crane operator with the appropriate hand signals.
- No personnel shall be permitted under the load at any time.
- Tag lines shall be attached to every load being made by the crane.

- The swing radius of the rear rotating superstructure (counterweight) of the crane shall be barricaded and no entrance allowed.

No part of the crane will come within 10 feet of overhead electrical powerlines rated 50 kV or less. For lines over 50 kV, increase clearance distance by 4 inches for every 10 kV over 50kV

3.1.9 Compressed Gas Cylinders

- Valve caps must be in place when cylinders are transported, moved, or stored.
- Cylinder valves must be closed when cylinders are not being used and when cylinders are being moved.
- Cylinders must be secured in an upright position at all times.
- Cylinders must be shielded from welding and cutting operations and positioned to avoid being struck or knocked over; contacting electrical circuits; or exposed to extreme heat sources.
- Cylinders must be secured on a cradle, basket, or pallet when hoisted; they may not be hoisted by choker slings.

3.1.10 Uneven walking surfaces

- Employees walking in ditches, swales and other drainage structures adjacent to roads or across undeveloped land must use caution to prevent slips and falls which can result in twisted or sprained ankles, knees, and backs.
- Whenever possible operate from a flat surface and do not enter a steep ditch or hillside.
- If steep terrain must be negotiated, sturdy leather safety shoes or boots with that provide a high degree of traction and ankle support should be used. The need for ladders or ropes to provide stability should be evaluated.
- Avoid extremely tall grass/vegetation areas where the ground surface level can not readily be anticipated or directly observed.
- Clear and grub heavily covered areas where possible prior to conducting regular activities in the work area.

3.1.11 Exposure to Public Vehicular Traffic

The following precautions must be taken when working around traffic, and in or near an area where traffic controls have been established by a contractor.

- Exercise caution when exiting traveled way or parking along street – avoid sudden stops, use flashers, etc.
- Park in a manner that will allow for safe exit from vehicle, and where practicable, park vehicle so that it can serve as a barrier.
- All staff working adjacent to traveled way or within work area must wear reflective/high-visibility safety vests.

- Eye protection should be worn to protect from flying debris.
- Remain aware of factors that influence traffic related hazards and required controls – sun glare, rain, wind, flash flooding, limited sight-distance, hills, curves, guardrails, width of shoulder (i.e., breakdown lane), etc.
- Always remain aware of an escape route—behind an established barrier, parked vehicle, guardrail, etc.
- Always pay attention to moving traffic—never assume drivers are looking out for you
- Work as far from traveled way as possible to avoid creating confusion for drivers.
- When workers must face away from traffic, a "buddy system" should be used, where one worker is looking towards traffic.
- When working on highway projects, obtain a copy of the contractor's traffic control plan.
- Work area should be protected by a physical barrier—such as a K-rail or Jersey barrier.
- Review traffic control devices to ensure that they are adequate to protect your work area. Traffic control devices should: 1) convey a clear meaning, 2) command respect of road users, and 3) give adequate time for proper traffic response. The adequacy of these devices are dependent on limited sight distance, proximity to ramps or intersections, restrictive width, duration of job, and traffic volume, speed, and proximity.
- Either a barrier or shadow vehicle should be positioned a considerable distance ahead of the work area. The vehicle should be equipped with a flashing arrow sign and truck-mounted crash cushion (TMCC). All vehicles within 40 feet of traffic should have an orange flashing hazard light atop the vehicle.
- Except on highways, flaggers should be used when 1) two-way traffic is reduced to using one common lane, 2) driver visibility is impaired or limited, 3) project vehicles enter or exit traffic in an unexpected manner, or 4) the use of a flagger enhances established traffic warning systems.
- Lookouts should be used when physical barriers are not available or practical. The lookout continually watches approaching traffic for signs of erratic driver behavior and warns workers. Vehicles should be parked at least 40 feet away from the work zone and traffic. Minimize the amount of time that you will have your back to oncoming traffic.

3.2 General Hazards

3.2.1 General Practices and Housekeeping

(Reference CH2M HILL- SOP HS-20, *General Practices*)

- Site work should be performed during daylight hours whenever possible. Work conducted during hours of darkness require enough illumination intensity to read a newspaper without difficulty.

- Good housekeeping must be maintained at all times in all project work areas.
- Common paths of travel should be established and kept free from the accumulation of materials.
- Keep access to aisles, exits, ladders, stairways, scaffolding, and emergency equipment free from obstructions.
- Provide slip-resistant surfaces, ropes, and/or other devices to be used.
- Specific areas should be designated for the proper storage of materials.
- Tools, equipment, materials, and supplies shall be stored in an orderly manner.
- As work progresses, scrap and unessential materials must be neatly stored or removed from the work area.
- Containers should be provided for collecting trash and other debris and shall be removed at regular intervals.
- All spills shall be quickly cleaned up. Oil and grease shall be cleaned from walking and working surfaces.

3.2.2 Hazard Communication

(Reference CH2M HILL-SOP HS-05, *Hazard Communication)*

The SHSS is to perform the following:

- Complete an inventory of chemicals brought on site by CH2M HILL using Attachment 2.
- Confirm that an inventory of chemicals brought on site by CH2M HILL subcontractors is available.
- Request or confirm locations of Material Safety Data Sheets (MSDSs) from the client, contractors, and subcontractors for chemicals to which CH2M HILL employees potentially are exposed.
- Before or as the chemicals arrive on site, obtain an MSDS for each hazardous chemical.
- Label chemical containers with the identity of the chemical and with hazard warnings, and store properly.
- Give employees required chemical-specific HAZCOM training using Attachment 3.
- Store all materials properly, giving consideration to compatibility, quantity limits, secondary containment, fire prevention, and environmental conditions.

3.2.3 Shipping and Transportation of Chemical Products

(Reference CH2M HILL's *Procedures for Shipping and Transporting Dangerous Goods)*

Chemicals brought to the site might be defined as hazardous materials by the U.S. Department of Transportation (DOT). All staff who ship the materials or transport them by

road must receive CH2M HILL training in shipping dangerous goods. All hazardous materials that are shipped (e.g., via Federal Express) or are transported by road must be properly identified, labeled, packed, and documented by trained staff. Contact the HSM or the Equipment Coordinator for additional information.

3.2.4 Lifting

(Reference CH2M HILL-SOP HS-29, *Lifting*)

- Proper lifting techniques must be used when lifting any object.
- Plan storage and staging to minimize lifting or carrying distances.
- Split heavy loads into smaller loads.
- Use mechanical lifting aids whenever possible.
- Have someone assist with the lift -- especially for heavy or awkward loads.
- Make sure the path of travel is clear prior to the lift.

3.2.5 Fire Prevention

(Reference CH2M HILL- SOP HS-22, *Fire Prevention*)

- Fire extinguishers shall be provided so that the travel distance from any work area to the nearest extinguisher is less than 100 feet. When 5 gallons or more of a flammable or combustible liquid is being used, an extinguisher must be within 50 feet. Extinguishers must:
  - be maintained in a fully charged and operable condition,
  - be visually inspected each month, and
  - undergo a maintenance check each year.
- The area in front of extinguishers must be kept clear.
- Post "Exit" signs over exiting doors, and post "Fire Extinguisher" signs over extinguisher locations.
- Combustible materials stored outside should be at least 10 feet from any building.
- Solvent waste and oily rags must be kept in a fire resistant, covered container until removed from the site.
- Flammable/combustible liquids must be kept in approved containers, and must be stored in an approved storage cabinet.

3.2.6 Electrical

(Reference CH2M HILL-SOP HS-23, *Electrical*)

- Only qualified personnel are permitted to work on unprotected energized electrical systems.
- Only authorized personnel are permitted to enter high-voltage areas.
- Do not tamper with electrical wiring and equipment unless qualified to do so. All electrical wiring and equipment must be considered energized until lockout/tagout procedures are implemented.

- Inspect electrical equipment, power tools, and extension cords for damage prior to use. Do not use defective electrical equipment, remove from service.
- All temporary wiring, including extension cords and electrical power tools, must have ground fault circuit interrupters (GFCIs) installed.
- Extension cords must be:
  - equipped with third-wire grounding.
  - covered, elevated, or protected from damage when passing through work areas.
  - protected from pinching if routed through doorways.
  - not fastened with staples, hung from nails, or suspended with wire.
- Electrical power tools and equipment must be effectively grounded or double-insulated UL approved.
- Operate and maintain electric power tools and equipment according to manufacturers' instructions.
- Maintain safe clearance distances between overhead power lines and any electrical conducting material unless the power lines have been de-energized and grounded, or where insulating barriers have been installed to prevent physical contact. Maintain at least 10 feet from overhead power lines for voltages of 50 kV or less, and 10 feet plus ½ inch for every 1 kV over 50 kV.
- Temporary lights shall not be suspended by their electric cord unless designed for suspension. Lights shall be protected from accidental contact or breakage.
- Protect all electrical equipment, tools, switches, and outlets from environmental elements.

3.2.7 Stairways and Ladders

(Reference CH2M HILL-SOP HS-25, *Stairways and Ladders*)

- Stairway or ladder is generally required when a break in elevation of 19 inches or greater exists.
- Personnel should avoid using both hands to carry objects while on stairways; if unavoidable, use extra precautions.
- Personnel must not use pan and skeleton metal stairs until permanent or temporary treads and landings are provided the full width and depth of each step and landing.
- Ladders must be inspected by a competent person for visible defects prior to each day's use. Defective ladders must be tagged and removed from service.
- Ladders must be used only for the purpose for which they were designed and shall not be loaded beyond their rated capacity.
- Only one person at a time shall climb on or work from an individual ladder.
- User must face the ladder when climbing; keep belt buckle between side rails

- Ladders shall not be moved, shifted, or extended while in use.
- User must use both hands to climb; use rope to raise and lower equipment and materials
- Straight and extension ladders must be tied off to prevent displacement
- Ladders that may be displaced by work activities or traffic must be secured or barricaded
- Portable ladders must extend at least 3 feet above landing surface
- Straight and extension ladders must be positioned at such an angle that the ladder base to the wall is one-fourth of the working length of the ladder
- Stepladders are to be used in the fully opened and locked position
- Users are not to stand on the top two steps of a stepladder; nor are users to sit on top or straddle a stepladder
- Fixed ladders > 24 feet in height must be provided with fall protection devices.
- Fall protection should be considered when working from extension, straight, or fixed ladders greater than 6 feet from lower levels and both hands are needed to perform the work, or when reaching or working outside of the plane of ladder side rails.

3.2.8 Heat Stress

(Reference CH2M HILL- SOP HS-09, *Heat and Cold Stress*)

- Drink 16 ounces of water before beginning work. Disposable cups and water maintained at 50°F to 60°F should be available. Under severe conditions, drink one to two cups every 20 minutes, for a total of 1 to 2 gallons per day. Do not use alcohol in place of water or other nonalcoholic fluids. Decrease your intake of coffee and caffeinated soft drinks during working hours.
- Acclimate yourself by slowly increasing workloads (e.g., do not begin with extremely demanding activities).
- Use cooling devices, such as cooling vests, to aid natural body ventilation. These devices add weight, so their use should be balanced against efficiency.
- Use mobile showers or hose-down facilities to reduce body temperature and cool protective clothing.
- Conduct field activities in the early morning or evening and rotate shifts of workers, if possible.
- Avoid direct sun whenever possible, which can decrease physical efficiency and increase the probability of heat stress. Take regular breaks in a cool, shaded area. Use a wide-brim hat or an umbrella when working under direct sun for extended periods.
- Provide adequate shelter/shade to protect personnel against radiant heat (sun, flames, hot metal).

- Maintain good hygiene standards by frequently changing clothing and showering.
- Observe one another for signs of heat stress. Persons who experience signs of heat syncope, heat rash, or heat cramps should consult the SHSS to avoid progression of heat-related illness.

Symptoms and Treatment of Heat Stress					
	Heat Syncope	Heat Rash	Heat Cramps	Heat Exhaustion	Heat Stroke
Signs and Symptoms	Sluggishness or fainting while standing erect or immobile in heat.	Profuse tiny raised red blister-like vesicles on affected areas, along with prickling sensations during heat exposure.	Painful spasms in muscles used during work (arms, legs, or abdomen); onset during or after work hours.	Fatigue, nausea, headache, giddiness; skin clammy and moist; complexion pale, muddy, or flushed; may faint on standing; rapid thready pulse and low blood pressure; oral temperature normal or low	Red, hot, dry skin; dizziness; confusion; rapid breathing and pulse; high oral temperature.
Treatment	Remove to cooler area. Rest lying down. Increase fluid intake. Recovery usually is prompt and complete.	Use mild drying lotions and powders, and keep skin clean for drying skin and preventing infection.	Remove to cooler area. Rest lying down. Increase fluid intake.	Remove to cooler area. Rest lying down, with head in low position. Administer fluids by mouth. Seek medical attention.	Cool rapidly by soaking in cool– but not cold– water. Call ambulance, and get medical attention immediately!

3.2.8.1 Monitoring Heat Stress

These procedures should be considered when the ambient air temperature exceeds 70°F, the relative humidity is high (>50 percent), or when workers exhibit symptoms of heat stress. The heart rate (HR) should be measured by the radial pulse for 30 seconds, as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 100 beats/minute, or 20 beats/minute above resting pulse. If the HR is higher, the next work period should be shortened by 33 percent, while the length of the rest period stays the same. If the pulse rate still exceeds 100 beats/minute at the beginning of the next rest period, the work cycle should be further shortened by 33 percent. The procedure is continued until the rate is maintained below 100 beats/minute, or 20 beats/minute above resting pulse.

3.2.9 Cold Stress

(Reference CH2M HILL- SOP HS-09, *Heat and Cold Stress*)

- Be aware of the symptoms of cold-related disorders, and wear proper, layered clothing for the anticipated fieldwork. Appropriate rain gear is a must in cool weather.
- Consider monitoring the work conditions and adjusting the work schedule using guidelines developed by the U.S. Army (wind-chill index) and the National Safety Council (NSC).
- Wind-Chill Index is used to estimate the combined effect of wind and low air temperatures on exposed skin. The wind-chill index does not take into account the body part that is exposed, the level of activity, or the amount or type of clothing worn. For

those reasons, it should only be used as a guideline to warn workers when they are in a situation that can cause cold-related illnesses.

- NSC Guidelines for Work and Warm-Up Schedules can be used with the wind-chill index to estimate work and warm-up schedules for fieldwork. The guidelines are not absolute; workers should be monitored for symptoms of cold-related illnesses. If symptoms are not observed, the work duration can be increased.
- Persons who experience initial signs of immersion foot, frostbite, hypothermia should consult the SHSS to avoid progression of cold-related illness.
- Observe one another for initial signs of cold-related disorders.
- Obtain and review weather forecast – be aware of predicted weather systems along with sudden drops in temperature, increase in winds, and precipitation.

Symptoms and Treatment of Cold Stress

	Immersion (Trench) Foot	Frostbite	Hypothermia
Signs and Symptoms	Feet discolored and painful; infection and swelling present.	Blanched, white, waxy skin, but tissue resilient; tissue cold and pale.	Shivering, apathy, sleepiness; rapid drop in body temperature; glassy stare; slow pulse; slow respiration.
Treatment	Seek medical treatment immediately.	Remove victim to a warm place. Re-warm area quickly in warm–but **not** hot–water. Have victim drink warm fluids, but **not** coffee or alcohol. Do not break blisters. Elevate the injured area, and get medical attention.	Remove victim to a warm place. Have victim drink warm fluids, but **not** coffee or alcohol. Get medical attention.

3.2.10 Compressed Gas Cylinders

- Valve caps must be in place when cylinders are transported, moved, or stored.
- Cylinder valves must be closed when cylinders are not being used and when cylinders are being moved.
- Cylinders must be secured in an upright position at all times.
- Cylinders must be shielded from welding and cutting operations and positioned to avoid being struck or knocked over; contacting electrical circuits; or exposed to extreme heat sources.
- Cylinders must be secured on a cradle, basket, or pallet when hoisted; they may not be hoisted by choker slings.

3.2.11 Procedures for Locating Buried Utilities

Do not begin subsurface construction activities (e.g., trenching, excavation, drilling, etc.) until a check for underground utilities and similar obstructions has been conducted. The use of as-built drawings and utility company searches must be supplemented with a

geophysical or other survey by a qualified, independent survey contractor to identify additional and undiscovered buried utilities.

Examples of the type of geophysical technologies include:

- **Ground Penetrating Radar (GPR),** which can detect pipes, including gas pipes, tanks, conduits, cables etc, both metallic and non-metallic at depths up to 30 feet depending on equipment. Sensitivity for both minimum object size and maximum depth detectable depends on equipment selected, soil conditions, etc.
- **Radio Frequency (RF),** involves inducing an RF signal in the pipe or cable and using a receiver to trace it. Some electric and telephone lines emit RF naturally and can be detected without an induced signal. This method requires knowing where the conductive utility can be accessed to induce RF field if necessary.
- **Dual RF**, a modified version of RF detection using multiple frequencies to enhance sensitivity but with similar limitations to RF
- **Ferromagnetic Detectors**, are metal detectors that will detect ferrous and non-ferrous utilities. Sensitivity is limited, e.g. a 100 mm iron disk to a depth of about one meter or a 25 mm steel paper clip to a depth of about 20 cm.
- **Electronic markers,** are emerging technologies that impart a unique electronic signature to materials such as polyethylene pipe to facilitate location and tracing after installation. Promising for future installations but not of help for most existing utilities already in place.

The following procedures shall be used to identify and mark underground utilities during subsurface construction activities on the project:

- The survey contractor shall determine the most appropriate geophysical technique or combinations of techniques to identify the buried utilities on the project, based on the survey contractor's experience and expertise, types of utilities anticipated to be present and specific site conditions.
- The survey contractor shall employ the same geophysical techniques used on the project to identify the buried utilities, to survey the proposed path of subsurface construction work to confirm no buried utilities are present.
- Identify customer specific permit and/or procedural requirements for excavation and drilling activities. For military installations contact the Base Civil Engineer and obtain the appropriate form to begin the clearance process.
- Contact utility companies or the state/regional utility protection service at least two (2) working days prior to excavation activities to advise of the proposed work, and ask them to establish the location of the utility underground installations prior to the start of actual excavation.
- Schedule the independent survey.
- Obtain utility clearances for subsurface work on both public and private property.

- Clearances are to be in writing, signed by the party conducting the clearance.
- Underground utility locations must be physically verified by hand digging using wood or fiberglass-handled tools when any adjacent subsurface construction activity (e.g. mechanical drilling, excavating) work is expected to come within 5 feet of the marked underground system. If subsurface construction activity is within 5 feet and parallel to a marked existing utility, the utility location must be exposed and verified by hand digging every 100 feet.
- Protect and preserve the markings of approximate locations of facilities until the markings are no longer required for safe and proper excavations. If the markings of utility locations are destroyed or removed before excavation commences or is completed, the Project Manager must notify the utility company or utility protection service to inform them that the markings have been destroyed.
- Conduct a site briefing for employees regarding the hazards associated with working near the utilities and the means by which the operation will maintain a safe working environment. Detail the method used to isolate the utility and the hazards presented by breaching the isolation..
- Monitor for signs of utilities during advancement of intrusive work (e.g., sudden change in advancement of auger or split spoon during drilling or change in color, texture or density during excavation that could indicate the ground has been previously disturbed).

3.3 Biological Hazards and Controls

3.3.1 Snakes

Snakes typically are found in underbrush and tall grassy areas. If you encounter a snake, stay calm and look around; there may be other snakes. Turn around and walk away on the same path you used to approach the area. If a person is bitten by a snake, wash and immobilize the injured area, keeping it lower than the heart if possible. Seek medical attention immediately. **DO NOT** apply ice, cut the wound, or apply a tourniquet. Try to identify the type of snake: note color, size, patterns, and markings.

3.3.2 Poison Ivy and Poison Sumac

Poison ivy, poison oak, and poison sumac typically are found in brush or wooded areas. They are more commonly found in moist areas or along the edges of wooded areas. Become familiar with the identity of these plants. Wear protective clothing that covers exposed skin and clothes. Avoid contact with plants and the outside of protective clothing. If skin contacts a plant, wash the area with soap and water immediately. If the reaction is severe or worsens, seek medical attention.

3.3.3 Ticks

Ticks typically are in wooded areas, bushes, tall grass, and brush. Ticks are black, black and red, or brown and can be up to one-quarter inch in size. Wear tightly woven light-colored clothing with long sleeves and pant legs tucked into boots; spray **only outside** of clothing

with permethrin or permanone and spray skin with only DEET; and check yourself frequently for ticks.

If bitten by a tick, grasp it at the point of attachment and carefully remove it. After removing the tick, wash your hands and disinfect and press the bite areas. Save the removed tick. Report the bite to human resources. Look for symptoms of Lyme disease or Rocky Mountain spotted fever (RMSF). Lyme: a rash might appear that looks like a bullseye with a small welt in the center. RMSF: a rash of red spots under the skin 3 to 10 days after the tick bite. In both cases, chills, fever, headache, fatigue, stiff neck, and bone pain may develop. If symptoms appear, seek medical attention.

3.3.4 Bees and Other Stinging Insects

Bee and other stinging insects may be encountered almost anywhere and may present a serious hazard, particularly to people who are allergic. Watch for and avoid nests. Keep exposed skin to a minimum. Carry a kit if you have had allergic reactions in the past, and inform the SHSS and/or buddy. If a stinger is present, remove it carefully with tweezers. Wash and disinfect the wound, cover it, and apply ice. Watch for allergic reaction; seek medical attention if a reaction develops.

3.3.5 Bloodborne Pathogens

(Reference CH2M HILL- SOP HS-36, *Bloodborne Pathogens*)

Exposure to bloodborne pathogens may occur when rendering first aid or CPR, or when coming into contact with landfill waste or waste streams containing potentially infectious material. Exposure controls and personal protective equipment (PPE) are required as specified in CH2M HILL SOP HS-36, *Bloodborne Pathogens*. Hepatitis B vaccination must be offered before the person participates in a task where exposure is a possibility.

3.3.6 Mosquito Bites

Due to the recent detection of the West Nile Virus in the Southeastern United States, it is recommended that **preventative measures** be taken to reduce the probability of being bitten by mosquitoes whenever possible. Mosquitoes are believed to be the primary source for exposure to the West Nile Virus as well as several other types of encephalitis. The following guidelines should be followed to reduce the risk of these concerns for working in areas where mosquitoes are prevalent:

- Stay indoors at dawn, dusk, and in the early evening.
- Wear long-sleeved shirts and long pants whenever you are outdoors.
- Spray clothing with repellents containing permethrin or DEET since mosquitoes may bite through thin clothing.
- Apply insect repellent sparingly to exposed skin. An effective repellent will contain 35 percent DEET (N,N-diethyl-meta-toluamide). DEET in high concentrations (greater than 35 percent) provides no additional protection.
- Repellents may irritate the eyes and mouth, so avoid applying repellent to the hands.

- Whenever you use an insecticide or insect repellent, be sure to read and follow the manufacturer's DIRECTIONS FOR USE, as printed on the product.

Note: Vitamin B and "ultrasonic" devices are NOT effective in preventing mosquito bites.

3.3.6.1 Symptoms of Exposure to the West Nile Virus

- Most infections are mild, and symptoms include fever, headache, and body aches, occasionally with skin rash and swollen lymph glands. More severe infection may be marked by headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, paralysis, and, rarely, death.
- The West Nile Virus incubation period is from 3-15 days.
- If you have any questions or to report any suspicious symptoms, contact the project Health and Safety Manager.

3.4 Radiological Hazards and Controls

Refer to CH2M HILL's Corporate Health and Safety Program, Program and Training Manual, and Corporate Health and Safety Program, Radiation Protection Program Manual, for standards of practice in contaminated areas.

3.5 Contaminants of Concern

Contaminants of concern are unknown.

3.6 Potential Routes of Exposure

Dermal: Contact with contaminated media. This route of exposure is minimized through proper use of PPE.

Inhalation: Vapors and contaminated particulates. This route of exposure is minimized through proper respiratory protection and monitoring, as specified in Sections 4 and 5, respectively.

Other: Inadvertent ingestion of contaminated media. This route should not present a concern if good hygiene practices are followed (e.g., wash hands and face before drinking or smoking).

4.0 Project Organization and Personnel

4.1 CH2M HILL Employee Medical Surveillance and Training

(Reference CH2M HILL- SOPs HS-01, *Medical Surveillance,* and HS-02, *Health and Safety Training)*

The employees listed meet state and federal hazardous waste operations requirements for 40-hour initial training, 3-day on-the-job experience, and 8-hour annual refresher training. Employees designated "SHSS" have completed a 12-hour site safety coordinator course, and have documented requisite field experience. An SHSS with a level designation (D, C, B) equal to or greater than the level of protection being used must be present during all tasks performed in exclusion or decontamination zones. Employees designated "FA-CPR" are currently certified by the American Red Cross, or equivalent, in first aid and CPR. At least one FA-CPR designated employee must be present during all tasks performed in exclusion or decontamination zones. At least two FA-CPR trained employees must be available at each job site/operation. The employees listed below are currently active in a medical surveillance program that meets state and federal regulatory requirements for hazardous waste operations. Certain tasks (e.g., confined-space entry) and contaminants (e.g., lead) may require additional training and medical monitoring.

Pregnant employees are to be informed of and are to follow the procedures in CH2M HILL-SOP HS-04, *Reproduction Protection,* including obtaining a physician's statement of the employee's ability to perform hazardous activities before being assigned fieldwork.

Employee Name	Office	Responsibility	SHSS/FA-CPR
Greg Wilfley	ATL	Project Manager	
Eric Burrell	ATL	Quality Manager	
Will Knox	ATL	Site Safety Manager	SC-HW, SC-C, SC-B FA/CPR
Rich Rathnow	ORO	Health and Safety Manager	SH-HW, SC-C, FA/CPR

ATL – Atlanta, GA
ORO – Oak Ridge, TN

4.2 Field Team Chain of Command and Communication Procedures

4.2.1 Client

Contact Name: Bill Hill/ NAVFAC SE
Phone: 843-820-7324

4.2.2 CH2M HILL

Program Manager: Sid Allison/ATL

Project Manager: Greg Wilfley/ATL
Health and Safety Manager: Rich Rathnow/ORO
Site Supervisor: Jeff Winnette/ATL
Site Health and Safety Specialist: William Knox/ATL

The CH2M HILL project manager (PM) is responsible for providing adequate resources (budget and staff) for project-specific implementation of the HS&E management process. The PM has overall management responsibility for the tasks listed below. The PM may explicitly delegate specific tasks to other staff, as described in sections that follow, but retains ultimate responsibility for completion of the following in accordance with this SOP:

- Include standard terms and conditions, and contract-specific HS&E roles and responsibilities in contract and subcontract agreements (including flow-down requirements to lower-tier subcontractors)
- Select safe and competent subcontractors by:
- obtaining, reviewing and accepting or rejecting subcontractor pre-qualification questionnaires
- ensuring that acceptable certificates of insurance, including CH2M HILL as named additional insured, are secured as a condition of subcontract award
- including HS&E submittals checklist in subcontract agreements, and ensuring that appropriate site-specific safety procedures, training and medical monitoring records are reviewed and accepted prior to the start of subcontractor's field operations
- Maintain copies of subcontracts and subcontractor certificates of insurance (including CH2M HILL as named additional insured), bond, contractors license, training and medical monitoring records, and site-specific safety procedures in the project file accessible to site personnel
- Provide oversight of subcontractor HS&E practices per the site-specific safety plan
- Manage the site and interfacing with 3rd parties in a manner consistent with our contract and subcontract agreements and the applicable standard of reasonable care
- Ensure that the overall, job-specific, HS&E goals are fully and continuously implemented

The CH2M HILL HSM is responsible for:

- Review and accept or reject subcontractor pre-qualification questionnaires that fall outside the performance range delegated to the Contracts Administrator (KA)
- Review and accept or reject subcontractor training records and site-specific safety procedures prior to start of subcontractor's field operations
- Support the SHSS's oversight of subcontractor (and lower-tier subcontractors) HS&E practices and interfaces with on-site 3rd parties per the site-specific safety plan
- The SHSS is responsible for verifying that the project is conducted in a safe manner including the following specific obligations:

- Verify this HSP remains current and amended when project activities or conditions change
- Verify CH2M HILL site personnel and subcontractor personnel read this HSP and sign Attachment 1 "Employee Signoff Form" prior to commencing field activities
- Verify CH2M HILL site personnel and subcontractor personnel have completed any required specialty training (e.g., fall protection, confined space entry) and medical surveillance as identified in Section 2
- Verify compliance with the requirements of this HSP and applicable subcontractor health and safety plan(s)
- Act as the project "Hazard Communication Coordinator" and perform the responsibilities outlined in Section 2.2.2
- Act as the project "Emergency Response Coordinator" and perform the responsibilities outlined in Section 4
- Post OSHA job-site poster; the poster is required at sites where project field offices, trailers, or equipment-storage boxes are established; posters can be obtained by calling 800/548-4776 or 800/999-9111
- Verify that safety meetings are conducted and documented in the project file initially and as needed throughout the course of the project (e.g., as tasks or hazards change)
- Verify that project H&S forms and permits, found in Attachment 5, are being used as outlined in Section 2
- Perform oversight and/or assessments of subcontractor HS&E practices per the site-specific safety plan and verify that project activity self-assessment checklists, found in Attachment 5, are being used as outlined in Section 2
- Verify that project files available to site personnel include copies of executed subcontracts and subcontractor certificates of insurance (including CH2M HILL as named additional insured), bond, contractors license, training and medical monitoring records, and site-specific safety procedures prior to start of subcontractor's field operations
- Manage the site and interfacing with 3rd parties in a manner consistent with our contract/subcontract agreements and the applicable standard of reasonable care
- Coordinate with the HS&E manager regarding CH2M HILL and subcontractor operational performance, and 3rd party interfaces
- Ensure that the overall, job-specific, HS&E goals are fully and continuously implemented
- The training required for the SHSS is as follows:
- SHSS 10 hour course
- OHSA 10 hour course for Construction

- First Aid and CPR
- Relevant Competent Person Courses (excavation, confined space, scaffold, fall protection, etc.)

The SHSS is responsible for contacting the Field Team Leader and Project Manager. In general, the Project Manager will contact the client. The Health and Safety Manager should be contacted as appropriate.

4.2.3 Subcontractors

(Reference CH2M HILL- SOP HS-55, *Subcontractor, Contractor, and Owner*)

Certain subcontractors (drilling, remedial and construction contractors) are required to be pre-qualified for safety by completing the Subcontractor Safety Performance Questionnaire. The subcontractors listed above are covered by this HSP. However, this plan does not address hazards associated with the tasks and equipment that the subcontractor has expertise in (e.g., drilling, excavation work, electrical). Subcontractors are responsible for the health and safety procedures specific to their work, and are required to submit these procedures to CH2M HILL for review before the start of field work by following the Subcontractor Safety Procedure Criteria specific to their work.

Subcontractors are also required to prepare Activity Hazard Analysis before beginning each activity posing H&S hazards to their personnel using the AHA form provided in Attachment 6 as a guide. The AHA shall identify the principle steps of the activity, potential H&S hazards for each step and recommended control measures for each identified hazard. In addition, a listing of the equipment to be used to perform the activity, inspection requirements and training requirements for the safe operation of the equipment listed must be identified.

Subcontractors must comply with the established health and safety plan(s). The CH2M HILL SHSS should verify that subcontractor employee training, medical clearance, and fit test records are current and must monitor and enforce compliance with the established plan(s). CH2M HILL oversight does not relieve subcontractors of their responsibility for effective implementation and compliance with the established plan(s).

CH2M HILL should continuously endeavor to observe subcontractors' safety performance. This endeavor should be reasonable, and include observing for hazards or unsafe practices that are both readily observable and occur in common work areas. CH2M HILL is not responsible for exhaustive observation for hazards and unsafe practices. In addition to this level of observation, the SHSS is responsible for confirming CH2M HILL subcontractor performance against both the subcontractor's safety plan and applicable self-assessment checklists. Self-assessment checklists contained in Attachment 5 are to be used by the SHSS to review subcontractor performance.

Health and safety related communications with CH2M HILL subcontractors should be conducted as follows:

- Brief subcontractors on the provisions of this plan, and require them to sign the Employee Signoff Form included in Attachment 1.

- Request subcontractor(s) to brief project team on the hazards and precautions related to their work.
- When apparent non-compliance/unsafe conditions or practices are observed, notify the subcontractor safety representative and require corrective action – the subcontractor is responsible for determining and implementing necessary controls and corrective actions.
- When repeat non-compliance/unsafe conditions are observed, notify the subcontractor safety representative and stop affected work until adequate corrective measures are implemented.
- When an apparent imminent danger exists, immediately remove all affected CH2M HILL employees and subcontractors, notify subcontractor safety representative, and stop affected work until adequate corrective measures are implemented. Notify the Project Manager and HSM as appropriate.
- Document all oral health and safety related communications in project field logbook, daily reports, or other records.

5.0 Personal Protective Equipment

(Reference CH2M HILL- SOP HS-07, *Personal Protective Equipment*, HS-08, *Respiratory Protection*)

PPE Specifications are listed in Table 5-1.

TABLE 5-1
PPE Specifications[a]

Task	Level	Body	Head	Respirator [b]
General site entry Oversight of remediation and construction Mobilization Site preparation	D	Work clothes; steel-toe, leather work boots; work glove.	Hardhat [c] Safety glasses Ear protection [d]	None required
Field documentation Demobilization	Modified D	Work clothes or cotton coveralls **Boots:** Steel-toe, chemical-resistant boots OR steel-toe, leather work boots with outer rubber boot covers **Gloves:** Inner surgical-style nitrile & outer chemical-resistant nitrile gloves.	Hardhat [c] Safety glasses Ear protection [d]	None required
Backfill and site restoration Waste management	Modified D	**Coveralls:** Uncoated Tyvek® **Boots:** Steel-toe, chemical-resistant boots OR steel-toe, leather work boots with outer rubber boot covers **Gloves:** Inner surgical-style nitrile & outer chemical-resistant nitrile gloves.	Hardhat [c] Splash shield [c] Safety glasses Ear protection [d]	None required.
Tasks requiring upgrade	C	**Coveralls:** Polycoated Tyvek® **Boots:** Steel-toe, chemical-resistant boots OR steel-toe, leather work boots with outer rubber boot covers **Gloves:** Inner surgical-style nitrile & outer chemical-resistant nitrile gloves.	Hardhat [c] Splash shield [c] Ear protection [d] Spectacle inserts	APR, full face, MSA Ultratwin or equivalent; with GME-H cartridges or equivalent[e].
Tasks requiring upgrade	B	**Coveralls:** Polycoated Tyvek® **Boots:** Steel-toe, chemical-resistant boots OR steel-toe, leather work boots with outer rubber boot covers **Gloves:** Inner surgical-style nitrile & outer chemical-resistant nitrile gloves.	Hardhat [c] Splash shield [c] Ear protection [d] Spectacle inserts	Positive-pressure demand self-contained breathing apparatus (SCBA); MSA Ultralite, or equivalent.

Reasons for Upgrading or Downgrading Level of Protection

Upgrade[f]	Downgrade
• Request from individual performing tasks. • Change in work tasks that will increase contact or potential contact with hazardous materials. • Occurrence or likely occurrence of gas or vapor emission. • Known or suspected presence of dermal hazards. • Instrument action levels (Section 5) exceeded.	• New information indicating that situation is less hazardous than originally thought. • Change in site conditions that decreases the hazard. • Change in work task that will reduce contact with hazardous materials.

TABLE 5-1
PPE Specifications[a]

Task	Level	Body	Head	Respirator [b]

[a] Modifications are as indicated. CH2M HILL will provide PPE only to CH2M HILL employees.

[b] No facial hair that would interfere with respirator fit is permitted.

[c] Hardhat and splash-shield areas are to be determined by the SHSS.

[d] Ear protection should be worn when conversations cannot be held at distances of 3 feet or less without shouting.

[e] Cartridge change-out schedule is at least every 8 hours (or one work day), except if relative humidity is > 85%, or if organic vapor measurements are > midpoint of Level C range (refer to Section 5)--then at least every 4 hours. If encountered conditions are different than those anticipated in this HSP, contact the HSM.

[f] Performing a task that requires an upgrade to a higher level of protection (e.g., Level D to Level C) is permitted only when the PPE requirements have been approved by the HSM, and an SHSS qualified at that level is present.

6.0 Air Monitoring/Sampling

(Reference CH2M HILL- SOP HS-06, *Air Monitoring)*

6.1 Air Monitoring Specifications

Air Monitoring Specifications are listed in Table 6-1.

TABLE 6-1
Air Monitoring Specifications

Instrument	Tasks	Action Levels[a]	Frequency[b]	Calibration
Air monitoring to be conducted by IES per their workplan, HSP and AHAs	All cylinder removal related tasks			

[a] Action levels apply to sustained breathing-zone measurements above background.
[b] The exact frequency of monitoring depends on field conditions and is to be determined by the SHSS; generally, every 5 to 15 minutes if acceptable; more frequently may be appropriate. Monitoring results should be recorded. Documentation should include instrument and calibration information, time, measurement results, personnel monitored, and place/location where measurement is taken (e.g., "Breathing Zone/MW-3", "at surface/SB-2", etc.).
[c] If the measured percent of O_2 is less than 10, an accurate LEL reading will not be obtained. Percent LEL and percent O_2 action levels apply only to ambient working atmospheres, and not to confined-space entry. More-stringent percent LEL and O_2 action levels are required for confined-space entry (refer to Section 2).
[d] Refer to SOP HS-10 for instructions and documentation on radiation monitoring and screening.
[e] Noise monitoring and audiometric testing also required.

6.2 Calibration Specifications

(Refer to the respective manufacturer's instructions for proper instrument-maintenance procedures)

Air Monitoring equipment calibration specifications are listed in Table 6-2

TABLE 6-2
Air Monitoring Equipment Calibration Specifications

Instrument	Gas	Span	Reading	Method
PID: OVM, 10.6 or 11.8 eV bulb	100 ppm isobutylene	RF = 1.0	100 ppm	1.5 lpm reg T-tubing
PID: MiniRAE, 10.6 eV bulb	100 ppm isobutylene	CF = 100	100 ppm	1.5 lpm reg T-tubing
PID: TVA 1000	100 ppm isobutylene	CF = 1.0	100 ppm	1.5 lpm reg T-tubing
FID: OVA	100 ppm methane	3.0 $\pm$ 1.5	100 ppm	1.5 lpm reg T-tubing

FID: TVA 1000	100 ppm methane	NA	100 ppm	2.5 lpm reg T-tubing
Dust Monitor: Miniram-PDM3	Dust-free air	Not applicable	0.00 mg/m^3 in "Measure" mode	Dust-free area OR Z-bag with HEPA filter
CGI: MSA 260, 261, 360, or 361	0.75% pentane	N/A	50% LEL ± 5% LEL	1.5 lpm reg direct tubing

6.3 Air Sampling

Sampling, in addition to real-time monitoring, may be required by other OSHA regulations where there may be exposure to certain contaminants. Air sampling typically is required when site contaminants include lead, cadmium, arsenic, asbestos, and certain volatile organic compounds. Contact the HSM immediately if these contaminants are encountered.

7.0 Decontamination

(Reference CH2M HILL- SOP HS-13, *Decontamination*)

The SHSS must establish and monitor the decontamination procedures and their effectiveness. Decontamination procedures found to be ineffective will be modified by the SHSS. The SHSS must ensure that procedures are established for disposing of materials generated on the site.

7.1 Decontamination Specifications

Personnel	Sample Equipment	Heavy Equipment
• Boot wash/rinse	• Wash/rinse equipment	• Power wash
• Glove wash/rinse	• Solvent-rinse equipment	• Steam clean
• Outer-glove removal	• Contain solvent waste for offsite disposal	• Dispose of equipment rinse water to facility or sanitary sewer, or contain for offsite disposal
• Body-suit removal		
• Inner-glove removal		
• Respirator removal		
• Hand wash/rinse		
• Face wash/rinse		
• Shower ASAP		
• Dispose of PPE in municipal trash, or contain for disposal		
• Dispose of personnel rinse water to facility or sanitary sewer, or contain for offsite disposal		

7.2 Diagram of Personnel-Decontamination Line

No eating, drinking, or smoking is permitted in contaminated areas and in exclusion or decontamination zones. The SHSS should establish areas for eating, drinking, and smoking. Contact lenses are not permitted in exclusion or decontamination zones.

Figure 7-1 illustrates a conceptual establishment of work zones, including the decontamination line. Work zones are to be modified by the SHSS to accommodate task-specific requirements.

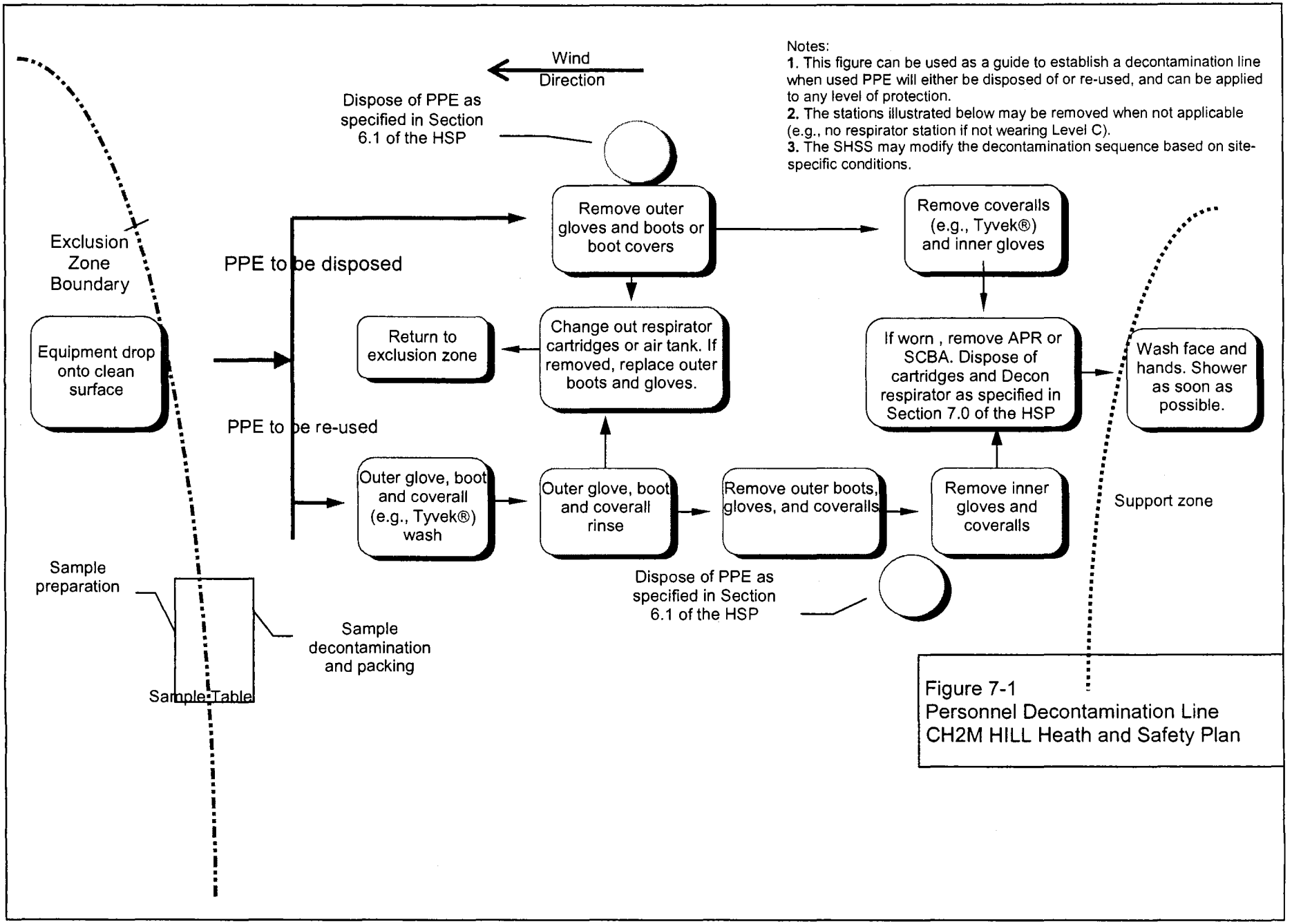


Figure 7-1
Personnel Decontamination Line
CH2M HILL Heath and Safety Plan

8.0 Spill-Containment Procedures

Sorbent material will be maintained in the support zone. Incidental spills will be contained with sorbent and disposed of properly.

9.0 Site-Control Plan

9.1 Site-Control Procedures

(Reference CH2M HILL- SOP HS-11, *Site Control)*

- The SHSS will conduct a site safety briefing (see below) before starting field activities or as tasks and site conditions change.
- Topics for briefing onsite safety: general discussion of Health and Safety Plan, site-specific hazards, locations of work zones, PPE requirements, equipment, special procedures, emergencies.
- The SHSS records attendance at safety briefings in a logbook and documents the topics discussed.
- Post the OSHA job-site poster in a central and conspicuous location in accordance with CH2M HILL- SOP HS-71, OSHA Postings.
- Establish support, decontamination, and exclusion zones. Delineate with flags or cones as appropriate. Support zone should be upwind of the site. Use access control at entry and exit from each work zone.
- Establish onsite communication consisting of the following:
  - Line-of-sight and hand signals
  - Air horn
  - Two-way radio or cellular telephone if available
- Establish offsite communication.
- Establish and maintain the "buddy system."
- Initial air monitoring is conducted by the SHSS in appropriate level of protection.
- The SHSS is to conduct periodic inspections of work practices to determine the effectiveness of this plan (refer to Sections 2 and 3). Deficiencies are to be noted, reported to the HSM, and corrected.

9.2 Hazwoper Compliance Plan

(Reference CH2M HILL- SOP HS-19, *Site-Specific Written Safety Plans)*

Certain parts of the site work are covered by state or federal Hazwoper standards and therefore require training and medical monitoring. Anticipated Hazwoper tasks might occur consecutively or concurrently with respect to non-Hazwoper tasks. This section outlines procedures to be followed when approved activities do not require 24- or 40-hour training. Non-Hazwoper-trained personnel also must be trained in accordance with all other state and federal OSHA requirements.

- In many cases, air sampling, in addition to real-time monitoring, must confirm that there is no exposure to gases or vapors before non-Hazwoper-trained personnel are allowed on the site, or while non-Hazwoper-trained staff are working in proximity to Hazwoper activities. Other data (e.g., soil) also must document that there is no potential for exposure. The HSM must approve the interpretation of these data.
- When non-Hazwoper-trained personnel are at risk of exposure, the SHSS must post the exclusion zone and inform non-Hazwoper-trained personnel of the:
  - nature of the existing contamination and its locations
  - limitations of their access
  - emergency action plan for the site
- Periodic air monitoring with direct-reading instruments conducted during regulated tasks also should be used to ensure that non-Hazwoper-trained personnel (e.g., in an adjacent area) are not exposed to airborne contaminants.
- When exposure is possible, non-Hazwoper-trained personnel must be removed from the site until it can be demonstrated that there is no longer a potential for exposure to health and safety hazards.
- Remediation treatment system start-ups: Once a treatment system begins to pump and treat contaminated media, the site is, for the purposes of applying the Hazwoper standard, considered a treatment, storage, and disposal facility (TSDF). Therefore, once the system begins operation, only Hazwoper-trained personnel (minimum of 24 hours of training) will be permitted to enter the site. All non-Hazwoper-trained personnel must not enter the TSDF area of the site.

10.0 Emergency Response Plan

(Reference CH2M HILL- SOP HS-12, *Emergency Response*)

10.1 Pre-Emergency Planning

The SHSS performs the applicable pre-emergency planning tasks before starting field activities and coordinates emergency response with CH2M HILL onsite parties, the facility, and local emergency-service providers as appropriate.

- Review the facility emergency and contingency plans where applicable.
- Determine what onsite communication equipment is available (e.g., two-way radio, air horn).
- Determine what offsite communication equipment is needed (e.g., nearest telephone, cell phone).
- Confirm and post emergency telephone numbers, evacuation routes, assembly areas, and route to hospital; communicate the information to onsite personnel.
- Field Trailers: Post "Exit" signs above exit doors, and post "Fire Extinguisher" signs above locations of extinguishers. Keep areas near exits and extinguishers clear.
- Review changed site conditions, onsite operations, and personnel availability in relation to emergency response procedures.
- Where appropriate and acceptable to the client, inform emergency room and ambulance and emergency response teams of anticipated types of site emergencies.
- Designate one vehicle as the emergency vehicle; place hospital directions and map inside; keep keys in ignition during field activities.
- Inventory and check site emergency equipment, supplies, and potable water.
- Communicate emergency procedures for personnel injury, exposures, fires, explosions, and releases.
- Rehearse the emergency response plan before site activities begin, including driving route to hospital.
- Brief new workers on the emergency response plan.
- The SHSS will evaluate emergency response actions and initiate appropriate follow-up actions.

10.2 Emergency Equipment and Supplies

The SHSS should mark the locations of emergency equipment on the site map and post the map.

Emergency Equipment and Supplies	Location
20 LB (or two 10-lb) fire extinguisher (A, B, and C classes)	Support Zone/Heavy Equipment
First aid kit	Support Zone/Field Vehicle
Eye Wash	Support & Decon Zone/Field Vehicle
Potable water	Support & Decon Zone/Field Vehicle
Bloodborne-pathogen kit	Support Zone/Field Vehicle

10.3 Incident Reporting, Investigation and Response

For any accident meeting the definition of Recordable Occupational Injuries or Illnesses or Significant Accidents, the Southern Division, NAVFAC Contracting Officer and Navy Technical Representative (NTR) shall be notified by the HSM or Program Manager soon as practical, but not later than four hours after occurrence. All other incidents must be reported to Southern Division, NAVFAC within 24 hours of incident occurrence.

Therefore in order for the incident to be assessed for reportability purposes it is imperative that according to CH2M HILL requirements, all personal injuries, near-misses, or property damage incidents involving CH2M HILL or subcontractor project personnel be reported IMMEDIATELY to the HSM Rich Rathnow/ORO, Program Manager Scott Newman/ATL, or CH2M HILL Corporate HSM Angelo Liberatore/ATL at the numbers identified in the emergency contact attachment contained in this plan.

The Site Manager or designee must report the following incident information to the HSM immediately after incident occurrence:

- Date and time of mishap
- Project name and project number
- Name and worker classification
- Extent of known injuries
- Level of medical attention
- Injury cause

A written incident investigation shall be performed and submitted to the HSM within 24 hours of incident occurrence by the completing the Incident Report, Near Loss Investigation and Root Cause Analysis provided in the HSP Attachments.

In fires, explosions, or chemical releases, actions to be taken include the following:

Shut down CH2M HILL operations and evacuate the immediate work area.
Notify appropriate response personnel.
Account for personnel at the designated assembly area(s).

Assess the need for site evacuation, and evacuate the site as warranted.

Instead of implementing a work-area evacuation, note that small fires or spills posing minimal safety or health hazards may be controlled.

10.4 Emergency Medical Treatment

The procedures listed below may also be applied to non-emergency incidents. CH2M HILL employee injuries and illnesses must be reported to the Human Resource contact in Attachment 4. If there is doubt about whether medical treatment is necessary, or if the injured person is reluctant to accept medical treatment, contact the CH2M HILL medical consultant, depending on whose employee is injured. During non-emergencies, follow these procedures as appropriate.

- Notify appropriate emergency response authorities (e.g., 911).
- The SHSS will assume charge during a medical emergency until the ambulance arrives or until the injured person is admitted to the emergency room.
- Prevent further injury.
- Initiate first aid and CPR where feasible.
- Get medical attention immediately.
- Perform decontamination where feasible; lifesaving and first aid or medical treatment take priority.
- Make certain that the injured person is accompanied to the emergency room.
- When contacting the medical consultant, give your name and telephone number, the name of the injured person, the extent of the injury or exposure, and the name and location of the medical facility where the injured person was taken.
- Report incident as outlined in Section 10.7.

10.5 Evacuation

- Evacuation routes and assembly areas (and alternative routes and assembly areas) are specified on the site map.
- Evacuation route(s) and assembly area(s) will be designated by the SHSS before work begins.
- Personnel will assemble at the assembly area(s) upon hearing the emergency signal for evacuation.
- The SHSS and a "buddy" will remain on the site after the site has been evacuated (if safe) to assist local responders and advise them of the nature and location of the incident.
- The SHSS will account for all personnel in the onsite assembly area.

- A designated person will account for personnel at alternate assembly area(s).
- The SHSS will write up the incident as soon as possible after it occurs and submit a report to the Corporate Director of Health and Safety.

10.6 Evacuation Signals

Signal	Meaning
Grasping throat with hand	Emergency-help me.
Thumbs up	OK; understood.
Grasping buddy's wrist	Leave area now.
Continuous sounding of horn	Emergency; leave site now.

10.7 Incident Notification and Reporting

- Upon any project incident (fire, spill, injury, near miss, death, etc.), immediately notify the PM and HSM. Call emergency beeper number if HSM is unavailable.
- For CH2M HILL work-related injuries or illnesses, contact the respective Human Resources contact listed in Attachment 4. For CH2M HILL incidents the HR administrator completes an Incident Report Form (IRF). IRF must be completed within 24 hours of incident.
- For CH2M HILL subcontractor incidents, complete the Subcontractor Accident/Illness Report Form (Attachment)and submit to the HSM.
- Notify and submit reports to client as required in contract.

11.0 Behavior Based Loss Prevention System

A Behavior Based Loss Prevention System (BBLPS) is a system to prevent or reduce losses using behavior-based tools and proven management techniques to focus on behaviors or acts that could lead to losses.

The four basic Loss Prevention tools that will be used on EE&S CH2M HILL projects to implement the BBLPS include:

- Activity Hazard Analysis (AHA)
- Pre-Task Safety Plans (PTSP)
- Loss Prevention Observations (LPO)
- Loss and Near Loss Investigations (NLI)

The Site Supervisor serves as the Site Health and Safety Specialist (SHSS) and is responsible for implementing the BBLPS on the project site. When a separate individual is assigned as the SHSS, the SHSS is delegated authority from the Site Supervisor to implement the BBLPS on the project site, but the Site Supervisor remains accountable for it's implementation. The Site Supervisor/Safety Coordinator shall only oversee the subcontractor's implementation of their AHAs and PTSPs processes on the project.

11.1 Activity Hazard Analysis

An Activity Hazard Analysis (AHA) defines the activity being performed, the hazards posed and control measures required to perform the work safely. Workers are briefed on the AHA before doing the work and their input is solicited prior, during and after the performance of work to further identify the hazards posed and control measures required.

Activity Hazard Analysis will be prepared before beginning each project activity posing H&S hazards to project personnel using the AHA form provided in Attachment 6. The AHA shall identify the work tasks required to perform each activity, along with potential H&S hazards and recommended control measures for each work task. In addition, a listing of the equipment to be used to perform the activity, inspection requirements and training requirements for the safe operation of the equipment listed must be identified.

An AHA shall be prepared for all field activities performed by CH2M HILL and subcontractor during the course of the project by the Site Supervisor/SHSS. The Project-Specific and General Hazards of the HSP, the Hazard Analysis Table (Table 2-1), and applicable CH2M HILL Standards of Practice (SOPs) should be used as a basis for preparing CH2M HILL AHAs.

CH2M HILL subcontractors are required to provide AHAs specific to their scope of work on the project for acceptance by CH2M HILL. Each subcontractor shall submit AHAs for their field activities, as defined in their work plan/scope of work, along with their project-specific HSP. Additions or changes in CH2M HILL or subcontractor field activities, equipment, tools or material to perform work or additional/different hazard encountered

that require additional/different hazard control measures requires either a new AHA to be prepared or an existing AHA to be revised.

11.2 Pre-Task Safety Plans

Daily safety meetings are held with all project personnel in attendance to review the hazards posed and required H&S procedures/AHAs, that apply for each day's project activities. The PTSPs serve the same purpose as these general assembly safety meetings, but the PTSPs are held between the crew supervisor and their work crews to focus on those hazards posed to individual work crews. At the start of each day's activities, the crew supervisor completes the PTSP, provided in Attachment 6, with input from the work crew, during their daily safety meeting. The day's tasks, personnel, tools and equipment that will be used to perform these tasks are listed, along with the hazards posed and required H&S procedures, as identified in the AHA. The use of PTSPs, better promotes worker participation in the hazard recognition and control process, while reinforcing the task-specific hazard and required H&S procedures with the crew each day. The use of PTSPs is a common safety practice in the construction industry.

11.3 Loss Prevention Observations

Loss Prevention Observations (LPOs) shall be conducted by Site Supervisor/SHSS for specific work tasks or operations comparing the actual work process against established safe work procedures identified in the project-specific HSP and AHAs. LPOs are a tool to be used by supervisors to provide positive reinforcement for work practices performed correctly, while also identifying and eliminating deviations from safe work procedures that could result in a loss. Site Supervisor/SHSS shall perform at least one LPO each week for a tasks/operations addressed in the project-specific HSP or AHA. The Site Supervisor/SHSS shall complete the LPO form in Attachment 6 for the task/operation being observed.

11.4 Loss/Near Loss Investigations

Loss/Near Loss Investigations shall be performed for the all CH2M HILL and subcontractor incidents involving:

- Person injuries/illnesses and near miss injuries
- Equipment/property damage
- Spills, leaks, regulatory violations
- Motor vehicle accidents

The cause of loss and near loss incidents are similar, so by identifying and correcting the causes of near loss causes, future loss incidents may be prevented. The following is the Loss/Near Loss Investigation Process:

- Gather all relevant facts, focusing on fact-finding, not fault-finding, while answering the who, what, when, where and how questions.

- Draw conclusions, pitting facts together into a probable scenario.

- Determine incident root cause(s), which are basic causes on why an unsafe act/condition existed.
- Develop and implement solutions, matching all identified root causes with solutions.
- Communicate incident as a Lesson Learned to all project personnel.
- Filed follow-up on implemented corrective active action to confirm solution is appropriate.

Site Supervisors/SHSS shall perform an incident investigation, as soon as practical after incident occurrence during the day of the incident, for all Loss and Near Loss Incidents that occur on the project. Loss and Near Loss incident investigations shall be performed using the following incident investigation forms provided in Attachment 6:

- Incident Report Form (IRF)
- Incident Investigation Form
- Root Cause Analysis Form

All Loss and Near Loss incident involving personal injury, property damage in excess of $1,000 or near loss incidents that could have resulted in serious consequences shall be investigated by completing the incident investigation forms and submitting them to the PM and HSM within 24 hours of incident occurrence. A preliminary Incident Investigation and Root Cause Analysis shall be submitted to the Project Manager and HSM within 24 hours of incident occurs. The final Incident Investigation and Root Cause Analysis shall be submitted after completing a comprehensive investigation of the incident.

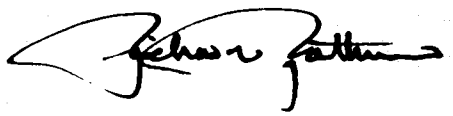
12.0 Approval

This site-specific Health and Safety Plan has been written for use by CH2M HILL only. CH2M HILL claims no responsibility for its use by others unless that use has been specified and defined in project or contract documents. The plan is written for the specific site conditions, purposes, dates, and personnel specified and must be amended if those conditions change.

12.1 Original Plan

Written By: Rich Rathnow **Date:** 2-14-2007

Approved By: Rich Rathnow **Date:** 2-16-2007



12.2 Revisions

Revisions Made By: **Date:**

Revisions to Plan:

Revisions Approved By: **Date:**

Attachment 1

Employee Signoff Form

EMPLOYEE SIGNOFF FORM

Health and Safety Plan

The CH2M HILL project employees and subcontractors listed below have been provided with a copy of this HSP, have read and understood it, and agree to abide by its provisions.

Project Name: **Project Number:**

EMPLOYEE NAME (Please print)	**EMPLOYEE SIGNATURE**	**COMPANY**	**DATE**

Attachment 2

Project-Specific Chemical Product Hazard Communication Form

Project-Specific Chemical Product Hazard Communication Form

This form must be completed prior to performing activities that expose personnel to hazardous chemicals products. Upon completion of this form, the SHSS shall verify that training is provided on the hazards associated with these chemicals and the control measures to be used to prevent exposure to CH2M HILL and subcontractor personnel. Labeling and MSDS systems will also be explained.

Project Name: **Project Number:**

MSDSs will be maintained at the following location(s):

Hazardous Chemical Products Inventory

Chemical	Quantity	Location	MSDS Available	Container labels	
				Identity	Hazard
Methane	1 liter, compressed	Support Zone			
Isobutylene	1 liter, compressed	Support Zone			
Pentane	1 liter, compressed	Support Zone			
Hydrochloric acid	< 500 ml	Support Zone / sample bottles			
Nitric acid	< 500 ml	Support Zone / sample bottles			
Sulfuric Acid	< 500 ml	Support Zone / sample bottles			
Sodium hydroxide	< 500 ml	Support Zone / sample bottles			
Methanol	< 1 Gallon	Support/Decon Zones			
Hexane	< 1 Gallon	Support/Decon Zones			
pH buffers	< 500 ml	Support Zone			
MSA Sanitizer	< 1 liter	Support/Decon Zones			
Alconox/Liquinox	< 1liter	Support/Decon Zones			

Refer to SOP HS-05 *Hazard Communication* for more detailed information.

Attachment 3

Chemical Specific Training Form

CHEMICAL-SPECIFIC TRAINING FORM

Location:	Project # :
SHSS:	Trainer:

TRAINING PARTICIPANTS:

NAME	SIGNATURE	NAME	SIGNATURE

REGULATED PRODUCTS/TASKS COVERED BY THIS TRAINING:

The HCC shall use the product MSDS to provide the following information concerning each of the products listed above.

☐ Physical and health hazards

☐ Control measures that can be used to provide protection (including appropriate work practices, emergency procedures, and personal protective equipment to be used)

☐ Methods and observations used to detect the presence or release of the regulated product in the workplace (including periodic monitoring, continuous monitoring devices, visual appearance or odor of regulated product when being released, etc.)

Training participants shall have the opportunity to ask questions concerning these products and, upon completion of this training, will understand the product hazards and appropriate control measures available for their protection.

Copies of MSDSs, chemical inventories, and CH2M HILL's written hazard communication program shall be made available for employee review in the facility/project hazard communication file.

Attachment 4

Emergency Contacts

Emergency Contacts-

24-hour CH2M HILL Emergency Beeper – 888/444-1226

Medical Emergency – 911
Facility Medical Response #:
Local Ambulance #:

CH2M HILL- Medical Consultant
Dr. Jerry H. Berke, M.D., M.P.H.
Health Resources
600 West Cummings Park, Suite 3400
Woburn, MA 01801-6350
781/938-4653
800/350-4511
(After hours calls will be returned within 20 minutes)

Fire/Spill Emergency -- 911
Facility Fire Response #:
Local Fire Dept #:

Local Occupational Physician

Security & Police – 911
Facility Security #:
Local Police #:

Navy RAC Program Manager
Name: Sid Allison/ATL
Phone: 770/604/9182

Utilities Emergency
Water:
Gas:
Electric:

Navy RAC Health and Safety Manager (HSM)
Name: Rich Rathnow/ORO
Phone: 865/483-9005 (Office); 865/607-6734 (Cell)
865/531-2933 (Home)

Site Health and Safety Specialist (SHSS)
Name: Will Knox/ATL
Phone: 770/604/9182

CH2M HILL Human Resources Department
Name: Nancy Orr/COR
Phone: 303/771-0952

Project Manager
Name: Greg Wilfley/ATL
Phone: 770/604/9182

Corporate Human Resources Department
Name: John Monark/COR
Phone: 303/771-0900

Federal Express Dangerous Goods Shipping
Phone: 800/238-5355

Emergency Number for Shipping Dangerous Goods
Phone: 800/255-3924

CH2M HILL Worker's Compensation and Auto Claims
Sterling Administration Services
Phone: 800/420-8926 After hours: 800/497-4566

Report fatalities AND report vehicular accidents involving pedestrians, motorcycles, or more than two cars.

Contact the Project Manager. Generally, the Project Manager will contact relevant government agencies.

Facility Alarms:

Evacuation Assembly Area(s):

Facility/Site Evacuation Route(s):

Hospital Name/Address:
Baptist Hospital
1000 W. Moreno St.
Pensacola, FL 32501

Hospital Phone #: Hospital Phone #:
(850) 434-4011

Directions to Hospital

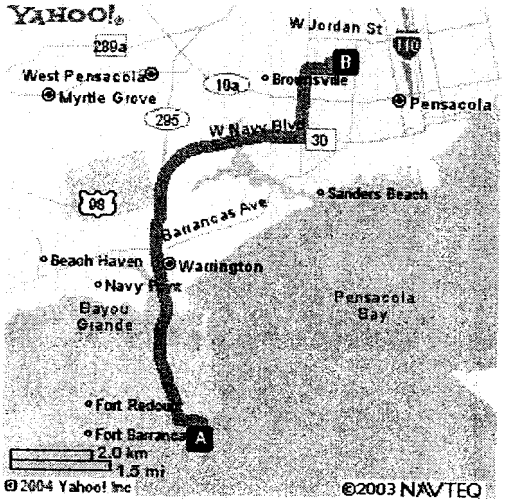
From the NAS Pensacola Main Gate, proceed on SR-295 for 1.5 miles then turn right onto SR-292 and proceed for approximately 4 miles to West Moreno Street. Turn right and proceed for eight blocks to Baptist Medical Center. Refer to map.

Your Directions

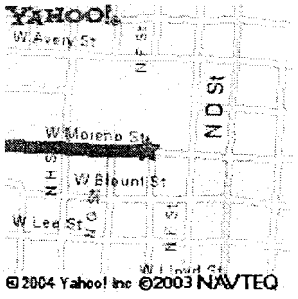
1.	Start at **200 EAST AVE, PENSACOLA** on **RADFORD BLVD** - go < **0.1** mi
2.	**RADFORD BLVD** becomes **EAST AVE** - go **0.3** mi
3.	**EAST AVE** becomes **SAUFLEY ST** - go **0.4** mi
4.	Turn **R** on **MURRAY RD** - go **1.4** mi
5.	Continue on **DUNCAN RD** - go **0.3** mi
6.	**DUNCAN RD** becomes **NAVY BRG** - go **0.1** mi
7.	**NAVY BRG** becomes **S NAVY BLVD** - go **0.9** mi
8.	Continue on **N NAVY BLVD** - go **0.9** mi
9.	Continue on **W NAVY BLVD** - go **2.4** mi
10.	Turn **L** on **N PACE BLVD** - go **1.1** mi
11.	Turn **R** on **W GODFREY ST** - go **0.3** mi
12.	Turn **L** on **N J ST** - go **0.1** mi
13.	Turn **R** on **W MORENO ST** - go **0.3** mi
14.	Arrive at **1000 W MORENO ST, PENSACOLA**

When using any driving directions or map, it's a good idea to do a reality check and make sure the road still exists, watch out for construction, and follow all traffic safety precautions. This is only to be used as an aid in planning.

Your Full Route



Your Destination



Address:
1000 W Moreno St
Pensacola, FL 32501-2316

Attachment 5

Project Activity Self-Assessment Checklists/Permits

Excavations
Hand and Power Tools

CH2MHILL

HS&E Self-Assessment Checklist - EXCAVATIONS

This checklist shall be used by CH2M HILL personnel **only** and shall be completed at the frequency specified in the project's HSP/FSI.

This checklist is to be used at locations where: 1) CH2M HILL employees enter excavations (complete Sections 1 and 3), and/or 2) CH2M HILL oversight of an excavation subcontractor is required (complete entire checklist).

SC may consult with excavation subcontractors when completing this checklist, but shall not direct the means and methods of excavation operations nor direct the details of corrective actions. Excavation subcontractors shall determine how to correct deficiencies and we must carefully rely on their expertise. Items considered to be imminently dangerous (possibility of serious injury or death) shall be corrected immediately or all exposed personnel shall be removed from the hazard until corrected.

Completed checklists shall be sent to the health and safety manager for review.

Project Name: _____ Project No.: _____

Location: _____ PM: _____

Auditor: _____ Title: _____ Date: _____

This specific checklist has been completed to:

☐ Evaluate CH2M HILL employee exposures to excavation hazards
☐ Evaluate a CH2M HILL subcontractor's compliance with excavation HS&E requirements
Subcontractor Name: _____

- Check "Yes" if an assessment item is complete/correct.
- Check "No" if an item is incomplete/deficient. Deficiencies shall be brought to the immediate attention of the excavation subcontractor. Section 3 must be completed for all items checked "No."
- Check "N/A" if an item is not applicable.
- Check "N/O" if an item is applicable but was not observed during the assessment.

Numbers in parentheses indicate where a description of this assessment item can be found in Standard of Practice HS-32.

SECTION 1	Yes	No	N/A	N/O
PERSONNEL SAFE WORK PRACTICES (4.1)				
1. Competent person has completed daily inspection and has authorized entry	☐	☐	☐	☐
2. Personnel aware of entry requirements established by competent person	☐	☐	☐	☐
4. Protective systems are free from damage and in stable condition	☐	☐	☐	☐
4. Surface objects/structures secured from falling into excavation	☐	☐	☐	☐
5. Potential hazardous atmospheres have been tested and found to be at safe levels	☐	☐	☐	☐
6. Precautions have been taken to prevent cave-in from water accumulation in the excavation	☐	☐	☐	☐
7. Personnel wearing appropriate PPE, per HSP/FSI	☐	☐	☐	☐

SECTION 2	Yes	No	N/A	N/O
GENERAL (4.2.1)				
8. Daily safety briefing/meeting conducted with personnel	☐	☐	☐	☐
9. Excavation and protective systems adequately inspected by competent person	☐	☐	☐	☐
10. Defective protective systems or other unsafe conditions corrected before entry	☐	☐	☐	☐
11. Guardrails provided on walkways over excavation 6' or deeper	☐	☐	☐	☐
12. Barriers provided at excavations 6' or deeper when not readily visible	☐	☐	☐	☐
13. Barriers or covers provided for wells, pits, shafts, or similar excavation 6' or deeper	☐	☐	☐	☐
14. Excavating equipment operated safely (use earthmoving equipment checklist in HS-27)	☐	☐	☐	☐
PRIOR TO EXCAVATING (4.2.2)				
15. Location of underground utilities and installations identified	☐	☐	☐	☐
16. Soils characterized prior to excavation where contamination may be present	☐	☐	☐	☐
17. Excavation area checked for wetlands, endangered species, cultural/historic resources	☐	☐	☐	☐
18. Stockpile construction and management plan	☐	☐	☐	☐
19. ECC consulted and plan established for wastewater disposal from excavation dewatering	☐	☐	☐	☐
20. SWPPP prepared for construction site 1-5 acres (depending on project location)	☐	☐	☐	☐
EXCAVATING ACTIVITIES (4.2.3)				
21. Rocks, trees, and other unstable surface objects removed or supported	☐	☐	☐	☐
22. Exposed underground utility lines supported	☐	☐	☐	☐
23. Undermined surface structures supported or determined to be in safe condition	☐	☐	☐	☐
24. Warning system used to remind equipment operators of excavation edge	☐	☐	☐	☐
25. Stockpile, excavation covers, liners, silt fences in place, where required	☐	☐	☐	☐
26. Fugitive dust suppressed	☐	☐	☐	☐
EXCAVATION ENTRY (4.2.4)				
27. Trenches > 4' deep provided with safe means of egress within 25'	☐	☐	☐	☐
28. Structure ramps designed and approved by competent person	☐	☐	☐	☐
29. Potential hazardous atmospheres tested prior to entry	☐	☐	☐	☐
30. Rescue equipment provided where potential for hazardous atmospheres exists	☐	☐	☐	☐
31. Ventilation used to control hazardous atmospheres and air tested frequently	☐	☐	☐	☐
32. Appropriate respiratory protection used when ventilation does not control hazards	☐	☐	☐	☐
33. Precautions taken to prevent cave-in from water accumulation in the excavation	☐	☐	☐	☐
34. Precautions taken to prevent surface water from entering excavation	☐	☐	☐	☐
35. Protection provided from falling/rolling material from excavation face	☐	☐	☐	☐
36. Spoil piles, equipment, materials restrained or kept at least 2' from excavation edge	☐	☐	☐	☐
EXCAVATION PROTECTIVE SYSTEMS (4.2.5)				
37. Protective systems used for excavations 5' or deeper	☐	☐	☐	☐
38. Protective systems for excavation deeper than 20' designed by registered PE	☐	☐	☐	☐
39. If soil unclassified, maximum allowable slope is 34 degrees	☐	☐	☐	☐
40. Protective systems free from damage	☐	☐	☐	☐
41. Protective system used according to manufacturer recommendations and not subjected to loads exceeding design limits	☐	☐	☐	☐
42. Protective system components securely connected to prevent movement or failure	☐	☐	☐	☐
43. Cave-in protection provided while entering/exiting shielding systems	☐	☐	☐	☐
44. Personnel removed from shielding systems when installed, removed, or vertical movement	☐	☐	☐	☐
PROTECTIVE SYSTEM REMOVAL (4.2.6)				
45. Protective system removal starts and progresses from excavation bottom	☐	☐	☐	☐
46. Protective systems removed slowly and cautiously	☐	☐	☐	☐
47. Temporary structure supports used if failure of remaining components observed	☐	☐	☐	☐
48. Backfilling taking place immediately after protective system removal	☐	☐	☐	☐

EXCAVATING AT HAZARDOUS WASTE SITES (4.2.7)				
49. Waste disposed of according to HSP and RCRA regulations	☐	☐	☐	☐
50. Appropriate decontamination procedures being followed, per HSP	☐	☐	☐	☐
BACKFILL (4.2.8)				
51. Backfill certified clean when required by client or local regulation	☐	☐	☐	☐
FORMS/PERMITS (4.3)				
52. Waste discharge/NPDES permit obtained for excavation de-watering, where required	☐	☐	☐	☐
53. Dig permit obtained, where required by client/facility	☐	☐	☐	☐
54. USDA soil permit obtained (for south/southeast and coastal states)	☐	☐	☐	☐

SECTION 3

Complete this section for all items checked "No" in Sections 1 or 2. Deficient items must be corrected in a timely manner.

Item #	Corrective Action Planned/Taken	Date Corrected

Auditor: ______________________________ Project Manager:

CH2MHILL

H&S Self-Assessment Checklist – HAND AND POWER TOOLS

This checklist shall be used by CH2M HILL personnel **only** and shall be completed at the frequency specified in the project's HSP/FSI.

This checklist is to be used at locations where: 1) CH2M HILL employees are exposed to hand and power tool hazards and/or 2) CH2M HILL provides oversight of subcontractor personnel who are exposed to hand and power tool hazards.

SSC or DSC may consult with subcontractors when completing this checklist, but shall not direct the means and methods of hand and power tool use nor direct the details of corrective actions. Subcontractors shall determine how to correct deficiencies and we must carefully rely on their expertise. Items considered to be imminently dangerous (possibility of serious injury or death) shall be corrected immediately or all exposed personnel shall be removed from the hazard until corrected.

Completed checklists shall be sent to the HS&E Staff for review.

Project Name: _____ Project No.: _____

Location: _____ PM: _____

Auditor: _____ Title: _____ Date: _____

This specific checklist has been completed to:

☐ Evaluate CH2M HILL employee exposure to hand and power tool hazards.
☐ Evaluate a CH2M HILL subcontractor's compliance with hand and power tool requirements.
Subcontractors Name: _____

- Check "Yes" if an assessment item is complete/correct.
- Check "No" if an item is incomplete/deficient. Deficiencies shall be brought to the immediate attention of the subcontractor. Section 3 must be completed for all items checked "No."
- Check "N/A" if an item is not applicable.
- Check "N/O" if an item is applicable but was not observed during the assessment.

Numbers in parentheses indicate where a description of this assessment item can be found in Standard of Practice HS-50.

SECTION 1

	Yes	No	N/A	N/O
SAFE WORK PRACTICES (3.1)				
1. All tools operated according to manufacturer's instructions and design limitations.	☐	☐	☐	☐
2. All hand and power tools maintained in a safe condition and inspected and tested before use.	☐	☐	☐	☐
3. Defective tools are tagged and removed from service until repaired.	☐	☐	☐	☐
4. PPE is selected and used according to tool-specific hazards anticipated.	☐	☐	☐	☐
5. Power tools are not carried or lowered by their cord or hose.	☐	☐	☐	☐
6. Tools are disconnected from energy sources when not in use, servicing, cleaning, etc.	☐	☐	☐	☐
7. Safety guards remain installed or are promptly replaced after repair.	☐	☐	☐	☐
8. Tools are stored properly.	☐	☐	☐	☐
9. Cordless tools and recharging units both conform to electrical standards and specifications.	☐	☐	☐	☐
10. Tools used in explosive environments are rated for such use.	☐	☐	☐	☐
11. Knife or blade hand tools are used with the proper precautions.	☐	☐	☐	☐
12. Consider controls to avoid muscular skeletal, repetitive motion, and cumulative trauma stressors.	☐	☐	☐	☐

GENERAL (3.2.1)

13. PPE is selected and used according to tool-specific hazards anticipated. ☐ ☐ ☐ ☐
14. Tools are tested daily to assure safety devices are operating properly. ☐ ☐ ☐ ☐
15. Damaged tools are removed from service until repaired. ☐ ☐ ☐ ☐
16. Power operated tools designed to accommodate guards have guards installed. ☐ ☐ ☐ ☐
17. Rotating or moving parts on tools are properly guarded. ☐ ☐ ☐ ☐
18. Machines designed for fixed locations are secured or anchored. ☐ ☐ ☐ ☐
19. Floor and bench-mounted grinders are provided with properly positioned work rests. ☐ ☐ ☐ ☐
20. Guards are provided at point of operation, nip points, rotating parts, etc. ☐ ☐ ☐ ☐
21. Fluid used in hydraulic-powered tools is approved fire-resistant fluid. ☐ ☐ ☐ ☐

ELECTRIC-POWERED TOOLS (3.2.2)

22. Electric tools are approved double insulated or grounded and used according to SOP HS-23. ☐ ☐ ☐ ☐
23. Electric cords are not used for hoisting or lowering tools. ☐ ☐ ☐ ☐
24. Electric tools are used in damp/ wet locations are approved for such locations or GFCI installed. ☐ ☐ ☐ ☐
25. Hand-held tools are equipped with appropriate on/off controls appropriate for the tool. ☐ ☐ ☐ ☐
26. Portable, power-driven circular saws are equipped with proper guards. ☐ ☐ ☐ ☐

ABRASIVE WHEEL TOOLS (3.2.3)

27. All employees using abrasive wheel tools are wearing eye protection. ☐ ☐ ☐ ☐
28. All grinding machines are supplied with sufficient power to maintain spindle speed. ☐ ☐ ☐ ☐
29. Abrasive wheels are closely inspected and ring-tested before use. ☐ ☐ ☐ ☐
30. Grinding wheels are properly installed. ☐ ☐ ☐ ☐
31. Cup-type wheels for external grinding are protected by the proper guard or flanges. ☐ ☐ ☐
32. Portable abrasive wheels used for internal grinding are protected by safety flanges. ☐ ☐ ☐ ☐
33. Safety flanges are used only with wheels designed to fit the flanges. ☐ ☐ ☐ ☐
34. Safety guards on abrasive wheel tools are mounted properly and of sufficient strength. ☐ ☐ ☐ ☐

PNEUMATIC-POWERED TOOLS (3.2.4)

35. Tools are secured to hoses or whip by positive means to prevent disconnection. ☐ ☐ ☐ ☐
36. Safety clips or retainers are installed to prevent attachments being expelled. ☐ ☐ ☐ ☐37
38. Compressed air is not used for cleaning unless reduced to < 30 psi, with PPE, and guarded. ☐ ☐ ☐ ☐
39. Manufacturer's safe operating pressure for hoses, pipes, valves, etc. are not exceeded. ☐ ☐ ☐ ☐
40. Hoses are not used for hoisting or lowering tools. ☐ ☐ ☐ ☐
41. All hoses >1/2-inch diameter have safety device at source to reduce pressure upon hose failure. ☐ ☐ ☐ ☐
42. Airless spray guns have required safety devices installed. ☐ ☐ ☐ ☐
43. Blast cleaning nozzles are equipped with operating valves, which are held open manually. ☐ ☐ ☐ ☐
44. Supports are provided for mounting nozzles when not in use. ☐ ☐ ☐ ☐
45. Air receiver drains, handholes, and manholes are easily accessible. ☐ ☐ ☐ ☐
46. Air receivers are equipped with drainpipes and valves for removal of accumulated oil and water. ☐ ☐ ☐ ☐
47. Air receivers are completely drained at required intervals. ☐ ☐ ☐ ☐
48. Air receivers are equipped with indicating pressure gauges. ☐ ☐ ☐ ☐
49. Safety, indicating, and controlling devices are installed as required. ☐ ☐ ☐ ☐
50. Safety valves are tested frequently and at regular intervals to assure good operating condition. ☐ ☐ ☐ ☐

SECTION 2 (continued)

	Yes	No	N/A	N/O
LIQUID FUEL-POWERED TOOLS (3.2.5)				
51. Liquid fuel-powered tools are stopped when refueling, servicing, or maintaining.	☐	☐	☐	☐
52. Liquid fuels are stored, handled, and transported in accordance with SOP HS-21	☐	☐	☐	☐
53. Liquid fuel-powered tools are used in confined spaces in accordance with SOP HS-17.	☐	☐	☐	☐
54. Safe operating pressures of hoses, valves, pipes, filters, and other fittings are not exceeded.	☐	☐	☐	☐
POWDER-ACTUATED TOOLS (3.2.6)				
55. Only trained employee operates powder-actuated tools.	☐	☐	☐	☐
56. Powder-actuated tools are not loaded until just prior to intended firing time.	☐	☐	☐	☐
57. Tools are not pointed at any employee at any time.	☐	☐	☐	☐
58. Hands are kept clear of open barrel end.	☐	☐	☐	☐
59. Loaded tools are not left unattended.	☐	☐	☐	☐
60. Fasteners are not driven into very hard or brittle materials.	☐	☐	☐	☐
61. Fasteners are not driven into easily penetrated materials unless suitable backing is provided.	☐	☐	☐	☐
62. Fasteners are not driven into spalled areas.	☐	☐	☐	☐
63. Powder-actuated tools are not used in an explosive or flammable atmosphere.	☐	☐	☐	☐
64. All tools are used with correct shields, guards, or attachments recommended by manufacturer.	☐	☐	☐	☐
JACKING TOOLS (3.2.7)				
65. Rated capacities are legibly marked on jacks and not exceeded.	☐	☐	☐	☐
66. Jacks have a positive stop to prevent over-travel.	☐	☐	☐	☐
67. The base of jacks are blocked or cribbed to provide a firm foundation, when required.	☐	☐	☐	☐
68. Wood blocks are place between the cap and load to prevent slippage, when required.	☐	☐	☐	☐
69. After load is raised, it is cribbed, blocked, or otherwise secured immediately.	☐	☐	☐	☐
70. Antifreeze is used when hydraulic jacks are exposed to freezing temperatures.	☐	☐	☐	☐
71. All jacks are properly lubricated.	☐	☐	☐	☐
72. Jacks are inspected as required.	☐	☐	☐	☐
73. Repair or replacement parts are examined for possible defects.	☐	☐	☐	☐
74. Jacks not working properly are removed from service and repaired or replaced.	☐	☐	☐	☐
HAND TOOLS (3.2.8)				
75. Wrenches are not used when jaws are sprung to the point of slippage.	☐	☐	☐	☐
76. Impact tools are kept free of mushroomed heads.	☐	☐	☐	☐
77. Wooden handles of tools are kept free of splinters or cracks and are tightly fitted in tool.	☐	☐	☐	☐

CH2MHILL

SECTION 3

Complete this section for all items checked "No" in Sections 1 or 2. Deficient items must be corrected in a timely manner.

Item #	Corrective Action Planned/Taken	Date Corrected

Auditor: ______________________________ Project Manager: ______________________________

Attachment 6

Behavior Based Loss Prevention System Forms

Activity Hazard Analysis
Pre-Task Safety Plans
Loss Prevention Observation
Incident Report and Investigation

Activity Hazard Form

Activity:	**Date:**
	Project:
Description of the work:	**Site Supervisor:**
	Site Safety Officer:
	Review for latest use: Before the job is performed.

Work Tasks	Identify & Analyze the Hazards	Identify Hazard Controls

Work Tasks	Identify & Analyze the Hazards	Identify Hazard Controls

Equipment to be used	Inspection Requirements	Training Requirements

PRINT	SIGNATURE		
Supervisor Name:	_____	_____	Date/Time: _____
Safety Officer Name:	_____	_____	Date/Time: _____
Employee Name(s):	_____	_____	Date/Time: _____
	_____	_____	Date/Time: _____
	_____	_____	Date/Time: _____
	_____	_____	Date/Time: _____
	_____	_____	Date/Time: _____
	_____	_____	Date/Time: _____
	_____	_____	Date/Time: _____
	_____	_____	Date/Time: _____
	_____	_____	Date/Time: _____
	_____	_____	Date/Time: _____
	_____	_____	Date/Time: _____

CH2MHILL **PRE-TASK SAFETY PLAN**

Project: _____ Location: _____ Date: _____

Supervisor: _____ Emergency Number(s): _____

Brief Job Descriptions:

1. _____
2. _____
3. _____
4. _____
5. _____

List Specific Tasks for the Jobs (Match number from above).

1. _____
2. _____
3. _____
4. _____
5. _____

Tools/Equipment required for Tasks, (ladders, scaffolds, fall protection, cranes/rigging, heavy equipment, power tools)match number from above:

1. _____
2. _____
3. _____
4. _____
5. _____

Potential H&S Hazards, including chemical, physical, safety, biological and environmental **(Check all that apply and review exposures as they will be encountered in the tasks above):**

__ Chemical burns/contact	__ Trench, excavations, cave-ins	__Ergonomics
__ Pressurized lines/equipment	__ Overexertion	__ Chemical splash
__ Thermal burns	__ Pinch points	__ Poisonous plants/insects
__ Electrical	__ Cuts/abrasions	___Eye hazards/flying projectile
__ Weather conditions	__ Spills	__ Inhalation hazard
__Heights/fall> 6'	__ Overhead Electrical hazards	__ Heat/cold stress
__ Noise	__ Elevated loads	__ Water/drowning hazard
__ Explosion/fire	__ Slips, trip and falls	__ Heavy equipment
__Radiation	__ Manual lifting	__ Aerial lifts/platforms
__ Confined space entry	__Welding/cutting	__ Demolition

Other Potential Hazards (Describe):

_____

CH2MHILL **PRE-TASK SAFETY PLAN**

Hazard Control Measures (Check all that apply):

PPE	Protective Systems	Fire Protection	Electrical
__ Thermal/lined	__ Sloping	__ Fire extinguishers	__ Lockout/tagout
__ Eye	__ Shoring	__ Fire watch	__ Grounded
__ Dermal/hand	__ Trench box	__ Non-spark tools	__ Panels covered
__ Hearing	__ Barricades	__ Grounding/bonding	__ GFCI/extension cords
__ Respiratory	__ Competent person	__ Intrinsically safe equipment	__ Power tools/cord inspected
__ Reflective vests	__ Locate buried utilities		
__ Flotation device	__ Daily inspections		
Fall Protection	**Air Monitoring**	**Proper Equipment**	**Welding & Cutting**
__ Harness/lanyards	__ PID/FID	__ Aerial lift/ladders/scaffolds	__ Cylinders secured/capped
__ Adequate anchorage	__ Detector tubes	__ Forklift/ Heavy equipment	__ Cylinders separated/upright
__ Guardrail system	__ Radiation	__ Backup alarms	__ Flash-back arrestors
__ Covered opening	__ Personnel sampling	__ Hand/power tools	__ No cylinders in CSE
__ Fixed barricades	__ LEL/O2	__ Crane w/current inspection	__ Flame retardant clothing
__ Warning system	__ Other	__ Proper rigging	__ Appropriate goggles
		__ Operator qualified	
Confined Space Entry	**Medical/ER**	**Heat/Cold Stress**	**Vehicle/Traffic**
__ Isolation	__ First-aid kit	__ Work/rest regime	__ Traffic control
__ Air monitoring	__ Eye wash	__ Rest area	__ Barricades
__ Trained personnel	__ FA-CPR trained personnel	__ Liquids available	__ Flags
__ Permit completed	__ Route to hospital	__ Monitoring	__ Signs
__ Rescue		__ Training	
Permits	**Demolition**	**Inspections:**	**Training:**
__ Hot work	__ Pre-demolition survey	__ Ladders/aerial lifts	__ Hazwaste
__ Confined space	__ Structure condition	__ Lanyards/harness	__ Construction
__ Lockout/tagout	__ Isolate area/utilities	__ Scaffolds	__ Competent person
__ Excavation	__ Competent person	__ Heavy equipment	__ Task-specific (THA)
__ Demolition	__ Hazmat present	__Cranes and rigging	__ Hazcom
__ Energized work			

FieldNotes:_____

_____

Supervisor signature:_____ Date:_____

List employees who reviewed hazards identified per the checklist.

Print Name	Badge No.	Signature	SS# (Unbadged Personnel)

CH2MHILL # LOSS PREVENTION OBSERVATION

Project:	Supervisor:	Date:

Task/Operation Observed:	Job Title of Worker Observed:

Background Information/comments:	Task Hazard Analysis completed for task (Y/N):

Positive Observations/Safe Work Procedures

1.
2.
3.
4.

Questionable Activity/Unsafe Condition Observed

1.
2.
3.

Observed Worker's Comment(s)

1.
2.
3.
4.

Supervisor's Corrective Actions Taken:

1.
2.
3.
4.

CH2MHILL

Loss Investigation Report Form

Employer Information

Company Name:

_____

Project Name: _____ Project Number: _____

Project Location:

_____

CHIL Project? Yes ☐ No ☐

Task Location:

_____

Job Assignment: _____ Business Group: _____

Preparer's Name: _____ Preparer's Employee Number: _____

Near Loss Incident Specific Information

Date of Incident: _____ Time of Incident: _____ a.m./p.m.

Location of incident:
☐Company premises
☐Field
☐In Transit
☐Other:_____

Address where the incident occurred:

_____

Equipment Malfunction : Yes ☐ No ☐
Activity was a Routine Task: Yes ☐ No ☐

Describe any property damage:

_____

Specific activity the employee was engaged in when the incident occurred:

_____

_____

All equipment, materials, or chemicals the employee was using when the incident occurred:

_____

_____

Describe the specific incident and how it occurred:

_____

_____

_____

_____

Describe how this incident may have been prevented:

_____

_____

_____

Contributing Factors (Describe in detail why incident occurred):

_____

_____

_____

Date employer notified of incident: _____ To whom reported: _____

Witness Information (First Witness)

Name: _____

Employee Number (for CH2M HILL employees):

_____

Address: _____

City: _____

Zip Code : _____

Phone: _____

Witness Information (Second Witness)

Name: _____

Employee Number (for CH2M HILL employees): _____

Address: _____

City: _____

Zip Code: _____

Phone : _____

Additional information or comments:_____

_____

COMPLETE ROOT CAUSE ANALYSIS FORM

Root Cause Analysis Form

Root Cause Analysis (RCA)

Lack of skill or knowledge
Lack of or inadequate operational procedures or work standards
Inadequate communication of expectations regarding procedures or work standards
Inadequate tools or equipment
Correct way takes more time and/or requires more effort
Short cutting standard procedures is positively reinforced or tolerated
Person thinks there is no personal benefit to always doing the job according to standards
Uncontrollable

RCA #	Solution(s): How to Prevent Loss From Occurring	RC[1]	CF[2]	Corrective Action Lead	Due Date	Completion Date	Date Verified

[1] RC = Root Cause; [2] CF = Contributing Factors (check which applies)

Investigation Team Members

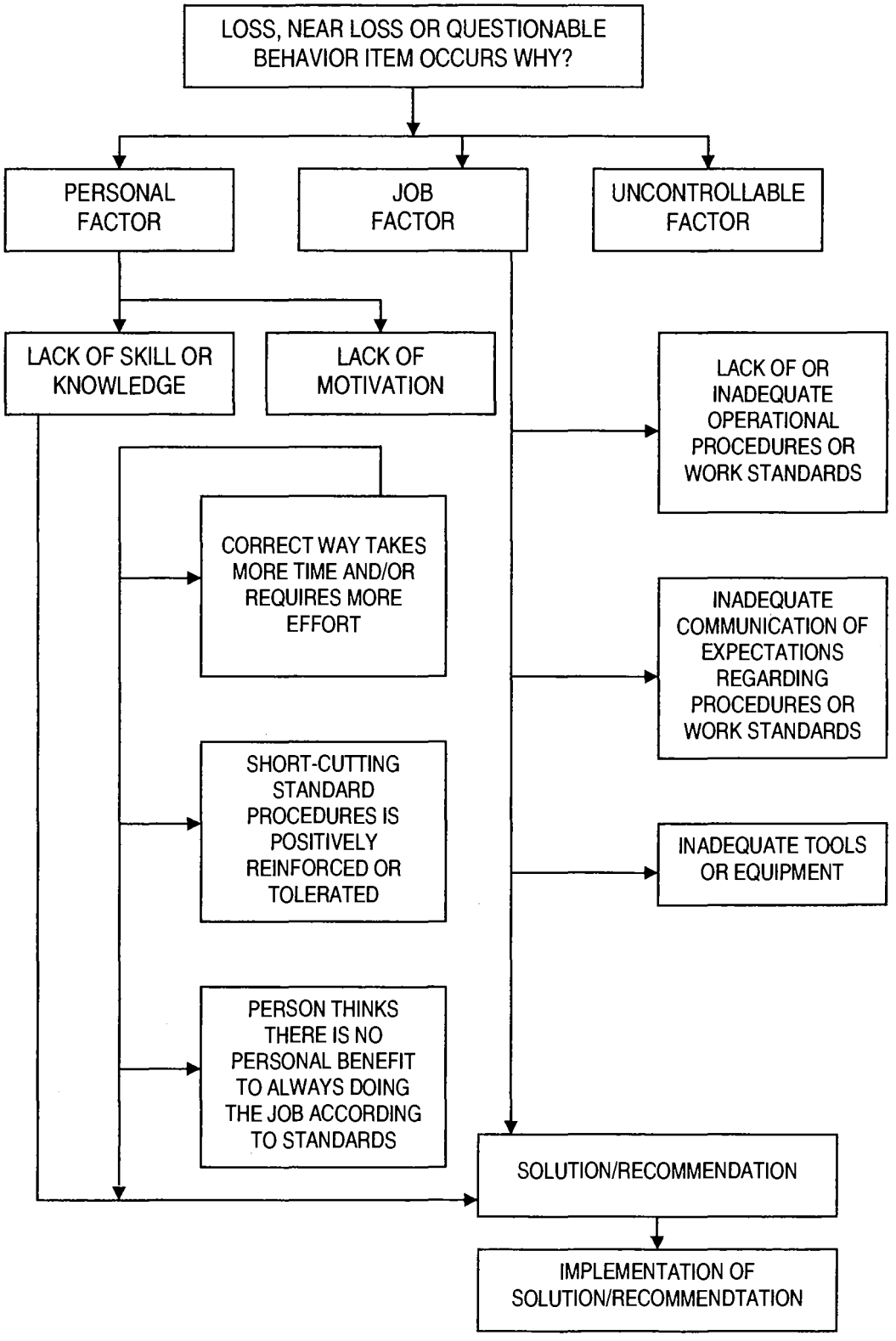
Name	Job Title	Date

Results of Solution Verification and Validation

Reviewed By

Name	Job Title	Date

Root Cause Analysis Flow Chart



Determination of Root Cause(s)

For minor losses or near losses the information may be gathered by the supervisor or other personnel immediately following the loss. Based on the complexity of the situation, this information may be all that is necessary to enable the investigation team to analyze the loss, to determine the root cause, and to develop recommendations. More complex situations may require the investigation team to revisit the loss site or re-interview key witnesses to obtain answers to questions that may arise during the investigation process.

Photographs or videotapes of the scene and damaged equipment should be taken from all sides and from various distances. This point is especially important when the investigation team will not be able to review the loss scene.

The investigation team must use the Root Cause Analysis Flow Chart to assist in identifying the root cause(s) of a loss. Any loss may have one or more "root causes" and "contributing factors". The "root cause" is the primary or immediate cause of the incident, while a "contributing factor" is a condition or event that contributes to the incident happening, but is not the primary cause of the incident. Root causes and contributing factors that relate to the *person* involved in the loss, his or her peers, or the supervisor should be referred to as "personal factors". Causes that pertain to the *system* within which the loss or injury occurred should be referred to as "job factors".

Personal Factors

Lack of skill of knowledge
Correct way takes more time and/or requires more effort
Short-cutting standard procedures is positively reinforced or tolerated
Person thinks that there is no personal benefit to always doing the job according to standards

Job Factors

Lack of or inadequate operational procedures or work standards.
Inadequate communication of expectations regarding procedures or standards
Inadequate tools or equipment

The root cause(s) could be any one or a combination of these seven possibilities or some other "uncontrollable factor". In the vast majority of losses, the root cause is very much related to one or more of these seven factors. Uncontrollable factors should be used rarely and only after a thorough review eliminates "all" seven other factors.

Incident Report Form

Fax completed form to:
425.462.5957
CH2M HILL Seattle Office
Attention: Corporate HS&E Department

Type of Incident (Select at least one)

- ☐ Injury/Illness
- ☐ Property Damage
- ☐ Spill/Release
- ☐ Environmental/Permit Issue
- ☐ Near Miss
- ☐ Other

General Information (Complete for all incident types)

Preparer's Name: _____ Preparer's Employee Number: _____
Date of Report: _____ Date of Incident: _____ Time of Incident: _____ am/pm

Type of Activity (Provide activity being performed that resulted in the incident)

- ☐ Asbestos Work
- ☐ Confined Space Entry
- ☐ Construction Mgmt- Haz Waste
- ☐ Construction Mgmt - Non-Haz Waste
- ☐ Demolition
- ☐ Drilling-Haz Waste
- ☐ Drilling-Non Haz Waste
- ☐ Drum Handling
- ☐ Electrical Work
- ☐ Excavation Trench-Haz Waste
- ☐ Excavation Trench-Non Haz
- ☐ Facility Walk Through
- ☐ General Office Work
- ☐ Keyboard Work
- ☐ Laboratory
- ☐ Lead Abatement
- ☐ Motor Vehicle Operation
- ☐ Moving Heavy Object
- ☐ Other (Specify) _____
- ☐ Process Safety Management
- ☐ Tunneling
- ☐ Welding
- ☐ Wetlands Survey
- ☐ Working from Heights
- ☐ Working in Roadways
- ☐ WWTP Operation

Location of Incident (Select one)

- ☐ Company Premises (CH2M HILL Office: _____)
- ☐ Field (Project #: _____ Project/Site Name: _____ Client: _____)
- ☐ In Transit (Traveling from: _____ Traveling to: _____)
- ☐ At Home

Geographic Location of Incident (Select region where the incident occurred)

- ☐ Northeast
- ☐ Southeast
- ☐ Northwest
- ☐ Southwest
- ☐ Corporate
- ☐ Canadian
- ☐ Asia Pacific
- ☐ Europe Middle East
- ☐ Latin America

If a CH2M HILL subcontractor was involved in the incident, provide their company name and phone number: _____

Describe the Incident (Provide a brief description of the incident): _____

_____

_____

Injured Employee Data (Complete for Injury/Illness incidents only)

If CH2M HILL employee injured

Employee Name: _____ Employee Number: _____

If CH2M HILL Subcontractor employee injured

Employee Name: _____ Company: _____

Injury Type

- ☐ Allergic Reaction
- ☐ Amputation
- ☐ Asphyxia
- ☐ Bruise/Contusion/Abrasion
- ☐ Burn (Chemical)
- ☐ Burn/Scald (Heat)
- ☐ Cancer
- ☐ Carpal Tunnel
- ☐ Concussion
- ☐ Cut/Laceration
- ☐ Dermatitis
- ☐ Dislocation
- ☐ Electric Shock
- ☐ Foreign Body in eye
- ☐ Fracture
- ☐ Freezing/Frost Bite
- ☐ Headache
- ☐ Hearing Loss
- ☐ Heat Exhaustion
- ☐ Hernia
- ☐ Infection
- ☐ Irritation to eye
- ☐ Ligament Damage
- ☐ Multiple (Specify)

_____

- ☐ Muscle Spasms
- ☐ Other (Specify)

_____

- ☐ Poisoning (Systemic)
- ☐ Puncture
- ☐ Radiation Effects
- ☐ Strain/Sprain
- ☐ Tendonitits
- ☐ Wrist Pain

Part of Body Injured

- ☐ Abdomen
- ☐ Ankle(s)
- ☐ Arms (Multiple)
- ☐ Back
- ☐ Blood
- ☐ Body System
- ☐ Buttocks
- ☐ Chest/Ribs
- ☐ Ear(s)
- ☐ Elbow(s)
- ☐ Eye(s)
- ☐ Face
- ☐ Finger(s)
- ☐ Foot/Feet
- ☐ Hand(s)
- ☐ Head
- ☐ Hip(s)
- ☐ Kidney
- ☐ Knee(s)
- ☐ Leg(s)
- ☐ Liver
- ☐ Lower (arms)
- ☐ Lower (legs)
- ☐ Lung
- ☐ Mind
- ☐ Multiple (Specify)

_____

- ☐ Neck
- ☐ Nervous System
- ☐ Nose
- ☐ Other (Specify)

_____

- ☐ Reproductive System
- ☐ Shoulder(s)
- ☐ Throat
- ☐ Toe(s)
- ☐ Upper Arm(s)
- ☐ Upper Leg(s)
- ☐ Wrist(s)

Nature of Injury

- ☐ Absorption
- ☐ Bite/Sting/Scratch
- ☐ Cardio-Vascular/Respiratory System Failure
- ☐ Caught In or Between
- ☐ Fall (From Elevation)
- ☐ Fall (Same Level)
- ☐ Ingestion
- ☐ Inhalation
- ☐ Lifting
- ☐ Mental Stress
- ☐ Motor Vehicle Accident
- ☐ Multiple (Specify)

_____

- ☐ Other (Specify)

_____

- ☐ Overexertion
- ☐ Repeated Motion/Pressure
- ☐ Rubbed/Abraded
- ☐ Shock
- ☐ Struck Against
- ☐ Struck By
- ☐ Work Place Violence

Initial Diagnosis/Treatment Date: _____

Type of Treatment

- ☐ Admission to hospital/medical facility
- ☐ Application of bandages
- ☐ Cold/Heat Compression/Multiple Treatment
- ☐ Cold/Heat Compression/One Treatment
- ☐ First Degree Burn Treatment
- ☐ Heat Therapy/Multiple treatment
- ☐ Multiple (Specify)

_____

- ☐ Heat Therapy/One Treatment
- ☐ Non-Prescriptive medicine
- ☐ None
- ☐ Observation
- ☐ Other (Specify)

_____

- ☐ Prescription- Multiple dose
- ☐ Prescription- Single dose
- ☐ Removal of foreign bodies
- ☐ Skin Removal
- ☐ Soaking therapy- Multiple Treatment
- ☐ Soaking Therapy- One Treatment
- ☐ Stitches/Sutures
- ☐ Tetanus
- ☐ Treatment for infection
- ☐ Treatment of 2nd /3rd degree burns
- ☐ Use of Antiseptics – multiple treatment
- ☐ Use of Antiseptics – single treatment
- ☐ Whirlpool bath therapy/multiple treatment
- ☐ Whirlpool therapy/single treatment
- ☐ X-rays negative
- ☐ X-rays positive/treatment of fracture

Number of days doctor required employee to be off work: _____
Number of days doctor restricted employee's work activity: _____
Equipment Malfunction : Yes ☐ No ☐ Activity was a Routine Task: Yes ☐ No ☐
Describe how you may have prevented this injury: _____

_____

Physician Information
Name: _____
Address: _____
City: _____
Zip Code: _____
Phone: _____

Hospital Information
Name: _____
Address: _____
City: _____
Zip Code: _____
Phone: _____

Property Damage (Complete for Property Damage incidents only)

Property Damaged: _____ Property Owner: _____
Damage Description: _____
Estimated Amount: $ _____

Spill or Release (Complete for Spill/Release incidents only)

Substance (attach MSDS): _____ Estimated Quantity: _____
Facility Name, Address, Phone No.: _____
Did the spill/release move off the property where work was performed?: _____
Spill/Release From: _____ Spill/Release To: _____

Environmental/Permit Issue (Complete for Environmental/Permit Issue incidents only)

Describe Environmental or Permit Issue: _____
Permit Type: _____
Permitted Level or Criteria (e.g., discharge limit): _____
Permit Name and Number (e.g., NPDES No. ST1234): _____
Substance and Estimated Quantity: _____
Duration of Permit Exceedence: _____

Verbal Notification (Complete for all incident types)(Provide names, dates and times)

CH2M HILL Personnel Notified: _____
Client Notified: _____

Witnesses (Complete for all incident types)

Witness Information (First Witness)
Name: _____
Employee Number (CH2M HILL):_____
Address: _____
City: _____
Zip Code:_____
Phone: _____

Witness Information (Second Witness)
Name: _____
Employee Number (CH2M HILL: _____
Address: _____
City: _____
Zip Code:_____
Phone :_____

Additional Comments:

_____

_____

NEAR LOSS INVESTIGATION FORM

Employer Information

Company Name: _____

Project Name: _____ Project Number: _____

Project Location: _____

CHIL Project? Yes ☐ No ☐

Task Location: _____

Job Assignment: _____ Business Group: _____

Preparer's Name: _____ Preparer's Employee Number: _____

Near Loss Incident Specific Information

Date of Incident: _____ Time of Incident: _____ a.m./p.m.

Location of incident:
☐Company premises ☐Field ☐In Transit ☐Other:_____

Address where the incident occurred: _____

Equipment Malfunction : Yes ☐ No ☐ Activity was a Routine Task: Yes ☐ No ☐

Describe any property damage: _____

Specific activity the employee was engaged in when the incident occurred:

_____

_____

All equipment, materials, or chemicals the employee was using when the incident occurred:

_____

_____

Describe the specific incident and how it occurred:

_____

_____

_____

Describe how this incident may have been prevented:

_____

_____

_____

Contributing Factors (Describe in detail why incident occurred):

_____

_____

_____

Date employer notified of incident: _____ To whom reported: _____

NEAR LOSS INVESTIGATION FORM

Witness Information (First Witness)

Name: _____
Employee Number (for CH2M HILL employees):_____
Address: _____
City: _____
Zip Code : _____
Phone: _____

Witness Information (Second Witness)

Name: _____
Employee Number (for CH2M HILL employees): _____
Address: _____
City: _____
Zip Code: _____
Phone : _____

Additional information or
comments:_____
_____

Attachment 7

Applicable Material Safety Data Sheets
(available onsite)

Attachment 8

Subcontractor H&S Plans/Procedures

Health and Safety Plan

in support of :

Subcontract No. 807883

Excavation and Remediation of Compressed Gas Cylinders
Naval Air Station Pensacola, Pensacola, FL.

Health and Safety Plan

Revision No. 0

Prepared for:

CH2M Hill

Prepared by:

Integrated Environmental Services, Inc.

January 2007

Table of Contents

1.0 Administrative Plan

1.1 Purpose

This document comprises the Health and Safety Plan (HASP) that will be used during the gas cylinder excavation and disposition operations conducted on behalf of CH2M Hill, at the Barrancas Cemetery, Pensacola Naval Air Station, in Pensacola, Florida. The purpose of this document is to outline measures that will be taken to: 1) minimize potential for accidents to occur during any phase of the project, 2) safeguard personnel working on the project, 3) protect the community, and 4) minimize the potential for environmental degradation caused by site operations.

This is a guidance document for both administrative and technical procedures. It will be present at the offices of Integrated Environmental Services, Inc. (IES) as a reference item. It will also be present at the project site, where it will be required reading for all members of the operations crew.

1.2 Project Team Policy Regarding Accident/injury Prevention

The Occupational Safety and Health Act of 1970 requires that employers furnish their employees a place of employment free from recognized hazards that might cause injury or death and the Occupational Safety and Health Administration (OSHA) of the Department of Labor has the primary responsibility for administering the Act.

> *It is the policy of the Integrated Environmental Services, Inc. to furnish each employee, a work environment which is free from recognized hazards.*

The Act provides that the employer has the responsibility to protect the employee from hazards associated with the work place, either by engineering control or by providing the necessary equipment and training to the employee. The employee has the responsibility to use the protective equipment issued in accordance with the training and directions received, and to follow the established health and safety protocols.

In accordance with this policy, IES actively initiates and maintains a health and safety program geared toward achieving a zero accident/injury rate. This policy has been developed and adopted by the management of IES and as a condition of each subcontract, must be adopted and followed for the duration of each project by the subcontractors working on that project.

1.3 Safety Administration and Organization

Safe execution of all site-related activities is the principal goal of this project. To achieve this goal, detailed, site-specific plans and procedures will be used for this project and will be implemented by competent, trained individuals.

1.3.1 Program Administration

Overall responsibility for development and enforcement of the Health and Safety Plan will reside with Mr. Jeff Gold. Mr. Gold is president of IES and will ensure that procedures set forth in this plan are adhered to for the project duration. Mr. Gold's primary responsibilities include:

1. Review of accident and injury prevention measures for use during the project.
2. Oversight for enforcement of safety protocols throughout the project.
3. Coordination with Site Safety and Health Technician (SSHT) to ensure consistent implementation of health and safety plan.
4. Overseeing safety training of all on-site personnel.
5. Establishing applicable action limits for various work activities.

1.3.2 Site Foreman

The project site superintendent, Mr. John Drago, or his qualified alternate will serve as the primary interface between the IES and CH2M Hill. The site foreman will be supported in monitoring and administering the provisions of this safety plan by the Site Safety and Health Technician.

Mr. Drago or qualified alternate will bear the responsibility of implementing the work procedures required to achieve the project goals. Mr. Drago will coordinate site activities, make personnel work assignments, and interface with other project management staff members to ensure the project is executed in accordance with the technical, administrative, and safety protocols that have been established for that purpose.

1.3.3 Site Safety and Health Technician

The position of Site Safety and Health Technician (SSHT) will be filled by Mr. Jason Yates or his qualified alternate. The SSHT will be responsible for implementation and enforcement of the provisions of this plan during the execution phase of this project.

SSHT duties include, but are not limited to the following:

1. Conducting daily on-site reviews.

2. Collection of readings from field instrumentation and devices pertaining to air quality.
3. Establishing appropriate levels of protection.
4. Providing on-site support and maintenance of safety equipment and supplies.
5. Monitoring crew members for weather related stress.
6. Notifying appropriate authorities during emergency situations.
7. Maintaining reports and logs relating to project safety issues.

The SSHT will have complete authority to stop operations at the site any time conditions warrant such actions.

1.3.4 Project Crew

All project crew will actively participate in the implementation of this Health and Safety Plan. Each will have had medical examinations and will have received job training in accordance with OSHA requirements for working on a hazardous waste site. Every member of the crew has stop work authority.

1.4 Regulatory Requirements

The Occupational Safety and Health Administration (OSHA) requires certain measures be taken to minimize the risk of injury of accident in any work environment, particularly hazardous substances. OSHA has enacted many rules regulating safety procedures in the workplace and most recently has issued directives addressing worker safety when hazardous materials or waste is involved. Several of the most pertinent regulations are described here which relate directly to this project.

1.4.1 Training

As a part of the Superfund Amendments and Reauthorization Act (SARA), OSHA enacted detailed requirements for the training of personnel involved with hazardous waste operations. The requirements prescribe the minimum level of training and certification which must be met by both workers and site supervisors prior to working on a hazardous waste site. These regulations are found in 29 CFR 1910.120.

All personnel involved directly with the container collection and disposition project will be trained in both general and site-specific safety procedures. All personnel entering the work area will be informed of the possible dangers present at the site.

The purpose of the safety training is: 1) develop safe work habits among the work crew, and 2) train and inform personnel involved with site work regarding site hazards to minimize potential for accidents or exposure to hazardous conditions.

1.4.1.1 40-Hour Training

All personnel working with hazardous materials on the project will have undergone safety training in accordance with requirements set forth in 29 CFR 1920.120. This training involves a minimum of 40 hours of formal classroom and hands-on training offering a full range of topics related to safety while working on hazardous waste sites.

Supervisory personnel will have successfully completed the 40-hour training plus an additional 8 hours of site supervisor's training addressing oversight and safety management at hazardous waste sites. Certificates of training, attesting to completion of the required training, will be kept on file at the site office trailer.

1.4.1.2 Site Specific Training

The purpose of this training is to familiarize all personnel with the hazards specific to the cylinder management job and provide instruction in safety procedures to adequately address them. Key areas in the site-specific safety training curriculum are detailed in Table 1.

Documentation of site-specific safety training will be maintained at the project office. All preparatory safety training will be completed at least one day prior to the start-up of container collection and processing activities at the site.

1.4.1.3 Cylinder Training

All IES crew members undergo a basic in-house training course in handling compressed gas cylinders and know the basics of cylinder and valve configuration. This enables them to more readily identify unmarked cylinders if not by name, then by category of gas. The IES crew also know the signs of potential hazards such as significant dents, advanced deterioration, and severe deformation of the valve. All IES personnel are versed in safe cylinder handling practices including the means for removing frozen valve caps, lifting cylinders, and decommissioning practices.

1.4.1.4 Daily (Tool Box) Safety Meetings

Daily meetings will be held prior to the start of each day's activities to review safety-related and other pertinent information, changes in procedure, and general progress of the job. These meetings will be documented by the SSHT.

The daily safety meetings are an essential part of the project safety training program because they allow training to be updated on a continual basis as conditions at the site change. Tool box meetings will be attended by all on-site personnel assigned to the job. Meetings will be held daily prior to starting the day's work. Follow-up safety training will be provided by the Project Supervisor or SSHT as needed and prior to any significant change in site operations and will be documented on the training log.

1.4.1.5 Facility Specific Training

IES personnel can expect training which is specific to the Barrancas Cemetery site and the Naval Air Station in general. This training, expected to be provided by the facility personnel and will deal with such issues as health and safety, emergency response, and security. This training will be required prior to start-up.

1.4.2 Medical Surveillance

All personnel involved directly with the compressed gas cylinder excavation and disposition project will have been given a medical examination by a licensed physician specializing in occupational medicine. This examination will form the basis of the medical surveillance program in force at this project.

The purpose of the medical surveillance program is threefold:

1) Ensure that workers involved in site operations are in good health and able to perform the duties expected of them.

2) Document that site workers are physically capable of using respiratory protection equipment and performing necessary tasks.

3) Establish medical base-line data for the purpose of historical comparison (i.e., to establish a "starting point" against which future medical testing may refer to detect increase or decrease in the parameters examined).

Once all physicals have been performed, a certificate signed by the examining physician will be completed indicating that the employee is capable of performing necessary work and is physically suited to wearing respiratory protection. A copy of this certification will be maintained at the project office.

The full battery of tests contained within the physical examination is conducted annually and may be repeated more often for the affected employee under the following conditions:

1) After acute exposure to any toxic or hazardous material present at the site.

2) At the discretion of the project manager, and occupational physician when the employee has been exposed to dangerous levels of toxic or hazardous materials at the project site.

3) At the discretion of the project manager, occupational physician, and at the request of an employee with demonstrated symptoms of overexposure to toxic or hazardous materials present at the project site.

4) Upon termination of an employee from work activities involving hazardous waste found at the site.

Post-project exams will be administered to project crew members if any of the conditions outlined above are met. As required by federal law, medical records for site workers will be kept on file for 30 years subsequent to project completion.

Prior to the initiation of site activities (excluding site preparation work that does not involve handling potentially hazardous waste), all workers will have had to be approved as medically fit to work on the project. Anyone who is shown to have medical problems which would affect their ability to work under the conditions imposed by this project will be prohibited from working at the site.

In the event of an illness or injury, IES personnel will be taken to the closest NAS Pensacola medical facility or be transported by NAS Pensacola ambulance to an off-site medical facility. To initiate medical attention, IES employees must coordinate with the CH2M Hill site supervisor or call one of the posted emergency numbers.

Given the relatively short term of the project, it is unlikely that IES will contract for local medical services.

1.4.3 Material Safety Data Sheets

In conformance with Federal hazard communication and worker right-to-know legislation, Material Safety Data Sheets (MSDS) for the chemicals being handled will be maintained both at the IES offices in Atlanta and at the project site. Materials used at the project site which are classified as possessing potentially hazardous properties will be included in a hazard communication session. Material Safety Data Sheets contain information vital to the safe handling of individual chemicals and includes information relating to the chemical's physical and chemical properties, spill containment techniques, personnel protective gear required when handling the chemical, and other pertinent safety-related data. Each employee working on site will be appraised of the hazards associated with chemicals included in this program and will be given free access to the MSDS for all inventoried chemicals.

Based on the limited amount of information available about the site the types of cylinders which are known or may potentially be buried there, it is thought that most of the cylinders will contain standard industrial gases. As such, IES will maintain MSDS information on site for the following chemicals:

- acetylene
- oxygen
- carbon dioxide
- nitrogen
- hydrogen
- propane

IES will maintain MSDS's for any chemicals which it may bring to the site. These chemicals will likely include:

- Helium
- Breathing Air
- Nitrogen
- Sodium Hydroxide
- Sulfuric Acid
- Gasoline
- Diesel fuel

There will be no Sodium Hydroxide or Sulfuric Acid on site unless and until a need for these reagents are identified. (These chemicals are used to neutralize acid gases such as chlorine and alkaline gases such as ammonia).

Given the fact that many of the chemicals on this project may be unknown until identified by analysis, IES will maintain an internet connection at or near the site to allow

rapid access of MSDS information from a number of reliable internet-based sources including commercial gas producers.

1.4.4 Other Requirements

OSHA has enacted numerous rules affecting safety in the workplace. Applicable rules will be implemented and enforced for the project duration; see Section 2.8.

1.5 Injury and Accident Reporting

In the event that an accident, injury, or incident such as an explosion, fire, release of gas, or exposure to toxic chemicals occurs during the project, proper notifications to authorities will be made and a report listing the following items will be completed:

1) Name, organization, telephone number, and contractor's location.
2) Name and title of person filing report.
3) Date and time of incident/accident.
4) Location of incident/accident.
5) Brief summary of accident/incident giving pertinent details including type of operation ongoing at the time of accident.
6) Cause of accident/incident.
7) Types and number of injuries.
8) Details of any existing chemical hazard or contamination.
9) Estimated property damage.
10) Nature of damage and effect on contract schedule.
11) Action taken by contractor to insure safety and security.
12) Other damage or injuries sustained.

All personnel involved directly with cylinder management will be instructed to report any injury as soon as possible after the injury. Lost-time injuries will be reported to Mr. Gold within 24 hours after the incident. These injuries will be documented on OSHA Form 300 and maintained at IES's corporate office and on site during the all operations.

An in-depth investigation will be made under the following circumstances:

1) Fatal injury
2) One or more persons admitted to the hospital
3) Property damage
4) All work related injuries

A daily record of all first aid treatment not otherwise reportable (OSHA Form 300 or otherwise) will be maintained and furnished upon request to CH2M Hill. An incident resulting in the death of an employee or the hospitalization of three or more employees will be reported to the CH2M Hill project manager and to OSHA within 8 hours.

1.6 Hazard Communication Information

In conformance with Federal regulations addressing hazard communication and worker right-to-know, IES will actively inform all personnel participating on this project of the hazards associated with the particular job being done (See Section 1.4.3). As part of this effort, the following topics will be discussed to properly inform project project team members of potential hazards and appropriate safety procedures:

1) General safety policy.
2) Project safety requirements.
3) Employee's responsibility for property and the safety of others.
4) Employee's responsibility for reporting all accidents.
5) Medical facilities and required treatment.
6) Procedures for reporting or correcting unsafe conditions or practices.
7) Fire fighting and other emergency procedures.
8) Job hazard and activity hazard analyses.
9) Alcohol and drug abuse policy.
10) Chemical hazard data.
11) Evacuation routes and procedures.

This information will be given to project members at the beginning of the job and updated during the daily safety meetings for the duration of the project field activity. All training and hazard communication sessions will be documented to record:

1) Date/time
2) Location
3) Name of attendees
4) Subjects discussed
5) Discussion leader's name

These records will be made a part of the project file and maintained at the project trailer office.

1.7 Inspections

Inspections will be conducted throughout the project to ensure that work is proceeding according to schedule within the framework of project specifications. The program will consist of several inspections and tests, which include the following:

1) Preparatory Inspections. This inspection will be performed prior to beginning each feature of work involving on-site operations and includes review of contract requirements, field controls, status of preliminary work, and inspection of equipment and equipment staging.

2) Initial Inspection. Initial inspections will be performed as soon as work begins on a particular phase of work and include examination of workmanship quality as well as review of compliance with contract requirements. This inspection will effectively confirm procedures, correct misinterpretations, and add any further guidance needed to improve work quality.

3) Safety/Operational Inspections. A daily site safety and system operations inspection will be conducted. The purpose of these inspections is to ensure compliance with safety protocols mandated under this plan and to ensure proper operation of equipment and tools used on this project. Inspections will be documented on the daily quality control report form. Observations of safety procedures and conduct will be noted in the reports along with any deficiencies and corresponding corrective actions taken.

1.8 Records

Various logs and reports will be maintained during this project to document significant events and day-to-day operations. The following reports will be produced and maintained specifically for this project:

1) Training Logs - Reports documenting both initial and follow-up training will be prepared and maintained.

2) Daily Safety Logs (Tool Box Meeting) - Daily safety logs will serve to document the safety procedures, inspections, and events occurring at the site on a day-to-day basis.

3) Weekly Safety Reports - Weekly reports will summarize work at the site for each successive week during management operations.

4) Close-out Report - At the end of the project, a report summarizing the project will be compiled, signed by the Project Director and SSHT and delivered to CH2M Hill.

The SSHT maintains a complete set of report forms in a project notebook. These forms are available for review by CH2M Hill. All completed reports and records are maintained at the project site as part of the contract file.

1.9 Emergency Telephone Numbers

In the event of an emergency, the following telephone numbers and radio channel may be used:

NAS Pensacola Emergency Services	TBD
Ambulance	TBD
Fire	TBD
Police	TBD

The above information will be posted on-site in the command trailer.

Site personnel will provide the following information, as available, when communicating emergency information to any emergency response organization.

1. The caller's name, telephone number, pager number
2. Exact location of the emergency
3. Nature of the emergency, including time of occurrence, current site conditions, and special hazards in the area
4. Injuries, if any, including numbers of injured, types of injuries, conditions of injured
5. Additional information as requested.

1.10 Policies/Rules

Various IES corporate policies and general rules are contained in this safety plan within attached appendices. These policies address:

1. Bloodborne pathogens (Appendix A and B)
2. Substance abuse (Appendix C)
3. General Project Safety Practices (Appendix D)

2.0 Health and Safety Technical Plan

2.1 Hazard Analysis

For this project there are five general types of hazards:

1) Physical hazards inherent in construction activities.
2) Physical hazards inherent in the excavation and collection of cylinders.
3) Physical hazards inherent in handling compressed gas cylinders.
4) Chemical hazards from known hazardous materials.
5) Chemical hazards from unidentified hazardous materials.
6) General site hazards.

The following sections discuss the various hazardous chemicals which are expected to be on-site during this project.

2.1.1 Physical Hazards - Construction Activities

While the project involves the excavation, segregation, sampling, and disposition of compressed gas cylinders, the entire effort has many hazards normally associated with a construction project. A wide variety of materials will be handled, hand and power tools may be used, and heavy machinery will be in operation. Physical hazards may result in cuts, abrasions, punctures and other bodily injuries caused by materials, equipment, and machines used during the job. The work at this site presents both standard construction-type, and unique hazards associated with excavation and the handling compressed gas cylinders.

Typically, the type of injuries which occur on construction work sites are cuts, impacts, abrasions, and punctures. These are often the most dangerous and debilitating types of injuries because it is so easy to lose awareness of them and they can result in bruises, sprains, broken bones, bleeding, and infections. This type of injury is associated with personnel lifting, moving, or otherwise handling various construction materials and tools. Simply moving around a site poses tripping hazards due to the presence of cables, wires, and other obstructions which may be present.

While personnel are often highly sensitive to, and very careful when working in the presence of dangerous chemicals, the routine nature of construction work often leads workers to casually disregard simple safety procedures and thus sustain an easily avoidable injury.

Construction-type hazards will be managed at this site through safety training of the site crew on how to properly and safely execute their job functions. Additionally, in accordance with OSHA requirements, each employee will be:

1) Told how to do the job.

2) Shown by example how to do the job.
3) Provided with proper tools.
4) Provided with proper protective equipment.
5) Supervised by a qualified person while performing the job.

(These procedures are also related to work with the hazardous materials at the site.)

All personnel at the site will be equipped with steel-toed boots to protect the wearer's feet from crushing forces. In addition, leather or synthetic fiber work gloves will be used during all phases of project execution to minimize hand injuries caused by cut, scrapes, minor impacts, and abrasions.

Safety glasses will be worn at all times during construction and excavation activities. Shatter-resistant lenses on the respiratory gear face pieces will protect wearer's eyes during work involving hazardous substances.

Hard hats will be required during those time when an overhead hazard is present.

Personnel will be trained on proper lifting techniques, and lumbar back supports belts may be used by personnel involved in any lifting activity to minimize the chances for back injury or strain.

2.1.2 Physical Hazards - Excavation Operations

The primary risk during excavation is from a collapse of the excavated area while workers are present in that area. OSHA maintains detailed requirements for sloping and shoring of trenches. IES will excavate each anomaly search location employing the proper trenching slopes to avoid collapse of the area. The soil in the project area is considered to be sandy and is not particularly stable, especially in the presence of operating heavy equipment that will be producing ground vibration in the immediate work areas.

There is always a risk of damaging a cylinder during the excavation process which could then result in a release of potentially harmful gas or forceful propulsion of the cylinder. IES will use a combination of a back-hoe to facilitate the removal of gross overburden augmented by a hand-operated air knife and vacuum truck for soil removal in areas where cylinders are thought or known to be in close proximity. Using the air knife and vacuum truck eliminates the potential for an excavator bucket to come into contact with and possibly damage a cylinder.

Each excavation point first be checked for the presence of cylinders (and other buried debris) with a magnetometer and fiberglass probes. If no cylinder is detected at a level of two feet or more, IES may use the excavator to remove one foot of dirt. One foot of clearance is required for mechanical excavation. When a cylinder is detected, IES will use an air knife to remove the overburden. Non-sparking hand tools may also be used to supplement the air knife operation.

Once a cylinder is exposed, it will be inspected, to the degree possible in-situ. Inspection will include an evaluation of physical condition and a leak check. A determination will be made as to the safest method of removing the cylinder given the fact that it may be under pressure or in a deteriorated or damaged condition. The inspection and decisions relevant to movement of the cylinder shall be documented. Removal of the cylinder from the excavation will be initiated only with the concurrence of the site supervisor. Once a cylinder is out of the ground, it will be cleaned to remove gross accumulations of soil and other debris and given another, more thorough examination to determine its potential contents and any other physical attributes (such as small corrosion holes) that can impact how the cylinder is handled and processed. Once this secondary examination has been concluded, the target cylinder is placed into a gas cylinder overpack for transport to the processing area.

Working in the excavation presents slip and trip hazards. It is anticipated that cylinders may be found intertwined with each other and possibly other types of debris making recovery difficult and increasing the potential for getting fingers and hands pinched. Whenever possible, a track hoe equipped with a specialized cylinder grappler will be used to extricate the target cylinder from the excavation and place it on the ground surface for handling by IES crew members. Using mechanical means to lift and remove cylinders from the excavations at anomaly locations will minimize dangers to the operating crew.

Compressed gas cylinders are heavy. Those containing acetylene are particularly heavy on account of the dense filler material inside the container. Moving the cylinder up and out of the excavation will require care; the potential for back strain is great in this situation. IES may elect to use mechanical means to lift and remove the cylinder, or place the cylinder in a carrying device, or use a carrying strap designed to allow two men to lift and move a cylinder. Depending upon the depth of the excavation, IES personnel may simply lift the cylinder out of the hole. In all cases, the following rules will be followed.

Crew members working in the site will follow a few basic rules when recovering cylinders. These rules are as follows:

1. Always wear the PPE provided for the task and make sure others around you are similarly prepared. See Section 2.5 for PPE requirements by task.
2. Always be aware of the conditions of the work area and avoid those which are unstable.
3. Allow the heavy equipment to mitigate potentially dangerous work conditions.
4. Practice safe lifting procedures as follows:
    a. Consider the size, shape, and weight of the object to be lifted. Two persons must lift an object if it cannot be lifted safely alone (e.g., greater than 50 pounds or 1/3 body weight).

    b. The hands and the object should be sufficiently free of dirt that could prevent a firm grip.

c. Leather or heavy duty work gloves must be used, and the object inspected for metal slivers, jagged edges, burrs, rough or slippery surfaces.

d. Fingers must be kept away from points that could crush or pinch them, especially when putting an object down.

e. Feet must be placed far enough apart for balance. The footing should be solid and the intended pathway should be clear.

f. The load should be kept as low as possible, close to the body with the knees bent.

g. To lift the load, grip firmly and lift with the legs, keeping the back as straight as possible.

h. A worker should not carry a load that he or she cannot see around or over.

i. When putting an object down, the stance and position are identical to that for lifting; the legs are bent at the knees, and the back is straight as the object is lowered.

A detailed discussion of PPE by project activity is presented in Section 2.5. Please see this section for more information related to the extraction operation.

Please note that this section discusses only the field hazards and mitigating measures in place for excavating and recovery target containers. Actual handling of the cylinder itself may represent a hazard and must be considered.

2.1.3 Physical Hazards - Compressed Gas Cylinders

Working with compressed gas cylinders and other pressurized containers present several unique physical hazards. Most notable, is the danger of breaching the cylinder vessel or valve. Such a breach allows the pressurized contents of the cylinder to escape in an uncontrolled manner and can violently propel the cylinder in a similar uncontrolled fashion. The cylinder can literally become a missile if the valve is damaged or forcibly removed from the cylinder end. The consequences of such an uncontrolled release can be devastating. Numerous deaths have been caused by careless handling of cylinders containing compressed gases, even when the gases themselves were non-toxic.

While the potential for a catastrophic breach exists, the most common release is a slow leak. Should a cylinder contain a toxic material, such a leak can be quite harmful. Crew members involved in cylinder excavation operations will wear supplied airline respiratory protection equipment furnished with a 5-minute escape pack or a standard SCBA (with a 5-minute warning device).

As noted earlier, all crew members will be provided with instruction on cylinder handling and specifically with identifying cylinders which appear to present special problems. Engineering controls such as a cylinder grappler may be used to mitigate these types of hazards.

2.1.4 Known Site Contaminants

Known site contaminants will consist of two material types:

1) Compressed gases at the site which are readily identifiable, and
2) Chemicals which are brought to the site to facilitate the disposition of the compressed gases (eg. neutralizing reagents, diesel fuel, etc.).

A MSDS will be provided for each chemical that is brought to the site. Additionally, a compendium of published MSDS's will be maintained on site. MSDS information can also be readily obtained through various internet sources.

Please see Section 1.4.4 of this document for a list of known or suspected site chemicals

While some of the chemicals listed in Section 1.4.4 are relatively benign from a toxicity standpoint, all containers suspected of holding any chemical must be handled with care.

2.1.4.1 Chemical Exposure Effects

While there is no definitive information related to the cylinders buried at the Barrancas Cemetery, it is not expected that they will contain particularly toxic gases. This is assumed in large part based on the missions at the air station that would have generated waste gas cylinders which consist mainly of standard industrial operations (vs. laboratory or development processes). In fact, no chemical reagents will be brought to the site unless and until toxic gases are discovered.

Should a toxic gas be found, the most common reagent employed by IES is sodium hydroxide. This material is highly corrosive and can cause severe skin burns, damage to the eyes, and the respiratory system. Personnel involved with this material must wear appropriate PPE including full face shields, rubber gloves, and splash suits or aprons. The chance of casual ingestion of hazardous materials will be minimized by a thorough cleaning of all equipment and PPE which contacts this and other similar chemicals after each use.

The other chemicals known to be on site are generally classified as simple asphyxiants. Venting of asphyxiants will never be done in a confined area.

Please note that acetylene cylinders often contain an asbestos filler block inside. An intact cylinder represents no harm from this material. However, a ruptured cylinder can expose a worker to potentially harmful fibers. Any acetylene cylinder exhibiting a

ruptured or severely deteriorated shell must be noted and not moved until mitigative measures, such as packaging the cylinder in protective plastic wrap, are taken.

2.1.4.2 Fire and Explosion Concerns

Of the anticipated chemicals, acetylene, hydrogen, and propane represent a fire and explosion concern. These materials are highly flammable. In the case of acetylene, it must not be allowed to vent within an enclosed area since it poses the risk of violent auto-detonation. Venting acetylene may be done safely but in an open area and away from any sources of ignition.

Oxygen, while not a flammable gas, is an oxidizer and will greatly increase the flame front and Btu of any fire. It must be handled with care and when vented, done so only when the area is clear of any flame.

Fire concerns will be mitigated by segregating incompatible gases. Cylinders with unknown content will be segregated based upon valve configuration. In the absence of suspected gas, by class, i.e, flammable, non-flammable, of gas, unknowns will be segregated from known materials. Segregation will be accomplished by maintaining at least 20 feet between storage areas. The areas will be clearly labeled as to hazard.

2.1.5 Unknown Chemical Hazards

The greatest chemical risk to site personnel is from containers holding unknown chemicals. The hazards of working with compressed gases is greatly mitigated by understanding the chemical, how it is used, appropriate protective measures, what to expect from a release, and proper response to a release and to an exposure. Working with unidentified gases presents greater challenges and requires conformance to the practices outlined at the end of this section.

While it is assumed that the majority of cylinders at site contain standard industrial gases, it is understood that there may be some surprises. Each new cylinder unearthed will be handled as if it contained toxic material until it can be conclusively shown to be otherwise.

It is expected that most of the cylinders at the site will not have viable labels. While a cylinder may not be labeled, it may still be possible to ascertain some clues as to its content based upon cylinder type and valve configuration. For instance, the cylinder body configuration and construction indicates whether or not it contains a high or low pressure gas. The cylinder valve configuration may indicate the category of gas; for example, the valve for inert gases is unique and designated as a CGA 580 while flammable gases have a unique CGA 510 valve.

Extracting the maximum amount of information about a cylinder with unidentified content is important to hazard mitigation. Cylinder characteristics are determined and recorded in the inspection and assessment phase of cylinder processing. This

information may then be used to more safely store and process cylinders with unidentified content.

When managing cylinders with unidentified content, the following practices should be observed:

1. handle all cylinders carefully.
2. store unidentified cylinders away from cylinders with known content.
3. to the degree possible, segregate unidentified cylinders on the basis of valve type.
4. secure the cylinders in an upright position if possible

2.1.6 General Site Hazards

The following subsections briefly discuss various site conditions and associated hazards and mitigative measures.

2.1.6.1 Weather Related Stress

Heat and cold stress are serious considerations but given the timing of this project, neither are expected to have a significant impact. A supply of drinking water will be maintained at the site and all crew members are encouraged to drink copious amount to prevent dehydration.

When ambient air temperature reaches 80° F IES will implement a heat stress monitoring program. The SSHT will monitor and record oral temperatures and heart rates of entry personnel. A baseline temperature and heart rate will be taken. During breaks, entry personnel will have their temperature and heart rate taken with results compared to baseline information. The following action items are established:

1. If oral temperature exceeds 10° F above base core temperature, shorten the next work cycle by 1/3 or lengthen the rest period by 1/3.

2. If oral temperature still exceeds 10° F above base core temperature at the end of the next work cycle, shorten the following work cycle by 1/3 more, or increase rest period by 1/3 more.

3. If oral temperature ever exceeds or equals 20° F above base core temperature, cease work immediately for the day.

4. If heart rate exceeds 140 beats per minute at the end of a work period and 100 beat per minute at the end of a rest period, shorten the work period by 1/3 or lengthen the rest period by 1/3.

5. If the heart rate still exceeds 140 beats per minute at the end of the next work cycle, shorten the following work cycle by 1/3 or lengthen the rest period by 1/3 more.

These frequency guidelines may be modified if work level changes. (Example: light work to moderate work to heavy work or reverse order.) Work levels are defined in the latest edition of American Conference of Governmental Industrial Hygienists (ACGIH).

Also, the above guidelines may be modified if worker is equipped with a cooling mechanism as may be common in the industry. (Example: cool vests designed to be worn beneath the PPE and iced towels worn over the head and shoulders. The SSHT determines the degree of modification after consultation with the worker.

2.1.6.2 Noise

Noise from sources such as heavy equipment, generator, air compressor, motors, and hydraulic equipment constitutes the most likely auditory hazard to workers. If such equipment is used, personnel will be provided with ear plugs. Noise surveys may also be conducted by the SSHT. High noise level areas requiring hearing protection will be demarcated.

2.1.6.3 Weather Related Problems

Weather events may include high winds and rain storms. The SSHT will direct a cessation of all work should weather conditions present a hazard.

2.1.6.4 Biological Hazards

The principal biological risks present at the project site are considered to be snakes and spiders.

Florida and the southeastern U.S. have a high diversity of snakes due primarily to the warm, moist climate and a wide variety of habitats. Some snakes are habitat specific and others can be found in almost any habitat. The majority of snakes are harmless. However, there are several species dangerous to humans. In the southeastern U.S. these are the copperhead, eastern coral snake, timber rattlesnake, cottonmouth, pigmy rattlesnake, and eastern diamondback rattlesnake.

Poisonous snakes can often be distinguished by their diamond shape heads and vertical, elliptically shaped pupils. Most snakes live in secluded habitats and are quite rare. Therefore, people rarely encounter these animals, and bites are infrequent. When snake bites do occur they often require a visit to the emergency room, but are rarely lethal. Recommended first aid for venomous snake bite include: (1) keep the victim calm and minimize their physical activity, (2) get the victim to the nearest medical facility immediately. It would be helpful to identify the snake, but be careful to avoid being bitten.

Symptoms of a snake bite include swelling, bleeding and severe pain at the site of the bite, chills or fever, sweating, weakness, thirst, nausea, numbness, and changes in heart rate and blood pressure.

Although snake bites are rare certain precautions are still wise. Snake bites usually occur on the hands, feet, and ankles. Always wear shoes or boots and avoid walking through dense grasses or underbrush where you can not see your feet. Similarly, look before you sit or grab at something in the outdoors; you do not want to inadvertently disturb a snake.

Spiders also represent a risk. Spider bites usually happen when people inadvertently disturb a spider. Care must be taken when collecting objects that may be a hiding place for spiders; gloves should be worn and pants legs should be taped or otherwise secured.

There are two types of venomous, dangerous spiders whose habitats extend to include Florida and the project area. These are the Black Widow Spider and the Brown Recluse. The bite of either of these spiders is considered poisonous, but encounters with both spiders are rare. Bites are infrequent, and death is also unlikely.

The actual effects of the spider bite can vary greatly. How ill the person becomes is dependent on the age and health of the person bitten, the depth and location of the bite, and the amount of venom injected. In some cases, people do not even know that they have been bitten until a few hours have passed. If the bite is indeed from a Black Widow or a Brown Recluse, pain will set in after some time. Other symptoms may include changes in heart rate, sweating and vomiting. With a black widow bite, the pain often migrates to the back or abdomen and the victim may have severe cramps in these regions; with a brown recluse, the area around the bite will grow and become an unsightly lesion as the hours go by. If these symptoms occur, it is necessary to seek medical attention.

2.2 Air Monitoring

Protection of personnel and the environment require that air quality be monitored during the project. Air quality information obtained during various site operations allows decisions to be made with regards to appropriate personnel protective equipment and engineering control applications.

Air quality will be monitored using several different instruments including combustible gas/oxygen meter, and toxic gas monitor. Atmospheric conditions will be monitored using an on-site meteorological station.

2.2.1 Meteorological Station

The meteorological station will provide real-time and historical records of wind speed, wind direction, and temperature. Information regarding wind speed and direction will be monitored continuously by the technician stationed in the command trailer and used in an emergency situation involving the accidental release of a large quantity of gas to guide evacuation or response actions. The meteorological station will be located at the project command trailer.

2.2.2 Explosimeter/Oxygen Meter

IES will use a standard hand-held explosimeter/oxygen meter to monitor airborne concentrations of flammable gas and oxygen during processing activities. This device will be used in the work area to determine the percent of the lower explosive limit (LEL) of any combustible gases present.

The unit selected for this purpose is an Industrial Scientific MX 251 (see Figure 1). The MX251 Monitor continuously and simultaneously monitors ambient levels of oxygen and combustible gases. A reading of 0%-5% of the LEL will be the cut-off point for ceasing work activities within the processing area. Work will not proceed until the area has been ventilated and readings return to 0% LEL.

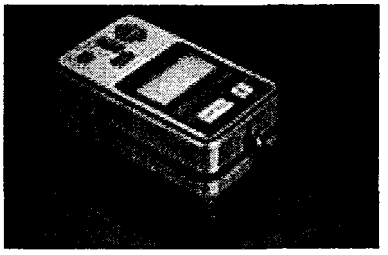


Figure 1
Industrial Scientific MX 251

Oxygen measurements exceeding 23.5% or falling below 19.5% will indicate that an abnormal situation exists and readings taken with the explosimeter are unlikely to be accurate. If readings are obtained outside these ranges, work will cease until oxygen concentrations return to normal and accurate explosimeter readings may be taken.

While both combustible gases and oxygen levels are monitored simultaneously, only one is displayed on the instrument's liquid crystal display (LCD). When one of two membrane switches located immediately below the LCD panel is touched, the respective gas readout will appear on the display. A small triangular pointer also appears on the display, just above the switch that was pressed, to indicate which gas is being displayed. The last gas selected will remain on display until a different switch is pressed. When the instrument is first turned on, it will automatically display the oxygen readout. Oxygen is displayed as a percent by volume in 0.1% increments.

These monitors will be calibrated as per manufactures recommendations. All monitors are calibrated annually and tagged with the date.

2.2.3 Toxic Gas Monitor

Extremely small leaks of virtually any gas can be readily detected through use of the thermoconductivity detector found in the IES toxic gas monitor (TGM) (see Figure 2). This real-time monitor is particularly useful in determining if leakage exists in any system components, including cylinder valves, piping, or cylinder/valve connection points. Although this instrument is not specific for any one type of gas, it is very useful in determining the presence (or absence) of a wide range of toxic gases. It is particularly sensitive to the presence of flammable and hydride gases and can often detect the presence of these compounds in the sub-part-per-million range.

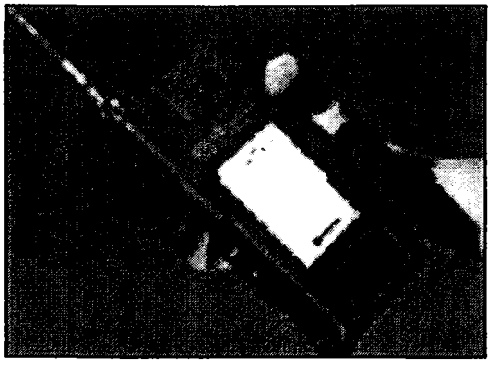


Figure 2
Matheson TGM

The monitor uses an auditory and visual alarm to alert the user to the presence of potentially toxic gases. A pump inside the unit pulls air from near the monitor into a detector chamber where it is "analyzed" for the presence of foreign gases. Sensitivity of the TGM is user adjustable to optimize its ability to detect toxic gases in very small concentrations.

The TGM detects a large number of gases at varying concentrations and is not calibrated to any one gas. The unit is tested, however, to determine proper adjustment of the sensitivity selector. This test is done using a vial of test vapor supplied by the manufacturer and challenging the instrument to determine if the alarm activates when the sensitivity rheostat is set at a predetermined level. The test is not as much a calibration as a test of sensitivity.

2.2.4 Colorimetric Indicator Tubes

Colorimetric indicator tubes are used to obtain quantitative data on gas concentrations in the part-per-million range. Tubes for specific gases are typically used once the chemical nature of the gas is known to monitor for gas leakage during processing operations. On this project, the IES mobile laboratory will be used for identification and for confirmatory analysis. However, colorimetric tubes will be used in the process of testing breathing air quality (see Figure 3).

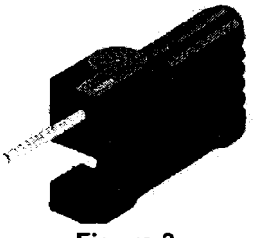


Figure 3
Draeger System

The tubes are used in conjunction with a sampling pump which is calibrated to draw in a very specific amount of air as it is sampled. The pump used on this project is manufactured by Draëger.

Concentration of the gas is shown by a change in color of a solid media packed inside the tube which extends up the calibrated tube a distance proportional to the concentration of gas present in the sampled air. Once used, the tubes are discarded but they do provide an accurate, quantitative indication of gas concentration once the type of gas sampled is known.

2.3 EMERGENCY PROCEDURES

Despite all safety precautions, accidents can still occur. Prior to the commencement of processing operations, NAS Pensacola emergency personnel will be notified as to the nature and scope of cylinder management activities. All notifications of this type will be managed by CH2M Hill. A discussion of hazards and mitigating measures will be discussed among the site crew and emergency response personnel. In addition, a pre-work briefing will be held with NAS Pensacola and CH2M Hill personnel to coordinate a plan for contact and appropriate response actions by base personnel in the event of an emergency situation.

The following subsections discuss emergency situations and responses.

2.3.1 General Procedures and Practices

Emergency procedures will follow those detailed in any NAS Pensacola plan governing operations at the project site. IES personnel will be briefed on the plan and its provisions prior to beginning any cylinder processing operations.

Any primary emergency response during this project will attempt to insure the safety of those individuals in the immediate affected area and notify the CH2M Hill emergency coordinator. Due to the fact that the entire cylinder handling operation will be under close supervision of the IES and CH2M Hill emergency coordinators, response to any abnormal conditions or situations will be very rapid. In addition, personnel attired in appropriate protective gear with specific air monitoring and decontamination equipment will be on standby to respond to any type of chemical incident associated with this project which will also contribute greatly to a rapid, appropriate, and effective response. Communications between the site crew and emergency coordinators will be done using hand-held radios.

In the event of an emergency such as a spill or gas release, Mr. Drago will serve as the IES emergency coordinator. In the event of an emergency, the IES emergency coordinator will work in concert with the CH2M Hill emergency coordinator to implement appropriate response actions as follows:

1. Whenever an imminent or actual emergency occurs, the IES emergency coordinator will immediately notify the CH2M Hill emergency coordinator who will perform of the following:

a. Activate communications systems that will work all facility personnel.

b. Notify appropriate state and local agencies that had been designated response roles, if it is deemed that their advice or help is required. Both IES and CH2M Hill will assist the agencies with their response efforts.

2. If a release, fire, or explosion occurs, the IES and CH2M Hill emergency coordinators will identify the character, exact sources, and the area affected by any released materials based on their knowledge of the specific materials released and operations at the time of the incident.

3. The emergency coordinators also will assess possible hazards to human health or the environment that may have been caused by the emergency. This evaluation will consider both the direct and indirect consequences such as the effects of toxic, irritating, or asphyxiating agents generated by the emergency, any chemical agents used in fire control, and/or heat-induced reactions or explosions.

4. During emergency, the CH2M Hill emergency coordinator working in conjunction with the IES emergency coordinator will take all reasonable measures to minimize the potential for occurrence and spread of fires, explosions, and releases at other facility areas. These measures may include stopping operations, collecting and containing released wastes, and removing or isolating materials.

5. After the emergency has been controlled, the CH2M Hill emergency coordinator will provide for the storage, or disposal of recovered wastes and/or contaminated materials.

In the event of a chemical release, IES personnel will immediately retreat to pre-designated muster points defined within the contingency plan. In general, this response will be to move all personnel to a location upwind of the release point. Reentry to the work area is made by only personnel protected with respiratory and dermal covering equipment carrying real-time air monitors specific to combustible gases.

The most common accidents that occur during site operations are physical injuries. Adequate protection from the chemical and physical hazards will be afforded to each employee through the use of protective suits and respiratory gear. Accidents such as tripping, falling, and bumping into stationary objects are, however, virtually impossible to completely protect against. Each person working on the site must use their own judgement and common sense to keep these kinds of accidents to a minimum. "Industrial" first-aid kits will be available at the site to treat minor injuries but for more serious accidents, outside professional help will be used.

External (outside the project site boundaries) communications at the site will be made through the use of a conventional or cellular telephone, although, any communications from the facility will be coordinated through CH2M Hill. On-site or internal communications will be conducted using radios.

The following subsections discuss response procedures by injury type. For any injury or chemical exposure that cannot be adequately managed on site, effected personnel will be transported to the designated hospital located a short distance from the site.

2.3.2 Chemical Injuries

In cases of chemical exposure to any of the target gases on this project, the first aid steps detailed in specific Material Safety Data Sheets will be followed. In general, the following steps will be taken:

1. For persistent contaminants, rescue personnel will don gloves, and chemical protective coveralls before initiating response actions.
2. The victim's vital signs will be assessed.
3. The victim will be removed to fresh air and resuscitated, if necessary.
4. If skin or clothing is chemically contaminated and injuries permit, clothing will be removed and skin will be flooded with copious amount of water. The deluge shower and emergency eyewash located at the container processing area will be used for this purpose.
5. If the eyes are contaminated, they will be irrigated immediately with copious amounts of water for 15 minutes (minimum).
6. The Poison Control Center may be contacted to obtain technical advice and assistance (1-800-962-1253) if it appears as though the victim has ingested potentially hazardous chemicals.
7. All personnel will be decontaminated before leaving the exclusion zone.

2.3.3 Physical Injuries

Physical injuries occurring during the project will be managed in the following manner:

1. For minor injuries, routine first-aid procedures will be used.
2. For major injuries, an ambulance will immediately be summoned. (Telephone numbers will be posted on site.)
3. In the event of bleeding, broken bones, shock, burns, hypothermia, seizure, etc., only personnel with certified Red Cross training may render approved measures for treatment.
4. If the injury is less serious but warrants further medical attention, the victim shall be transported as directed by IES's supervision.

2.3.4 Responding to Fire or Explosion

In the event that a fire or explosion occurs at the project site during site operations, a notice will be issued over the site radios. This will notify all personnel to immediately proceed to predetermined rally points on the site to await further instructions.

2.3.4.1 Site Evacuation

In the event of a small fire at the site, the following actions will be taken (at a minimum):

1. Evacuate all non-essential personnel from the area, to an upwind location.
2. Attempt to extinguish fire using portable fire extinguishers or by smothering.
3. In the event of a chemical fire, all personnel in firefighting efforts will wear Level B protective equipment and be equipped with either a air line respirator or SCBA.
4. Request emergency assistance as necessary.
5. Decontaminate all personnel before leaving the exclusion zone.

Larger fires and small fires which cannot be extinguished will be managed in the following manner:

1. Evacuate all personnel from the active site to an upwind location.
2. Notify emergency response personnel from the Naval Air Station and request assistance.

There is a risk of rupture/explosion of cylinders subjected to prolonged heating. For fire situations involving gas cylinders, the following actions will be taken:

1. If possible, cylinders will be moved to a safe place before they become too hot.
2. If cylinders cannot be moved, they will be cooled with water hosed from a safe distance.

2.3.4.2 Fire Extinguishers

Fire extinguishers will be located at the site to facilitate control of small fires which might occur. Each fire extinguisher will be rated 1-A:10-B:C at a minimum. Specific locations of each extinguisher will be noted on a site plan and employees will be shown their location prior to project initiation.

2.3.5 Spill Containment and Response

Although less likely than common physical accidents, mishaps occurring in conjunction with the waste gas cylinders are potentially more serious. In an emergency situation involving a leaking cylinder, the following actions will be taken immediately:

1. The area around and downwind of the leaking cylinder will be identified and notifications issued to downwind receptors, if necessary.

2. The source of the leak will be determined and rectified if possible. Using appropriate PPE and breathing equipment, experienced crew members will work directly with the leaking cylinder to safely and expeditiously contain a leak or spill.
3. Unnecessary personnel will be kept away from the site and entry will be denied to all but emergency personnel.
4. If a cylinder overpack is available, the leaking cylinder should be placed inside as quickly as possible. (In no case may an acetylene cylinder be placed inside an overpack).
5. When use of an overpack is not possible, and the cylinder contains a liquefied gas, the cylinder will be oriented in such a way that the leak is above the liquid level (generally with leak point located at the highest possible position).
6. All non-essential or unprotected personnel will stay upwind of the spill or evacuate the site.
7. Air monitoring equipment will be used to determine when contaminant gas levels have subsided.

There will be SCBA's located on-site for the duration of this project for use in emergency situations and for short-term ingress-egress to work areas where a hazardous atmosphere currently exists or has the potential to exist.

2.3.6 Emergency Assistance

Medical emergencies requiring immediate care will be handled at the Pensacola Naval Hospital located at 6000 W Highway 98. Emergency telephone numbers and a map indicating the most direct route to medical care facilities will be posted at the site. Key telephone numbers will also be posted at the site as an aid to emergency notification.

2.4 Respiratory Protection Program

A respiratory protection program is applicable to all crew members involved in handling any target containers selected for management under this contract.

The human respiratory system is the easiest route of entry into the body for gaseous or aerosolized contaminants that may be encountered during the cylinder project. The human lung is also one of the most vulnerable organs in terms of susceptibility to damage from hostile contaminants. To minimize the chances for any gases or vapors to enter the lungs, a Respiratory Protection Program has been established for use on this project.

The Respiratory Protection Program includes site specific training in the proper use of the respiratory protection systems selected for this job and the different protection levels afforded by this equipment. Instruction will also be supplied to workers in the proper maintenance and care of the respiratory equipment.

The Respiratory Protection Program encompasses the following items:

1. The SSHT will perform an initial determination as to what levels of respiratory protection are necessary for the performance of the job.

2. The appropriate respiratory protection device will be used in designated work areas based upon all available data available prior to and during site operations.

3. Instruction and Training

   a. Medical Approval: Prior to work on site, documented approval will be obtained for employees to use a respirator. This approval will be obtained from the physician that has conducted the physical examination (including an examination of pulmonary function) for each employee.

   b. Respirator Fit-Testing: All of the members of the field crew will have been fit tested (qualitative) in the following types of respirators prior to performing cylinder cleaning activities at the site:

      i. Positive-pressure airline respirator with a 5 minute emergency egress bottle.
      ii. Positive-pressure Self-Contained Breathing Apparatus (SCBA).

   c. Employee Instruction: Each user will be instructed in the following before they are allowed to start work at the site:

      i. Usage, limitations, and cleaning procedure for each type of respirator, including the emergency egress system (Maintenance work, such as valve replacement, will be performed by the SSHT. Work performed on the supplied air systems, such as compressors and regulators, will be done by a technician certified for the specific repairs).
      ii. Discussion of the engineering and administrative controls in use and why respirators are needed.
      iii. Explanation of the nature of the respiratory hazard and what happens if the respirator is not used properly.
      iv. Explanation of why a particular type of respirator has been selected.
      v. Discussion of how to recognize and handle emergencies.

4. Each site worker will be responsible for ensuring that his respirator is functioning properly prior to each day of use.

5. Each worker using the respirator will be assigned his own individual unit, which will be labeled with an identification mark. Each user will be responsible for their respirator's care.

6. SCBA and supplied air respiratory equipment, including the air-bank will be inspected daily when in use.

7. SCBA and air-bank air quality will meet the requirements for Grade D breathing air as described in Compressed Gas Association Commodity Specification G-07.1-1989.

Each user of breathing gear is responsible for the daily checking of that equipment and ensuring that it is operating correctly.

2.5 Personal Protective Equipment

For the purposes of this project, three levels of personal protection will be used. In accordance with standard EPA designations, these levels are termed "Level D, Level C, and Level B".

Level D PPE is the minimum basic level of personal protection equipment used where no air contaminants are present that would require respiratory protection. While en route from one work location to another, modesty clothing is acceptable as the minimum dress. Workers exiting a contaminated area may remove protective clothing at the step-off pad and proceed to the change trailer in modesty clothes. Specific PPE requirements will be determined prior to beginning each work activity. Level D protective gear (general) is as follows:

- Coveralls and/or street clothes - covering the legs and shoulders
- Safety glasses or goggles
- Protective footwear with steel toes
- Hard hat
- Reflective vest
- Hearing protection (available and used as needed based on site postings or noise surveys)
- Gloves

Level C PPE is required where airborne contaminant levels are known or characterized, and a potentially hazardous atmosphere exists. Use of Level C PPE is not permitted in oxygen-deficient atmospheres (less than 19.5 percent oxygen), for contaminants with poor warning properties (odor detection level is greater than the threshold limit value), or when contaminant concentrations exceed the respirator limits. This level of protection can only be used when atmospheric contaminants will not adversely affect the skin or be absorbed through exposed skin.

- Full-face air-purifying respirator (with appropriate filters and/or canisters and appropriate prescription eye wear without temple bars)

- Disposable chemical resistant coveralls
- Protective footwear with steel toes
- Chemical-resistant shoe covers
- Hard hat
- Reflective vest
- Inner chemical-resistant gloves (impervious to chemical agent of interest)
- Outer chemical-resistant gloves (impervious to chemical agent of interest)
- Hearing protection (available and used as needed based on site postings or noise surveys)

Level B PPE is required where airborne contaminant levels are unknown, and a potentially hazardous atmosphere exists. Level B PPE is used when it is unlikely that workers will be exposed to very high sustained concentrations of contaminants or large scale liquid chemical splashes that will affect the skin or be absorbed by it. Level B as used by IES is generally upgraded dermal protection from that found with Level C and may include garments that range from semi-permeable (such as conventional Tyvek garments) to fully impermeable suits, such as the Trellborg ensembles. Respiratory protection associated with Level B protection is a air-supplied respirator or self contained breathing apparatus (SCBA). Level B PPE generally includes:

- Air-supplied respirator or SCBA
- Chemical-resistant garments (specific garment based on type and state of expected contaminants)
- Protective footwear
- Chemical-resistant shoe covers
- Hard hat
- Reflective vest
- Inner chemical-resistant gloves (impervious to chemical agent of interest)
- Outer chemical-resistant gloves (impervious to chemical agent of interest)
- Hearing protection (available and used as needed based on site postings or noise surveys)

2.5.1 Protective Suits

IES personnel will have several types of PPE garments available for use when disposing hazardous gases. The first is a standard Tyvek (or equivalent) suite, and second, a polyethylene-coated Tyvek, and the third, a gas-tight heavy-duty suit.

When managing gases which represent a minimal dermal hazard but still present a threat to the respiratory system, the use of standard or polycoated Tyvek suit, nitrile gloves, and a supplied air respirator is permissible.

When managing gases which represent an extreme dermal and respiratory hazard, then the SSHT may elect to utilize the gas tight suit in conjunction with a supplied-air respirator.

The heavy duty suit is manufactured by Trellborg and represents state-of-the-art for this type of protective garment. The boots (or foot cover) are an integral part of the suits. The glove-to-suit junction consists of a locking ring which forms a gas-tight seal. A special gas-tight cuff coupled with an inner glove ensures that no dermal contact with the body is made even if the gloves of the wearer become ripped or torn.

The Trellborg suit covers the entire head and forms a gas-tight seal with the wearer's face and the face-piece of the respirator. Tests conducted by the US Army indicate that this type of seal provides excellent protection (equal to or greater than that of a conventional mask-to-face seal) against the intrusion of airborne or liquid contaminants. All of the seams and joints on the suit are welded to form a completely gas-tight barrier between the wearer and the outside environment.

2.5.2 Respiratory Protection System

A Type "C" (OSHA designation) airline respirator operated in the positive pressure-demand mode will be used in conjunction with protective suits to ensure that contaminants do not enter the body through the respiratory or ingestion route. This system carries a protection factor of 10,000 when operated in the positive pressure-demand mode and because of its ability to protect the wearer, even in the event of a leak in the mask (any leakage is in an outward direction since the mask is continually under a slight internal air pressure).

A five-minute egress air supply cylinder will be worn by all personnel for use in emergency situations. The five-minute air supply enables the user to safely exit the work area under supplied air even if the air supply line is cut or disconnected. (Use of a five-minute egress bottle is required by OSHA when airline supplied respirators are used in atmospheres which are potentially Immediately Dangerous to Life and Health - IDLH).

Self-contained breathing appartus (SCBA) units will be available on site for use in emergency situations and when mobility greater than that afforded by airline respirators is required.

2.5.3 Air Supply

Breathing air supplied to the airline respirators will come from a high-pressure air bank composed of DOT-approved air cylinders. IES may elect to produce and package Class D breathing air for this project at the work site or may purchase breathing air from a local supplier.

The IES breathing air production system includes a CO_2 monitor and a high-temperature shut-down switch. IES maintains a breathing air testing program to ensure quality.

The breathing air production system will feed a set of DOT-approved air cylinders with a common manifold feeding compressed air into a pressure-reducing regulator and manifold where standard breathing hose airlines are connected and routed to individual users. This system is the most efficient and safest method to deliver high-quality breathing air to multiple airline users. A single-stage pressure regulator will receive air from the cylinders at pressures up to 2216 psi and reduce the pressure to approximately 90-120 psi for delivery to the airline manifold.

Standard, heavy-duty airlines will route air from the distribution manifold to individual users involved in the processing operation. Care will be taken to avoid crossing and tangling air lines during active site operations.

The following sections discuss specific PPE applications by activity.

2.5.4 Site Preparation

Site preparation work involves staging and installing equipment to be used during the cylinder management operations. It is not anticipated that this project phase will present chemical hazards to personnel working on-site. However, the potential does exist to incur injuries related to physical hazards (falls, impacts, etc.). For this reason, minimal level of protection, Level D will be used.

All personnel at the site will be equipped with steel-toed boots to protect the wearer's feet from crushing forces. In addition, leather work gloves will be used during all phases of project execution to minimize hand injuries caused by cuts, scrapes, minor impacts, and abrasions.

Hard hats will be worn during certain site preparation activities to minimize the chances of incurring injuries to the head. In addition, safety glasses will be worn by personnel at all times.

Those personnel involved in preparing reagent solutions and scrubber solutions will wear Level D supplemented by full face shields (over eye protection), splash suits or aprons, and rubber gloves.

Those personnel working in areas where motorized equipment is in operation will wear a highly reflective vest, and will not work behind heavy equipment. All heavy equipment will have back-up alarms.

2.5.5 Excavation and Segregation

During the excavation process, there is the potential for damaging a cylinder and initiating a release. As such, it these acitivities will be done in Level B.

2.5.6 Cylinder Sampling and Analysis

Confirmatory sampling of all cylinders will be performed in Level B and an airline respirator or SCBA. Sampling of cylinders with unknown content must be performed in Level B and an airline respirator must be employed. For cylinders with operable valves, this sampling may be done directly from the CMD or through the use of an IES sampling manifold attached directly to the cylinder valve outlet.

2.5.7 Cylinder Processing

The SSHT will determine appropriate PPE and respirator protection for activities within this task based on the chemical properties of the cylinder being processed.

Those involved in the disposition of cylinder gases will wear PPE appropriate to the activity. In cases where cylinder gases may be freely vented, Level D, supplemented with ear plugs and safety glasses, will be required. Those involved with the disposal of hazardous gases will be required to use Level B PPE and airline respirator.

2.5.8 Decontamination

Cylinders which formerly contained hazardous gases will be decontaminated. This activity consist of devalving the cylinder and rinsing the cylinder interior with water or an appropriate chemical reagent such as dilute caustic. This activity will be performed in polycoated Tyvek, butyl-rubber, nitrile, or neoprene gloves, and eye protection. At the discretion of the SSHT, the crew member performing this task may be required to use respiratory protection.

2.5.9 Decommissioning

Cylinder decommissioning consist of removing the valve (if this has not already been done during decontamination) and drilling a hole in the cylinder side wall. This activity will be performed in Level D.

2.5.10 Demobilization

Demobilization will be performed in Level D. Those involved in packaging waste reagent and decontamination fluids will supplement their Level D with full face shields (over eye protection), splash suits or aprons, and rubber gloves.

2.6 Safety Zones

The project site will be strictly controlled to minimize exposure potential for non-protected persons and to isolate potentially hazardous operations to controlled areas. To achieve this type of control, the following measures will be placed into effect:

1. Minimizing on-site work force.
2. Establishing specific work zones on the site.
3. Establishing of a single point for project-related site access. (Except emergency exits).

The safety zones will be established once all stationary equipment is positioned on site. The following sections briefly discuss the purpose of each zone.

2.6.1 Zone 1 - Exclusion Zone ("Hot Zone")

Following site preparation, the general area around active excavation sites, cylinder storage site, cylinder processing trailer, and mobile laboratory will be clearly marked. The areas inside the established boundary will be considered the "Exclusion Zone" (EZ), or "Zone 1". The boundary of this zone will be a barrier of warning tape placed on vertical posts or other stationary objects around the zone perimeter.

Since the active excavation areas will change during the course of the project as operations move from one anomaly location to another, the Exclusion Zone boundaries will also change. It is expected that an EZ encompassing the excavation areas expected to be accessed on each day will be established on a daily basis and changed as the anomaly areas are cleared.

2.6.2 Zone 2 - Contamination Reduction Zone (CRZ)

The area between the Exclusion Zone and the Support Zone is termed the "Contamination Reduction Zone" (CRZ). Given that compressed gases rarely have a contaminating effect, the CRZ on this project will primarily encompass the accessways between Zone 1 (the EZ) and the Support Zone as described below. It is also not expected that soils encountered on this project will be contaminated and therefore will not necessitate an expanded CRZ. For this same reason, it is not expected that dust suppression activities will be necessary during the execution phase of the job.

2.6.3 Zone 3 - Support Zone ("Clean Zone")

The support zone, the outermost part of the work area, is considered a non-contaminated or clean zone. All of the facilities and support equipment necessary for the logistical execution of the project will be located within this zone. It is expected for this project that the support areas will be located close but not immediately on the project site. Wherever possible, command trailers and other heavy support systems will be positioned on existing roadways within the cemetery directly adjacent to the work areas.

2.7 Engineering Controls

In addition to the safety equipment, respiratory protection gear, and administrative procedures described in this proposal, various pieces of equipment along with engineering practices will be used during this project to minimize potential hazards posed by chemical and physical dangers at the site. The primary engineering controls described in this section are the cylinder management device, overpack systems, cylinder grappler, glovebox, and chemical scrubbers.

2.7.1 Cylinder Management Devices (CMD)

Due to the potential for encountering cylinders with inoperable valves as well as handling those which may be unsafe to manage through manual techniques, one or more cylinder management devices (CMDs) may be deployed as one of the primary engineering controls on this project. The basic philosophy behind using the CMD is to isolate hazards associated with accessing and processing potentially dangerous cylinders from both the environment and personnel.

All of the CMDs permits the cylinder sidewall to be breached using a drill while the cylinder itself is fully contained within an enclosed pressure vessel. The advantages of using this type of system is that it affords a full level of containment between the target cylinder and the operator as well as the environment. The cylinder may be safely opened within a secure containment with virtually no risk of the contents escaping from the system.

IES maintains CMD systems ranging from those sized to handle small lecture bottles (2' x 12") to large, tractor-trailer mounted units that can handle full-size ammonia cylinders (15" x 50"). The smaller units are typically operated under manual control while the larger units are operated using a computer-control system, typically housed in a separate operations control room. It is expected that a large trailer-mounted unit, the CMD III, will be used on this project and mobilized from Atlanta to the project site. The smaller Valkyr Mark III may also be brought to the site for use in the event that smaller lecture bottle cylinders are recovered.

2.7.2 Overpacks

IES proposes to use at least two, and possibly more gas cylinder overpacks on this project. A cylinder overpack is basically a high-pressure containment vessel designed to hold a target gas cylinder inside (see figure ??). During cylinder excavation and extraction operations, an overpack will be used to hold cylinders that are recovered from the anomaly excavations during their movement to the staging and storage area. In accordance with CH2M Hill policies, the target cylinders will remain in the overpack until they can be sampled and processed. Two styles of overpack are proposed for this project; a high-pressure unit for use with cylinders with pressure designations above

480 psi and a low-pressure unit for use with liquefied gas cylinders that are deteriorated or present a high leakage potential.

Each overpack has a quick-closure hatch and is constructed of carbon steel to ASME standards. Both styles are DOT-exempt which allows them to be used for transporting damaged, leaking, or deteriorated cylinders over public highways in the event a cylinder needs to be moved from the site to an off-site processing location.

2.7.3 Cylinder Grappler

The cylinder grappler is a pincer-like clamp designed to be operated remotely from the cab of a small trackhoe. It may be used to grasp and collect hard to reach cylinders or containers in deteriorated condition. Hydraulic actuators control the grappler functions of opening, closing, and rotating. The unit is configured to allow cylinders to be grasped in either the horizontal or vertical position and held securely while being moved. Thick rubber pads can be affixed to the grappler's inside gripping surfaces to cushion the unit's hold on its target which is particularly useful when handling deteriorated cylinders.

Whether or not the grappler is used will be a decision made by the personnel performing the cylinder recovery operation because while the grappler is extremely useful for handling and moving cylinders, particularly inside excavations, it cannot be relied upon exclusively for all handling operations. It is often safer for experienced personnel to manually inspect, and in some cases, maneuver cylinders into a position where they may be more safely removed from the excavation using a grappler or sling. A good example of this situation is where there are buried stacks of cylinders which cannot be safely moved without the high potential for damaging nearby cylinders or potentially impacting exposed cylinder valves. In these situations, it is more advantageous to excavate around and maneuver the cylinders by hand into a safe position where the grappler or sling can then be used to extricate the cylinder from the excavation.

2.7.4 Glovebox

A medium-sized glove box will be used at the site to contain smaller target cylinders during sampling or processing where there is an apparent risk of leakage during this activity. The glove box is equipped with a air-lock pass-through opening on one end that allows operators to place a cylinder inside the main portion of the box without introducing appreciable amounts of outside air. The interior of the glovebox may be fully purged with inert gas to provide a non-reactive atmosphere during cylinder handling operations. The unit is also configured with openings that allow gases inside the box to be directed through a gas scrubber in the event that any undesireable gases are released inside.

The IES glovebox is mounted on a mobile frame and can be placed on any level surface. A pair of gloveports on the front are sealed to the large pane of safety glass

that allows the opperator unobstructive visual access to the glovebox interior. Various connections on the unit's back panel allow purge gas or reagent to be piped directly into the box for use by operators during cylinder manipulation.

The glovebox is typically used in situations when the integrity of a smaller target cylinder is in question or the contents of the cylinder are thought to be air-reactive. In these cases, the glovebox affords operators the option of sampling or processing the target cylinder in an atmosphere-controlled environment that provides a high level of protection and isolation for the cylinder operator.

2.7.5 Chemical Scrubbers

Removal and neutralization of various gases and vapors from both the sampling manifold, CMDs, or overpack will be accomplished using a 2 or 3-stage system composed of a reactor tank and high-vacuum venturi scrubber coupled in series with a dry scrubber. Fugitive emissions and control of low concentration gases will be managed using a high-flow dry scrubber system.

The high-vacuum scrubber and chemical reactor system are used for direct chemical reactions and for removal of high-concentration vapor from process systems. A reactor tank and venturi scrubber within this system uses a solution selected based on the intended target chemical but typically composed of sodium or potassium hydroxide as the primary reactant.

The venturi scrubber is used provide the motive force to move target gases through the scrubber system while the dry scrubber module "polishes" exhaust gas by removing trace residual amounts of target gas exiting the venturi scrubber sump. Typical layout for the 3-stage scrubber system is shown in Figure 4.

The reactor tank consists of a 110-gallon stainless steel vessel equipped with gas inlets, outlets, a liquid introduction dip tube, and drain tube. Gas enters the tank through the dip tube and bubbles up through reagent, undergoing neutralization in the process. A vacuum is drawn on the tank headspace via the high-vacuum scrubber to facilitate gas flow into the tank even when the CMD is drawn to sub-atmospheric levels.

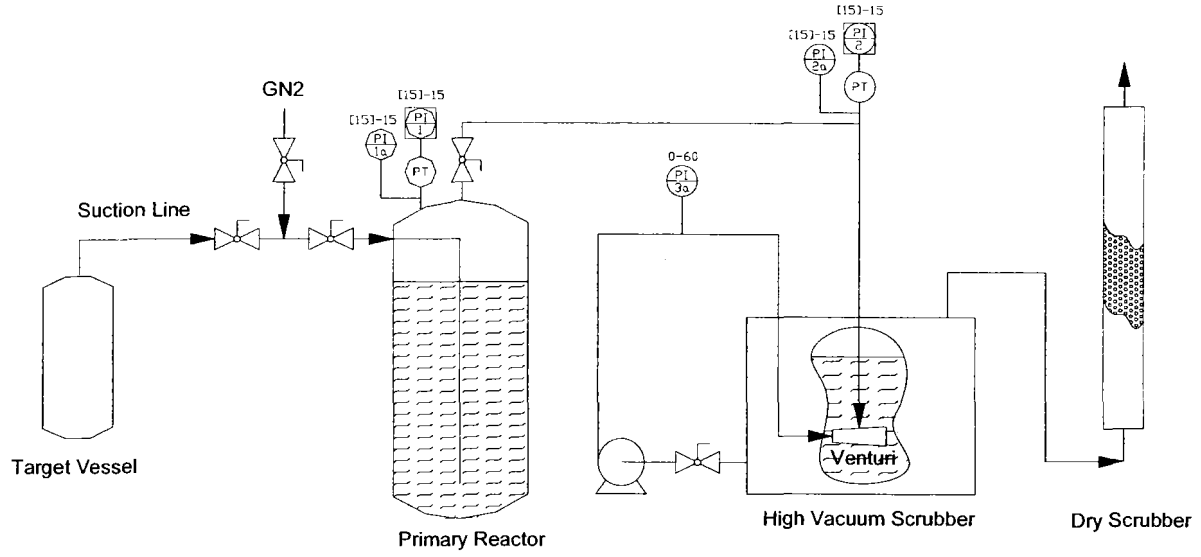


Figure 4
Three-Stage Scrubber Configuration

The high-vacuum scrubber consists of an eighty-gallon reagent tank connected to a magnetic drive centrifugal recirculating pump. The pump directs active reagent through a pair of venturi throat eductors and back into the tank bottom. Vacuum formed in the venturi is directed through a ½ " Teflon-lined/stainless steel line, which is connected to a gas control manifold. At full vacuum, the system can induce and maintain a vacuum of -26"Hg on a target container.

The scrubber system's final stage is a vertical column packed with a dry media engineered to oxidize or adsorb low concentrations of gases exiting the venturi scrubber. All exhaust gases from the low-flow scrubber is directed into the dry scrubber which consists of a six-inch diameter stainless steel column filled with granular activated alumina impregnated with potassium permanganate. Target gas enters through the column bottom and exits at the top after passing through a four-foot thick bed of dry media. Upon contact with the media, target gas reacts with the selected media and is removed from the exiting gas stream. Exhaust from the dry scrubber leaves the system and enters the open atmosphere.

The high flow scrubber used on this project consists of a regenerative blower connected in series with two drums which hold solid filtration media. A variety of filtration media can be used to react with and remove a variety of contaminants from the influent gas stream. Gas is directed into the scrubber through a flexible intake hose which enables personnel to place the intake at a contaminant source or use it to "vacuum" a particular area. The intake hose is approximately four inches in diameter and can be assembled in lengths up to forty feet long. This scrubber weighs approximately 400 pounds and has a four-foot by two-foot footprint (see Figure 5).

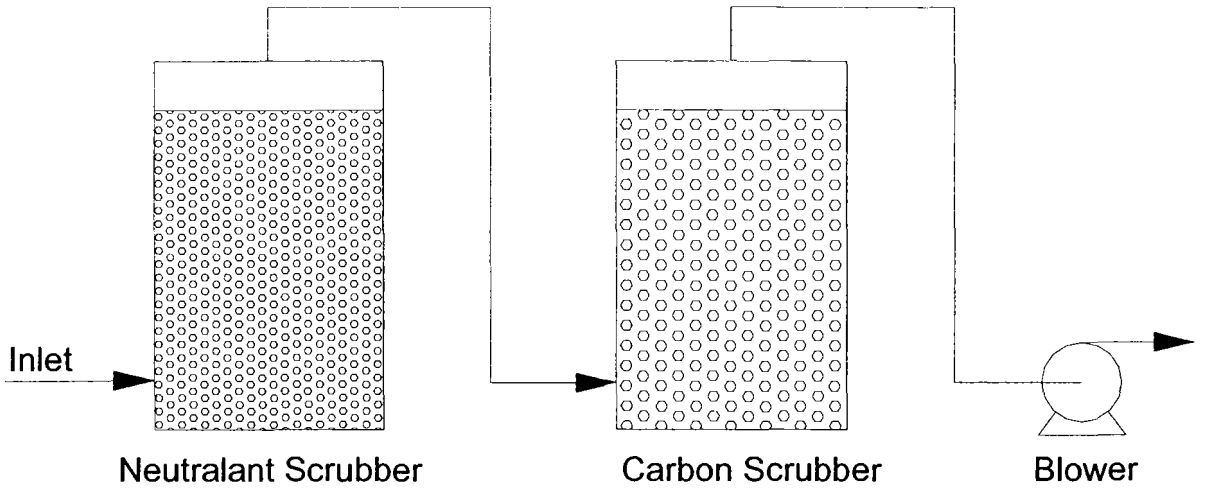


Figure 5
High-Flow Emergency Scrubber Configuration

The solid media scrubber system is designed to capture and neutralize dilute concentrations of gas resulting from a small leak, piping disconnection, or similar situation. It is designed to be portable and is equipped with a hose that can be lengthened to accommodate use over a large area. Flow rates through the system are approximately 150-160 scfm.

The high-flow solid media scrubber consists of two or more 55-gallon drums containing a variety of media including pelletized alumina oxide, activated carbon, and potassium permanganate, and other molecular sieve materials through which target gas is drawn. The media drums are arranged in series. A regenerative blower on the exhaust port of the last drum in series induces a negative pressure in the drums and draws target air through a large-diameter intake hose. The blower exhausts to the atmosphere as shown in Figure 5. Target gas vapors are entrained in the air flow created by the regenerative blower and contact the media inside each drum where it is either adsorbed into the media or converted to a nontoxic compound.

Incoming gases enter each drum at the bottom and are distributed through a slotted pipe embedded beneath the solid media. As the incoming gas rises through the media fill, it contacts and reacts with the fill forming relatively inert products. In the case of an inlet gas stream of fluorine contacting alumina oxide, the resultant product is aluminum fluoride (AlF3).

Process efficiency is monitored at the system exhaust using either conventional Drager tubes or with a MDA Single Point Monitor (SPM) configured to measure the target gas. Under normal conditions, no target gas is detectable at the scrubber exhaust.

2.8 General Site Safety Procedures

In addition to the procedures outlined throughout this plan, IES will follow general safety rules and procedures for the project duration. The general rules reflect good safety practices and follow military standards for construction-type work and cover such topics as:

1) Personal Precautions
2) Housekeeping
3) Fire Prevention
4) Electrical Safety
5) Hand and Power Tool Safety
6) Machinery and Mechanical Equipment Safety
7) Medical and First Aid Procedures
8) Potable Water and Sanitary Facilities

These procedures are included in this plan in Appendix D.

Appendix A

Bloodborne Pathogens Exposure Control Plan

Appendix A
Bloodborne Pathogens
Exposure Control Plan

A.1 Policy

It is the policy of the Integrated Environmental Services, Inc. (IES) to provide a safe workplace for all its employees. IES will comply with all applicable federal, state, and local regulations that address the control and management of occupational health hazards.

A.2 PURPOSE

It is the intent of this directive to establish an exposure control plan for workers, who, in the course of their work, may be exposed to pathogenic agents. While IES strives to maintain a safe working environment at all times, given the nature of the work, accidents may happen. To mitigate the effects of an accident, some IES employees are trained in the administration of first aid and the performance of CPR. In the course of performing such services, it is possible for a worker to become infected with a blood borne pathogen. It is the intent of this program to prevent the transmission of such pathogens, and in particular, the human immunodeficiency virus (HIV) and hepatitis B virus (HBV).

A.3 SCOPE AND APPLICABILITY

The requirements and responsibilities set forth in this directive apply to all workers who have been certified by the Red Cross to perform First Aid and CPR. Safe practices, control measures, and procedures are included in the IES Company Exposure Control Manual.

A.4 REFERENCES

a. OSHA standard on "Bloodborne Pathogens" (29 CFR 1910.1030)

b. U.S. Department of Health and Human Services/Centers for Disease Control publication "Prevention of Transmission of Human Immunodeficiency Virus and Hepatitis B Virus" (February 1989)

c. U.S. Department of Health and Human Services/Centers for Disease Control publication "Guidelines for Protecting the Safety and Health of Health Care Workers" (September 1989)

A.5 RESPONSIBILITIES

The Site Safety and Health Technician (SSHT) has the following responsibilities:

1. Assure that affected employees are adequately trained and equipped to conduct their job properly.

2. Ensure that proper PPE and engineering controls are in supply and readily accessible.

3. Ensure that employees shall comply with the provisions of the IES Exposure Control Plan.

4. Sub-contractors shall incorporate the provisions of the IES Exposure Control Plan into their approved health and safety plans where applicable.

A.6 REVISIONS OR RESCISSIONS

This directive will be revised and updated at least annually or more often if it is necessary to change procedures or standards.

Appendix B

Bloodborne Pathogen Exposure Control Manual

November 20, 1998

Prepared by
Integrated Environmental Services, Inc.

B.1 Purpose

It is the intent of this manual to establish requirements and safe work procedures for workers, who in the course of performing tasks may be called upon to administer First Aid and CPR and may be exposed to blood or other potentially infectious materials. In particular, it is the intent to prevent the transmission of the human immunodeficiency virus (HIV), hepatitis B virus (HBV), and other blood borne diseases.

B.2 Scope

The requirements set forth in this chapter apply to all workers certified to respond to a medical emergency at IES which involves exposure to blood or other potentially infectious materials. Employees affected include, those with American Red Cross certificates for First Aid and CPR.

B.3 Authority

Occupational Safety and Health Act (1970)
OSHA Hazard Communication Standard (29 CFR 1910.1200)
OSHA Blood borne Pathogen Standard (29 CFR 1910.1030)

B.4 Definitions

"Blood" means human blood, human blood components and products made from human blood.

"Blood borne Pathogens" means pathogenic microorganisms that are present in human blood and can cause disease in humans. These pathogens include hepatitis B virus (HBV) and human immunodeficiency virus (HIV).

"Contaminated" means the presence, or the reasonably anticipated presence of blood or other potentially infectious materials on an item or surface.

"Exposure Incident" means a specific eye, mouth, other mucous membrane, non-intact skin, or parenteral contact with blood or other potentially infectious materials that result from the performance of an employee's duties.

"Infectious Waste" means blood and blood products, contaminated sharps, pathological waste and microbiological wastes.

"Occupational Exposure" means reasonably anticipated skin, eye, mucous membrane or parenteral contact with blood or other potentially infectious materials that may result from the performance of an employee's duties.

"Other Potentially Infectious Materials" means:

1. Semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, pericardial fluid, peritoneal fluid, amniotic fluid, saliva in dental procedures, and any body fluid that is visibly contaminated with blood.

2. Any unfixed tissue or organ (other than dead skin) from a human (living or dead).

3. HIV- or HBV-containing cell or tissue cultures, organ cultures, and culture medium; and blood, organs or other tissues from experimental animals infected with HIV or HBV.

"Parenteral" means piercing mucous membranes or the skin barrier through such events as needle sticks, human bites, cuts, and abrasions.

"Personal Protective Equipment (PPE)" is specialized clothing or equipment worn by an employee for protection against a hazard.

"Source Individual" means any individual, living or dead, whose blood or other potentially infectious materials may be a source of occupational exposure to the employee.

"Universal Precautions" is a method of infection control in which all human blood and certain human body fluids are treated as if known to be infectious for HIV, HBV, and other blood borne pathogens.

B.5 Hazard Determination

It has been determined by IES that all employees certified to perform First Aid and CPR have occupational exposure to blood or other potentially infectious materials as defined by the Blood borne Pathogens standard.

It has also been determined by IES that no other job classifications have occupation exposure to blood or other potentially infectious materials as defined under the provisions of the OSHA Blood borne Pathogens standard.

B.6 General Requirements

General Requirements of the OSHA "Blood borne Pathogens" standard (29 CFR 1910.1030) are as follows:

The "Universal Precautions" guidelines established by the Center for Disease Control (CDC) and/or the Occupational Safety and Health Administration (OSHA), will be observed in order to prevent contact with blood and other potentially infectious materials, unless they interfere with the proper delivery of health care or would create significant risk to the personal safety of the worker.

Records will be maintained in IES' corporate office.

Employees shall wash hands immediately after removal of gloves or other Personal Protective Equipment (PPE), and after hand contact with blood or other potentially infectious material.

All PPE shall be removed prior to leaving the work area and placed in appropriate containers for storage, decontamination or disposal.

Eating, drinking, smoking, applying cosmetics, or handling contact lenses are prohibited in the subject work areas where there is a potential for occupational exposure.

All procedures involving blood or other potentially infectious materials shall be performed in such a manner as to minimize splashing, spraying, and aerosolization of these solutions.

B.7 Personal Protective Equipment (PPE)

Where the potential for an occupational exposure exists, appropriate PPE shall be provided at no cost to the employee and kept readily accessible in the appropriate sizes. Hypoallergenic gloves, glove liners, powderless gloves, or other similar alternatives shall be readily accessible to those employees who are allergic to the gloves normally provided. Appropriate PPE must be used wherever the possibility of exposure to blood or other infectious materials exists.

Personal Protective Equipment may be obtained in the following locations:

1) Latex gloves are available in the first aid kit which is located in the command trailer.

2) Safety glasses are available in the first aid kit which is located in the command trailer.

The following general guidelines will be practiced during the use of PPE:

a. Impervious gloves shall be worn when the employee has the potential for the hands to have direct skin contact with blood, other potentially infectious materials, mucous membranes, or non-intact skin; when performing vascular access procedures, and when handling items or surfaces soiled with blood or other potentially infectious materials.

b. All contaminated items will be placed in a plastic bag and disposed. Nothing will be retained for reuse.

c. Eye protection whenever splashes, spray, splatter of blood or other potentially infectious materials may be generated and there is a potential for eye, nose, or mouth contamination.

B.8 Housekeeping

After an emergency has occurred and the victim removed, the work area shall be decontaminated with an appropriate disinfectant

All bins, pails, cans and similar receptacles which have a reasonable likelihood of becoming contaminated with blood or other potentially infectious materials shall be inspected and decontaminated on a regularly scheduled basis, and immediately (or as soon as feasible) upon visible contamination.

Equipment which may be contaminated shall be checked prior to servicing or shipping and shall be decontaminated as necessary.

Broken glassware which may be contaminated shall not be picked up directly with the hands. It shall be picked up using mechanical means such as a brush and dust pan, tongs, or forceps

B.9 Contaminated Waste Disposal

PPE and clothing that is contaminated with blood or other potentially infectious material during the course of administering First Aid or CPR shall be removed and placed in a plastic bag and then disposed. Protective gloves shall be worn during handling of these materials.

B.10 Post Exposure Follow-up

IES will cover the cost of post exposure evaluation and follow-up of job related incidents where there has been a specific eye, mouth, other mucous membrane, non- intact skin, or parenteral contact with blood or other potentially infectious materials. The confidential medical evaluation and follow-up includes the following elements:

a. Documentation of the:

* route(s) of exposure,
* HBV and HIV antibody status of the source individual(s), if known,
* the circumstances under which the exposure occurred, and
* any "first aid" or "prophylactic" measures that may have been used.

b. Collection of and testing of the source individual's blood to determine the presence of HIV or HBV infection, if the source individual can be identified, and permission can be obtained. Also, permission should be obtained to advise exposed employee of results. Employee shall be informed of applicable laws and regulations concerning disclosure of the identity and infectious status of the source individual.

c. Collection of blood from the exposed employee as soon as possible after the exposure incident for the determination of HBV and/or HIV antibody status.

d. Follow-up of the exposed employee including:

* antibody or antigen testing,
* counseling,
* evaluation of reported illnesses, and
* safe and effective post-exposure prophylaxis, according to standard recommendations for medical practice.

The Occupational Health program at IES is directed primarily at job related health services and preventive measures. IES will provide HBV or HIV testing for job related potential exposures. Requests for other HBV or HIV testing will be referred to outside resources.

In the event of an exposure, IES will provide a description of the affected employee's duties, documentation of the route(s) of exposure and circumstances under which exposure occurred and provide this information to the physician. For each post-exposure evaluation, the physician shall provide a written opinion within 15 working days and shall include the following information:

a. The physician's opinion for hepatitis B vaccination shall be limited to whether the vaccine is indicated, and if the employee received such vaccination.

b. A statement that the employee has been informed of the results of the medical evaluation.

c. That the employee has been told about any medical conditions resulting from exposure to blood or other potentially infectious materials which require further evaluation or treatment.

All other findings or diagnoses shall remain confidential and shall not be included in the written report.

B.11 Hazard Communication

All employees with potential occupational exposure shall participate in a training program. Training shall be provided at the time of initial assignment and at least annually thereafter. The training shall include:

a. A copy of the OSHA standard "Blood borne Pathogens" and an explanation of its contents.

b. A general explanation of the epidemiology and symptoms of blood borne diseases.

c. An explanation of the modes of transmission of blood borne pathogens.

d. A copy and explanation of the Medical Center written Exposure Control Manual.

e. An explanation of the appropriate methods for recognizing tasks and other activities that may involve exposure to blood and other potentially infectious material.

f. An explanation of the use and limitations of practices that will prevent or reduce exposure including appropriate engineering controls, work practices, and personal protective equipment.

g. Information on the types, proper use, location, removal, handling, decontamination and/or disposal of personal protective equipment.

h. An explanation of the basis for selection of personal protective equipment.

I. Information on the appropriate actions to take and persons to contact in an emergency.

j. An explanation of the procedure to follow if an exposure incident occurs, including the method of reporting the incident and the medical follow-up that will be made available.

k. Information on the post-exposure evaluation and follow-up that the employer will provide for the employee following an exposure incident.

l. An opportunity for interactive questions and answers with the person conducting the training session.

B.12 Record keeping

Should an exposure incident occur, an injury report must be filed. All records of this nature are subject to the Privacy Act of 1974.

B.12.1 Medical Records

An accurate record shall be established and maintained for each employee and shall include:

a. Name and social security number of employee.

b. Medical records relative to the employee's ability to receive vaccination or the circumstances of an exposure incident.

c. A copy of physical examination results, medical testing, and follow-up procedures.

d. The employer's copy of the physician's written opinion.

e. Medical records are to be kept confidential and not disclosed to any person within or outside the workplace except as may be required by law. These records shall be retained for the duration of employment plus 30 ears.

B.12.2 Training Records

Training records shall include:

a. Dates of training sessions.

b. Contents or summary of training sessions.

c. Names and job titles of persons conducting the training.

d. Name and job titles of all persons attending the training.

IES shall maintain these records for 3 years.

An employee's medical and training records shall be made available upon request to the employee, and anyone having written consent of the employee. Employee training records shall be provided to employees and employee representatives upon request.

Appendix C

IES Substance Abuse Policy

IES Substance Abuse Policy

IES is committed to providing its employees with a safe workplace and an atmosphere which allows them to protect inventory and other assets placed in their care: IES employees should not be subject to any safety threats from fellow workers. Every employee is expected to be in a suitable mental and physical condition while at work, allowing him to perform the job effectively and safely.

Whenever use or abuse of any mood altering substance (such as alcohol or other drugs) interferes with a safe workplace, appropriate action must be taken. IES has no desire to intrude into its employees' personal lives. However, both on-the-job and off-the-job involvement with any mood altering substances can have an impact on our workplace and on IES' ability to achieve its objectives of safety and security. Therefore, each employee is expected to report to the workplace with no mood altering substances in his body. While each employee may make his own lifestyle choices, IES cannot accept the risk in the workplace which substance use or abuse may create. The possession, sale, or use of mood altering substances at the workplace, or coming to work under the influence of such substances shall be a violation of safe work practices and will be subject to disciplinary action, including possible dismissal.

Appendix D

General Site Safety Procedures

General Site Safety Procedures

D.1 Personal Precautions

1) Eating, drinking, chewing gum or tobacco, smoking, or any practice that increase the probability of hand-to-mouth transfer an ingestion of material is prohibited in any area designated "contaminated".

2) Entire body must be thoroughly washed upon leaving the work area.

3) No excessive facial hair, which interferes with a satisfactory fit of a respiratory mask-to-face seal, is allowed on personnel required to wear respiratory protective equipment.

Medicine and alcohol can increase the effects from exposure to toxic chemicals. Prescribed drugs will not be taken by personnel working on the site where the potential for absorption, inhalation, or ingestion of toxic substances exists unless specifically approved by a qualified physician.

D.2 Housekeeping

The following housekeeping rules will be in effect at the work site:

1) All stairways, passageways, gangways, and access ways will be kept free of materials, supplies, and obstructions at all times.

2) Loose or light material will not be stored or left on roofs or floors that are not closed in, unless it is safely secured.

3) Tools, materials, extension cords, hoses, or debris will be located so as not to cause tripping or other hazards.

4) Tools, materials, and equipment subject to displacement or falling will be adequately secured.

5) All storage and construction sites will be kept free from the accumulation of combustible materials.

6) All spills of flammable and combustible liquids will be cleaned up immediately.

D.3 Fire Prevention

The following Fire Prevention Rules will be used.

1) Fires and open flame devices will not be left unattended.

2) Smoking is prohibited except within designated areas.

3) All sources of ignition will be prohibited within 50 feet (15.15m) of operations which constitute a fire hazard.

4) All major motorized equipment will be equipped with a fire extinguisher of a type and make approved by the National Board of Fire Underwriters.

Fire Lane Spacing

1) Fire lanes to provide access to all areas will be maintained free of obstruction.

2) Material will be piled to minimize the spread of fire internally and to permit access for fire fighting.

3) Clearance will be maintained around lights and heating units to prevent ignition of combustible materials.

D.4 Electrical Safety

The following rules will be in effect at the site regarding electrical safety:

1) All electrical wiring and equipment will be of a type listed by UL or Factor Mutual Engineering Corp. for the specific application.

2) All installations will comply with the National Electrical Safety Code (NESC), National Electrical Code (NEC), or United States Coast Guard regulations.

3) All work will be by personnel familiar with code requirements and qualified for the class of work to be performed.

4) Live parts of wiring or equipment will be guarded to protect all persons or objects from harm.

5) Electric wire passing through work areas will be covered or elevated to protect it from damage by foot traffic, vehicles, sharp corners, projections, or pinching.

6) Before work has begun the person in charge will ascertain by inquiry, direct observation, or by instruments, whether any part of an electric power circuit, exposed or concealed, is so located that the performance of the work may bring any person, tool, or machine into physical or electrical contact therewith. Whenever possible, all equipment as well as circuits to be worked on will be de-energized before work is started and personnel protected by clearance procedures and grounding.

7) When it is necessary to work on energized lines and equipment, rubber gloves and other protective equipment or hotline tools meeting the provisions of the ANSI J-6 series will be used.

8) Patched, oil soaked, worn or frayed electric cords or cables will not be used.

9) Extension cords or cables will not be fastened with staples, hung from nails, or suspended by bare wire.

10) Portable and semi-portable electrical tools and equipment will be grounded by a multi-conductor cord having an identified grounding conductor and a multi-contact polarized plug-in receptacle.

11) Semi-portable equipment, floodlights, and work lights will be grounded. The protective ground of such equipment will be maintained during moving unless supply circuits are de-energized.

12) Driven rod electrodes will have a resistance to ground not to exceed 25 ohms.

Temporary Wiring

1) Temporary wiring will be guarded, buried, or isolated by elevation to prevent accidental contact by workers or equipment.

2) Flexible cord sets will be of a type listed by the UL. Flexible cord sets used on construction sites will contain the number of conductors required for the service plus an equipment ground wire. The cords will be Type ST, STO, SJT, S, SO, SEO, W or G.

3) Portable electric lighting used in confined wet and/or hazardous locations such as drums, tanks, vessels, and grease pits will be operated at a maximum of 12 volts.

4) Ground fault circuit interrupters and equipment check is required.

D.5 Hand and Power Tools

1) All hand tools will be in good repair and used only for the purpose for which designed.

2) Tools having defects that will impair their strength or render them unsafe will be removed from service.

3) When work is being performed overhead, tools not in use will be secured or placed in holders.

4) Throwing tools or materials from one location to another, from one person to another, or dropping them to lower levels, will not be permitted.

5) Only non-sparking tools will be used in locations where sources of ignition may cause a fire or explosion.

6) Power tools will be inspected, tested, and determined to be in safe operating condition prior to use. Continued periodic inspections will be made to assure safe operating condition and proper maintenance.

7) Rotating or reciprocating portable power tools will have a constant pressure switch that will shut off the power when the tool is released by the operator. A portable power tool may have a lock-on control provided turn-off can be accomplished by a single motion of the same finger or fingers that turned it on.

8) Hydraulic fluid used in power tools will retain its operating characteristics at the most extreme temperatures to which it will be exposed.

9) Manufacturers' safe operating pressures for hydraulic hoses, valves, pipes, filters and other fitting will not be exceeded.

10) All hydraulic or pneumatic tools which are used on or around energized lines or equipment will have nonconducting hoses having adequate strength for the normal operating pressures.

11) Loose and frayed clothing, loose long hair, dangling jewelry, rings, chains, and wrist watches will not be worn while working with any power tool or machine.

12) All woodworking tools and machinery will meet applicable requirements of ANSI 01.1, Safety Code for Woodworking Machinery.

D.6 Machinery and Mechanized Equipment

1) Before any machinery or mechanized equipment is placed in use, it will be inspected and tested by a competent mechanic and certified to be in safe operating condition.

2) IES will designate a competent person to be responsible for the inspection of all machinery and equipment daily and during use to make sure it is in safe operating condition. Tests will be made at the beginning of each shift during which the equipment is to be used to determine that the brakes and operating systems are in proper working condition.

3) Preventative maintenance procedures recommended by the manufacturer will be followed.

4) Any machinery or equipment found to be unsafe will be deadlined and its use prohibited until unsafe conditions have been corrected.

5) Inspections or determinations of road conditions and structures will be made in advance to assure that clearances and load capacities are safe for the passing or placing of any machinery or equipment.

6) Machinery and mechanized equipment will be operated only by designated personnel. Equipment deficiencies observed at any time that affect their safe operation will be corrected before continuing operation.

7) Seats or equal protection will be provided for each person required to ride on equipment.

8) Getting off or on any equipment while it is in motion is prohibited.

9) Machinery or equipment requiring an operator will not be permitted to run unattended.

10) Machinery or equipment will not be operated in a manner that will endanger persons or property nor will the safe operating speeds or loads be exceeded.

11) All machinery or equipment will be shutdown and positive means taken to prevent its operation while repairs or manual lubrications are being done. Exemption: Equipment designed to be serviced while running.

12) Heavy machinery, equipment, or parts thereof which are suspended or held apart by slings, hoists, or jacks also will be substantially blocked or cribbed before personnel are permitted to work underneath or between them.

13) Bulldozer and scraper blades, end-loader buckets, dump bodies, and similar equipment will be either fully lowered or blocked when being repaired or when not in use. All controls will be in a neutral position, with the engines stopped and brakes set, unless work being performed on the machine requires otherwise.

14) All points requiring lubrication during operation will have fittings so located or guarded to be accessible without hazardous exposure.

15) When necessary, all mobile equipment and the area in which they are operated will be adequately illuminated while work is in progress.

16) Mechanized equipment will be shutdown prior to and during fueling operations. Closed systems, with automatic shut-off which will prevent spillage if connections are broken, may be used to fuel diesel powered equipment left running.

17) All towing devices used on any combinations of equipment will be structurally adequate for the weight drawn and securely mounted.

18) Persons will not be permitted to get between a towed and towing piece of equipment until the towing equipment has been stopped.

19) All equipment with windshields will be equipped with powered wipers. Vehicles that operate under conditions that cause fogging or frosting of windshields will be equipped with operable defogging or defrosting devices.

20) All equipment left unattended at night, adjacent to a highway in normal use, or adjacent to construction areas where work is in progress, will have lights or reflectors, or barricades equipped with lights or reflectors, to identify the location of the equipment.

21) Whenever the equipment is parked, the parking brake will be set. Equipment parked on inclines will have the wheels chocked or track mechanism blocked and the parking brake set.

22) Lift trucks, stackers, etc., will have the rate capacity posted on the vehicle so as to be clearly visible to the operator. When auxiliary removable counterweights are provided by the manufacturer, corresponding alternate rated capacities also will be clearly shown on the vehicle. The ratings will not be exceeded.

23) Steering or spinner knobs will not be attached to the steering wheel unless the steering mechanism prevents road reactions from causing the steering handwheel to spin. When permitted the steering knob will be mounted within the periphery of the wheel.

24) All industrial trucks in use will meet the requirements of design, construction, stability, inspection, testing, maintenance, and operation, defined in ANSI B56.1, Safety Standards for Powered Industrial Trucks.

25) The installation of live booms on material and personnel hoists is prohibited.

26) The controls of loaders, excavators, or similar equipment with folding booms or lift arms will not be operated from a ground position unless so designed.

27) Personnel will not work or pass under the buckets of booms of loaders in operation.

D.7 Medical and First Aid Procedures

1) Communication and transportation to effectively care for injured workers will be provided by CH2M Hill.

2) Where any part of the body may be exposed to toxic or corrosive materials, drenching and/or flushing facilities will be used to dilute the contaminant.

3) On site activities requiring a first aid station or an infirmary, the facilities and equipment will be determined by the proximity and quality of available medical services and will be in accordance with the recommendation of a licensed physician.

D.8 Potable Water and Sanitary Facilities

1) An adequate supply of drinking water will be supplied from sources approved by Federal, State, or local health authorities

2) Drinking water will be labeled and dispensed by means which prevent contamination between source and the consumer.

3) The common cup is prohibited. A sanitary container for the paper cups and a waste receptacle for the used cups will be provided.

4) Containers for drinking water will be clearly marked as to contents and not used for other purposes.

5) There will not be any cross-connection, open or potential, between a system furnishing potable water and a system furnishing non-potable water.

Appendix B

Submittal Register and Testing Plan and Log

Submittal Register

Contract Number: N62467-01-D-0331			CTO No.: 0043			CTO Title: Compressed Gas Cylinder Removal					Location: Pensacola, FL				Contractor: CH2M HILL Constructors, Inc.		
A	B		C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
Spec Section	Item Description		Para. Number	Approving Authority	Other Reviewers	Submittal Number	Scheduled Submission Date	CCI Review Date	CCI Disposition	CCI Transmit Date	QC Admin Received Date	QC Disposition	QC Admin Transmit Date	Contracting Officer Received	Contracting Officer Disposition	Contracting Officer Return	Remarks
	SD-07	**Schedules**															
		Project Schedule															
	SD-09	**Reports**															
		Project Completion Report															
		Environmental Conditions Report															
		Field Laboratory Reports															
	SD-13	**Certificates**															
		Analytical Laboratory Certification															
		Disposal Facility Permit (if req'd)															
		Transporter Permit (if req'd)															
	SD-18	**Records**															
		As-built Drawing															
		Cylinder Log															
		List of Contractor Personnel															
		Contractor Production Reports															
		Contractor QC Reports															
		Transportation and Disposal Log															
		Testing Plan and Log															
		Monthly Summary Report of Field Tests															
		Weight tickets (import fill, disposal, etc.)															

Testing Plan and Log

CH2M HILL Constructors, Inc.

Contract Number: N62467-01-D-0331		CTO No.: 0043		CTO Title: Compressed Gas Cylinder Removal				Location: Pensacola, FL		
A	B	C	D	E	F	G	H	I	J	K
Spec Section and Paragraph	Test Required	Proposed Lab	Sampled By	Tested By	Test Location	Frequency	Date Test Made	Test Results	Date Results Forwarded	Remarks

Appendix C

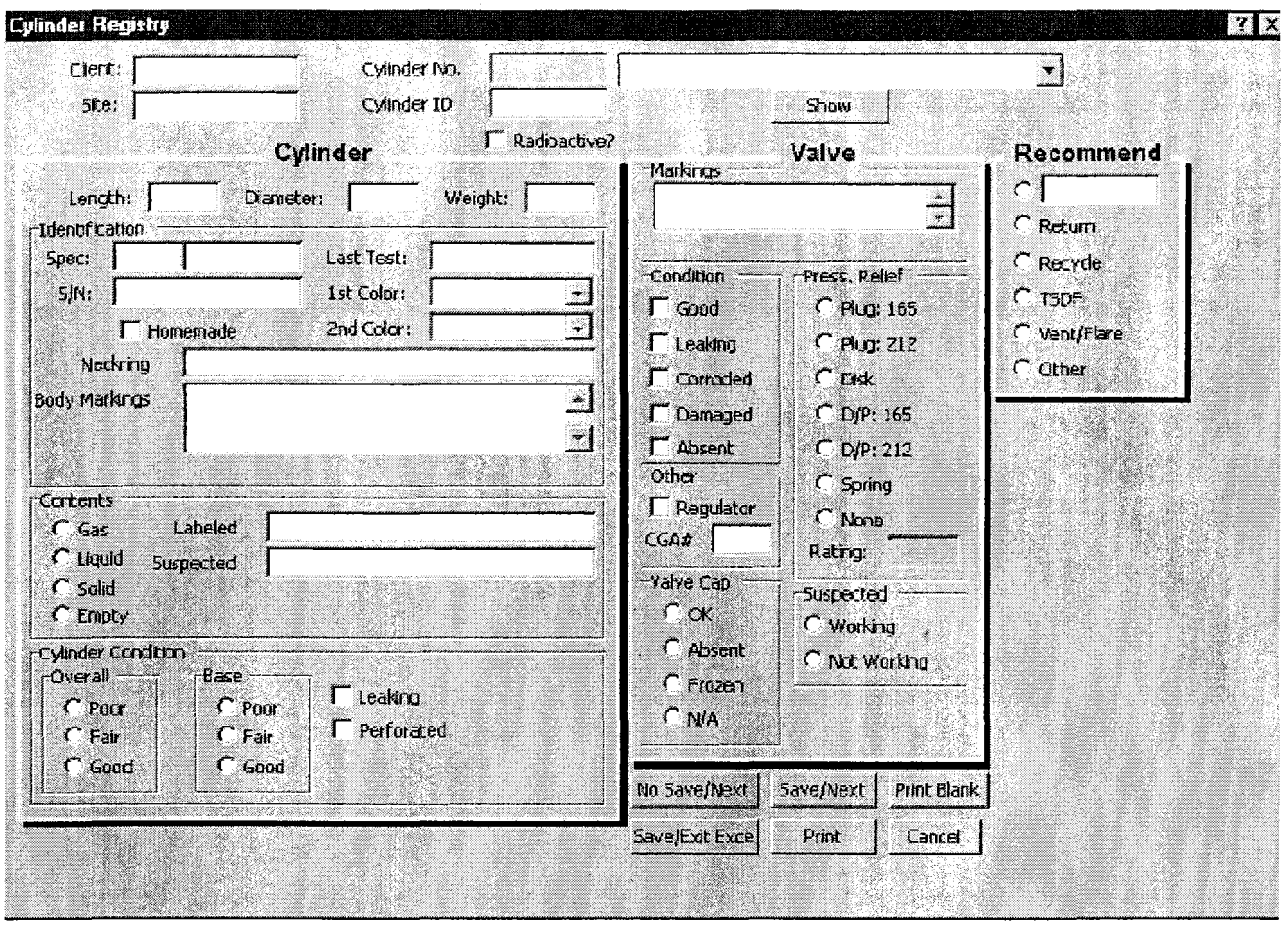
Transportation and Disposal Log

Transportation and Disposal Log

CTO No	Project No	Project Name	Site Description	Container Type	Container Design	Waste Profile Sample No	Contractor	Transporter	Date Transported	Transporter EPA ID	Load ID	Disposal Facility	Disp Fac EPA ID	Media	Waste Type (Haz, Nonhaz, TSCA)	Waste Code/ Haz Waste No	Disposal Date	Manifest Number	Disposal Treatment Method (Enter disposal quantity under appropriate method)					Certif of Disp/ Destruc Date	Comments/Notes
																			Incineration	Recycle	Landfill	Other	Unit		

Appendix D

Cylinder Inventory Form



Cylinder Inventory Form

Appendix E

Equipment Specifications

- Hazardous Gas Leak Detector
- Scrubber System

Matheson® SAFETY

TECHNICAL BULLETIN #218D Issue 1

Model 8057
Hazardous Gas Leak Detector

FEATURES

- Small portable unit weighs only 14 oz.
- Detects small gas leaks in the laboratory, plant, production or process area at low ppm levels.
- Audible alarm alerts wearer of potentially dangerous gas leaks.
- Easily worn on the belt — always handy.
- Detachable probe allows unit to be used as point source leak detector for tubing fittings, valves, containers, etc.
- Rechargeable Ni Cad batteries (supplied) give long operating life.

The Model 8057 Hazardous Gas Leak Detector effectively monitors laboratory, plant and process area, instrumentation, tubing, fittings, storage containers, and production equipment for potentially dangerous leaks of gases and vapors such as acetone, arsine, phosphine, hydrogen, ethanol, hydrogen sulfide, chlorine and others. The TLV of many gases can be detected.

Slightly larger than a paging device or beeper and weighing only 14 ounces, this truly portable and personal leak detector can be conveniently worn on a belt or over the shoulder with its carrying strap. The unit samples for leaks of hazardous gases and vapors. It sounds an audible alarm and flashes an LED lamp when a potentially dangerous gas leak is detected. For noisy laboratory, plant or process environments, an earplug is provided. The entire unit is protected in a leather outer case and can be worn under lab coats, clean room garments, or protective clothing. Each Model 8057 is factory calibrated for maximum sensitivity. Rechargeable Ni Cad batteries (with charger) are standard.

This personal Hazardous Gas Leak Detector is also useful when transporting toxic gas cylinders, checking valves in cylinder storage areas, and during cylinder changeovers in laboratory, plant and production gas cabinets. It can also be used for leak checking of pipes and valves. The Model 8057 is especially useful in facilities where large, complex leak detection systems may be impractical and where workers cover wide areas in their daily functions. With the Model 8057 Hazardous Gas Leak Detector, each worker can have an important leak detection tool wherever they are.

DESCRIPTION

The Model 8057 uses a solid state gas sensor with a sintered metallic block. The new sensor design allows low concentrations of gases to be detected.

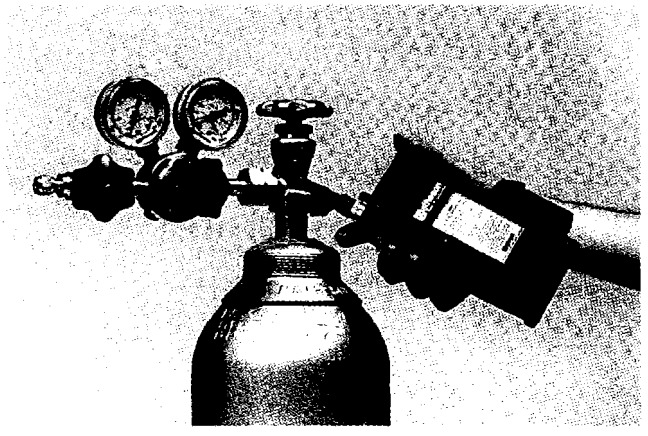
An air sample from the suspected leak-source area is drawn into the unit by the internal, low power-drain micro pump. The sample is then passed over the sensor and exhausted to the atmosphere. An intermittent tone sounds and an LED lamp flashes if a gas leak is detected. The tone frequency is proportional to the detected gas concentrations, i.e., low concentrations are signalled by a slow beep and higher gas concentrations are signalled by a faster beep. The alarm can be silenced by means of a switch on the back of the unit. In this mode, the LED continues to flash in the event of gas detection. Because of the sensor's design, and depending on the sensitivity setting and zero point, many gases and vapors can be detected with the Model 8057, making it a very flexible leak checking tool for all areas of the laboratory and plant.

SEMICONDUCTOR PROCESS APPLICATIONS

The Model 8057 functions as a personal gas leak detector for production, QC, maintenance, and engineering personnel in a wide variety of process locations and environments. Personnel now take their personal gas leak detectors with them, on site where needed.

Since personal protection is only as good as the sampling procedure used, different areas should be checked for gas leaks that could lead to potential worker exposure.

LEAK DETECTION



The Model 8057 is an excellent point leak detector for semiconductor process gases. With the accessory probe attached, it can give an early warning indication of small leaks in cylinder or piping connections, or other gas handling hardware before they become large, potentially dangerous leaks. A comprehensive floor-to-ceiling scan procedure should be used for maximum effectiveness in leak detection.

GAS CABINET CYLINDER CHANGEOVER

The Model 8057 has applications in leak detection of valves, fittings, purge assemblies and other hardware during cylinder changes in gas cabinets.

CYLINDER STORAGE AREAS

A good practice is to screen process gas cylinders (both on receipt and return shipments) for leakage around cylinder valves. The Model 8057 with probe simplifies this process because of its small size and weight. It can detect as little as 0.13 ppm of phosphine and 0.3 ppm of arsine.

Because gas leaks can stratify, a comprehensive floor-to-ceiling scan procedure should be used to detect accumulations of potentially hazardous gas leaks in cylinder storage areas.

GASES DETECTED

Arsine	Diborane	Hydrogen
Phosphine	Silane	

Other gases depending upon sensitivity setting.

LABORATORY AND PLANT APPLICATIONS

LEAK DETECTION

The Model 8057 is ideal as a point source leak detector for many laboratory or production operations where potentially dangerous levels of toxic or hazardous gases can be generated. With the accessory probe attached, it can give an early warning of small leaks in cylinder or piping/tubing connections, storage vessels, or other gas handling hardware before they become large, potentially dangerous leaks. A comprehensive floor-to-ceiling scan procedure should be used, especially in large plant processes for maximum effectiveness in leak detection.

LABORATORY INSTRUMENTATION

Laboratory instruments that use cylinder gases for their operation (such as GC's, AA's GC/MS systems, ICP systems, electron microscopes, and others) should be periodically checked for gas leaks. Leak detection is especially needed when cylinders and filters are changed. The Model 8057 makes this job fast and easy without the need for messy soap solutions that could contaminate some high-purity systems.

GAS CABINET CYLINDER CHANGEOVER

The Model 8057 is also ideal for leak checking valves, fittings, purge assemblies and other hardware during cylinder changeover in gas cabinets.

CYLINDER STORAGE AREAS/ CYLINDER LEAK CHECKS

A good practice is to screen gas cylinders (for the laboratory or plant) both on receipt and on return shipments for leakage around cylinder valves. The Model 8057 with probe attachment simplifies this process because of its small size and weight. A large number of cylinders can be leak checked in a very short time.

Because gas leaks can stratify, a comprehensive floor-to-ceiling scan procedure should be used to detect accumulations of potentially hazardous gas leaks. This is especially important in large plants or laboratory storage areas.

SPECIFICATIONS

Model	8057 Hazardous Gas Leak Detector
Detection Principle	Solid state sensor with low power drain; automatic and continuous sampling of leak areas.
Gas Detected	See accompanying Gas Listings
Detection Time	10-20 seconds depending on gas and sensitivity setting.
Detection Indication	Intermittent LED and buzzer
Power Source	Size "AA" rechargeable Ni Cad batteries (4) 1.5V, automatic voltage drop indication; continuous operating time approximately 6 hours with full charge (charger included).
Operating Temperature	0° to 40°C.
Size (without probe)	2.7" W x 6.1" H x 1.2" D 68mm W x 155mm H x 32mm D
Weight	14 oz. (397 g)
Accessories Included	Leather carrying case, filter housing with filter element, spare filters, check gas vial, ear phone with plug, sampling probe, batteries (4) with charger.
Applicable Batteries	Manganese (SUM-3) Alkaline (LR-6) Ni Cad (KR-AA or GC-1)
Warranty	One year from date of purchase.
Replacement Components	Model 8057-01 Pump Assembly 8057-02 Sensor Assembly 8057-03 Frame Assembly 8057-04 Replacement Filter (pkg. 100) 8057-05 Circuit Board

General Purpose Leak Detection — Detectable Concentrations

Acetone	10 cc/min.
Ammonia	5 ppm
Benzene	10 cc/min
Carbon Monoxide	1 ppm
Chlorine	7 ppm
Dichloroethane	10 cc/min.
Ethanol	10 cc/min.
Ethylene	1 cc/min.
Ethylene Oxide	350 ppm
Formaldehyde	10 cc/min.
Freon 12	1 cc/min.
Hexane	10 cc/min.
Hydrogen Bromide	1 ppm
Hydrogen Chloride	1 ppm
Hydrogen Sulfide	1 ppm
Isopropyl Alcohol	10 cc/min.
Methane	1 cc/min.
Methyl Alcohol	10 cc/min.
Methyl Bromide	40 ppm
Methyl Chloride	50 ppm
Methyl Ethyl Ketone	10 cc/min.
Propane	1 cc/min.
Sulfur Dioxide	1 ppm
Toluene	10 cc/min.
Trichloroethylene	10 cc/min.
Vinyl Chloride	10 ppm
Xylene	10 cc/min.

ALARM CONCENTRATIONS

	Wheel Settings				
Gas	3.5	3.0	2.5	2.0	1.5
Arsine	0*	0.3 ppm	0.8 ppm	>1 ppm	>>1 ppm
Phosphine	0*	0.13 ppm	0.3 ppm	0.4 ppm	0.6 ppm
Diborane	0*	0.15 ppm	0.4 ppm	0.5 ppm	0.7 ppm
Silane	0*	0.3 ppm	0.7 ppm	>1 ppm	>>1 ppm
Hydrogen	0*	5 ppm	10 ppm	>10 ppm	>>10 ppm

Typical Calibration Model 8057

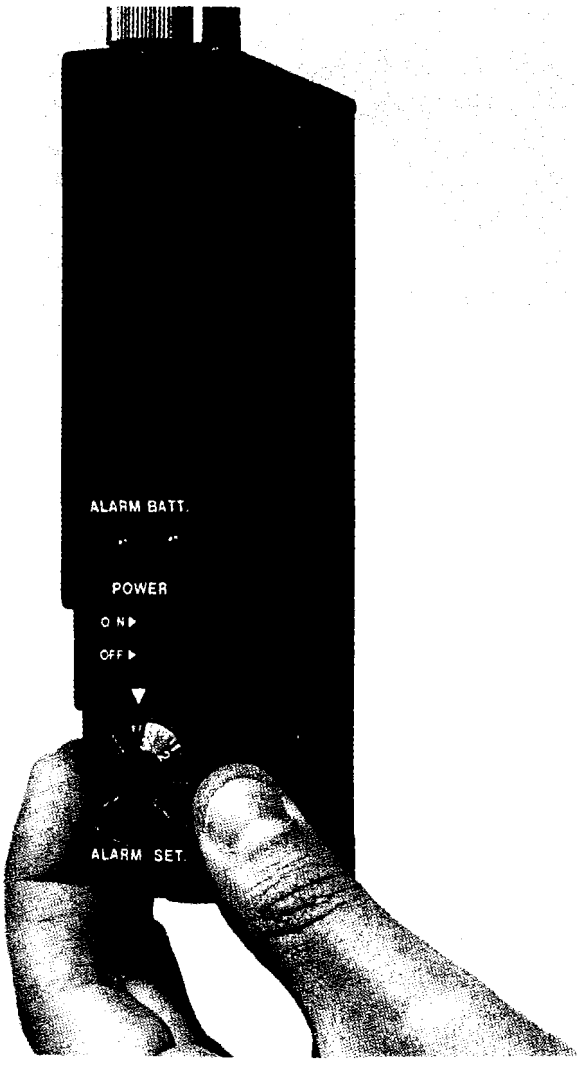
*Zeroing on air Background at Wheel Setting of 3.5 at the facility.

MODEL 8057 OPERATION

The Model 8057 Hazardous Gas Leak Detector is easy to set up and operate. To use the Model 8057, you simply:

1. With the WHEEL set to zero, turn power switch ON. An initial alarm beep will be heard indicating proper operation.
2. Allow the unit to warm up for about 30 seconds in clean air.
3. Turn the alarm set WHEEL clockwise to an alarm condition start point (factory set zero point at 3.5), then turn counterclockwise slowly, and locate the point on the alarm set WHEEL where the alarm first stops. The unit is now zeroed on the background ambient air.
4. Turn the WHEEL further counterclockwise 2-5 additional WHEEL graduations to help eliminate any additional interferences from background concentrations of gases and vapors. Consider the laboratory or plant environment where leak checking will be performed as a guide to how many additional WHEEL graduations to turn.

The Model 8057 is sensitive to many gases and vapors that may be present in a laboratory or plant environment. The unique sensor design in combination with the alarm set WHEEL allows you to minimize interferences from these ambient background gases and vapors when leak checking.



Matheson
Safety Products

INTEGRATED
ENVIRONMENTAL
SERVICES

IES Three-Stage Scrubber System
Scrubber Efficiency Information

IES designs and builds its own air scrubbers. During the cylinder processing phase of this project, IES will primarily employ a three-stage scrubbing system with supplemental coverage provided by a high-flow solid media emergency scrubber. The scrubber elements will be connected in series and will include liquid phase potassium hydroxide units followed by a solid phase alumina unit. The liquid phase will handle both chlorine and fluorine inputs. The solid phase will primarily handle fluorides but will also have a limited affinity for chlorine. The specifications for each unit are as follows:

Liquid Reactor:	Capacity:	110 gallons, uses 50-60 gallons
	Solution:	KOH or H_2SO_4 (15% -25% solutions)
	Control Efficiency:	<75%
Liquid Scrubber:	Capacity:	30 gallons, uses 15-20 gallons
	Solution:	KOH or H_2SO_4 (15% -25% solutions)
	Control Efficiency:	<99%
Dry Scrubber:	Dimensions:	6" to 8" D Column, 6'-0" H
	Media:	Al_2O_3
	Construction:	316 s.s.
	Control Efficiency:	Greater than 95%
Emergency Scrubber		
	Dimensions:	55 gallons
	Media:	Carbon
	Construction:	carbon steel
	Control Efficiency:	93% - 99%

Control efficiency is based upon field measurements conducted by IES. Target cylinders contain material in varying amounts as shown under "Input Quantity". For the purpose of computing adequacy of the selected scrubbing equipment, IES makes the following assumptions to indicate the amount of target material potentially passing through each scrubber stage. Estimated quantities passing each stage are based on conservative estimates of efficiency ranges.

Material potentially exiting the three-stage scrubber system could be further controlled using the emergency scrubber to reduce the amount of target material entering the atmosphere.

Material	Input Quantity (lbs)	1st Stage (85%)	2nd Stage (99%)	3rd Stage (95%)
Fluorine	5	0.75	0.0075	0.000375
Chlorine/Bromine Trifluoride	5	0.75	0.0075	0.000375
Dichlorosilane	1000	150	1.5	0.015
Ammonia	5	0.75	0.0075	0.000375

Appendix F

Standard Operating Procedures

- Scrubber System
- Magnetometer
- Low Pressure Penetrator and Saddle Access
- Air Knife Operation
- Cylinder Venting
- Acetylene Cylinder Venting
- Flammable Gas Flaring

Identifier: **SOP-MAGreacq-1**	Revision: **R0**	
Effective Date: **01-09-2007**		
Author: **B. Brunette**	Brian Brunette	
Reviewer: **I. Wilson**		

ARM Geophysics
(a Division of ARM Group Inc.)

Standard Operating Procedures (SOP)

for

Reacquire Methods using a hand-held magnetometer (Schonstedt GA-72Cd) for relocation of man-portable magnetometer (TM6mag,858mag) data

date

January 9th, 2007

Revision No.	Effective Date	Prepared By	Description of Revisions	Affected Pages
0	1/9/2007	B. S. Brunette	New SOP	All

TABLE OF CONTENTS

1.0 INTRODUCTION

Buried ferrous metal objects ranging from large-sized drums / tanks to small-sized metal scrap can be effectively detected from the surface using the Schonstedt GA-72Cd Magnetic Locator. The Schonstedt leverages the same basic principles as the other magnetometer (MAG) systems (TM6mag, 858mag, 856mag) in order to discriminate between background soils and ferrous objects of interest. The common principle is the utilization of two sensors to obtain a differential, or gradient, magnetic anomaly reading. For the TM6mag and 858mag, the differential reading is dependent on a 856mag base station. For the Schonstedt and similar hand-held instruments, an additional sensor is contained within the instrument itself to get the gradient reading. Schonstedt instruments are one of the most widely used surface and down-hole detection devices and are discussed in more detail in the next section.

2.0 PRINCIPLES AND EQUIPMENT

The Model GA-72Cd Magnetic Locator detects the magnetic field of ferromagnetic objects. The GA-72Cd responds to the difference in the magnetic field between two sensors which are spaced about 14 inches apart. The response is indicated by a change in the frequency of the signal emitted by the piezoelectric speaker.

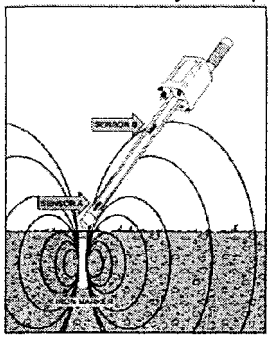


Figure 1: Detecting Magnetic Field From an Iron Bar

Figure 1 illustrates an application of the gradiometer in which it is used to detect an iron bar. As shown, the magnetic field of the iron bar is stronger at sensor A than it is at sensor B. As a result, the frequency of the signal from the piezo-electric speaker is higher than the idling frequency, 40 Hz, which exists when the field is the same at both sensors. The stronger signal also causes the analog signal to peak in either the positive or negative direction when the audio signal is at its highest frequency. The pitch of the Schonstedt's audio signal and the meter readout will increase in direct proportion to size and the proximity of ferrous material.

3.0 SETUP AND CALIBRATION

Set-up and calibration procedures are typically performed in accordance with the Schonstedt Model GA-72Cd Magnetic Locator Instruction Manual. As an overview, complete the following steps for setup: (1) Remove old batteries and supply new D cell

batteries each day; (2) Turn on the instrument and set the volume control to high; (3) Set the instrument range to the initial desired sensitivity. Calibration of the instrument range to the desired sensitivity is accomplished by changing the settings to the most sensitive range that will not detect the metal-free background soil as a false positive while still detecting a metal test item to an appreciable level on the audible range and analog readout. A clean area for calibration testing will be determined using another instrument or determined from the results from the digital data prior to conducting the calibration tests. An alternative method for calibration would be to conduct the response test while the instrument is held in the air as long as the instrument does not respond erratically to soil conditions site-wide. This completes the setup and calibration process. (See Appendix A for the full-version of the manual.)

4.0 FIELD USE CONSIDERATIONS AND GENERAL PROCEDURES

Using the instrumentation near any known sources of interference such as power-lines, fences, and magnetic geology, will increase false positives and may decrease the value of utilizing the GA-72Cd MAG system. Additionally, as with most metal detection devices, the detection depth within the vicinity of the sensors is limited to 2 to 4 feet depending on the size of the item. General field procedures will involve the use of Sub-Meter Global Positioning System (GPS) or Real-Time Kinematic Differential Global Positioning System (DGPS) to accurately relocate the reacquired anomaly position within the positional tolerances of the project scope. As general guideline, sub-Meter GPS and RTK GPS daily location checks should be within +/- 1 meter and +/- 20 cm respectively. Both operators should complete a Personnel Test to remove all metal within or on their clothing. Once the Position Check and Personnel Tests are complete, the anomaly positions will be relocated and flagged by the GPS operator and checked for peak anomaly location by the Schonstedt operator. The flag will be repositioned by the Schonstedt operator as long as it is within a few feet; if the area is cluttered, the flags will be left at the initial location to prevent movement from the current anomaly location to a new (the next) anomaly location. Once the flags have been moved to their final location, the GPS operator will return and record the new location for those flags that were moved significantly during the anomaly interrogation process. A picture collage of reacquire procedures are provided in Appendix B.

5.0 DATA AND RECORDS MANAGEMENT

Since the GA-72Cd MAG will be used primarily in audible / analog mode, data will not be digitally logged; however, audibility for calibrations will be documented in a logbook and compared against background / standard responses. Finally, the calibration tests will be compared between separate days in order to monitor changes.

6.0 REFERENCES

Schonstedt Instrument Company, "Schonstedt Model GA-72Cd Magnetic Locator Instruction Manual", April 2001. The document is provided in Appendix A.

APPENDIX A:
Schonstedt Model GA-72Cd Magnetic Locator
Instruction Manual and Guidelines

Instruction Manual

Model GA-72Cd
Magnetic Locator

Manufactured By
Schonstedt Instrument Company
4 Edmond Road
Kearneysville, WV 25430
(304) 725-1050
Fax (304) 725-1095

Preface

The Model GA-72Cd® Magnetic Locator is a product of over forty-six years experience in producing the world's finest flux-gate magnetometers and magnetic detectors for aerospace, military and civilian applications. The GA-72Cd® incorporates the knowledge obtained from manufacturing under the most rigid quality control standards. The heart of the GA-72Cd® is its patented Schonstedt HeliFlux® magnetic field sensors. These sensors, acknowledged to be the world's finest, make possible the unequalled performance of the locator.

April 2001

Table of Contents

OPERATION

Introduction

The Model GA-72Cd Magnetic Locator detects the magnetic field of ferromagnetic objects. It responds to the difference in the magnetic field between two sensors which are spaced about 14 inches apart. The GA-72Cd is unique because it provides an audio signal, and visual indications of both signal strength and polarity. Although most objects can be located using either of the indications, simultaneous use of both types will help you pinpoint a target and determine its orientation and identify magnetically detectable nonmetallic duct and cable.

Figure 1 illustrates an application of the locator in which it is used to detect an iron marker of the type used for property line identification. As shown, the magnetic field of the iron marker is stronger at sensor **A** than it is at sensor **B**. As a result, the frequency of the audio signal is higher than the idling frequency, 40 Hz, which exists when the field strength is the same at both sensors. This stronger signal also causes the digital indication to peak in either the positive or the negative direction when the audio signal is at its highest frequency.

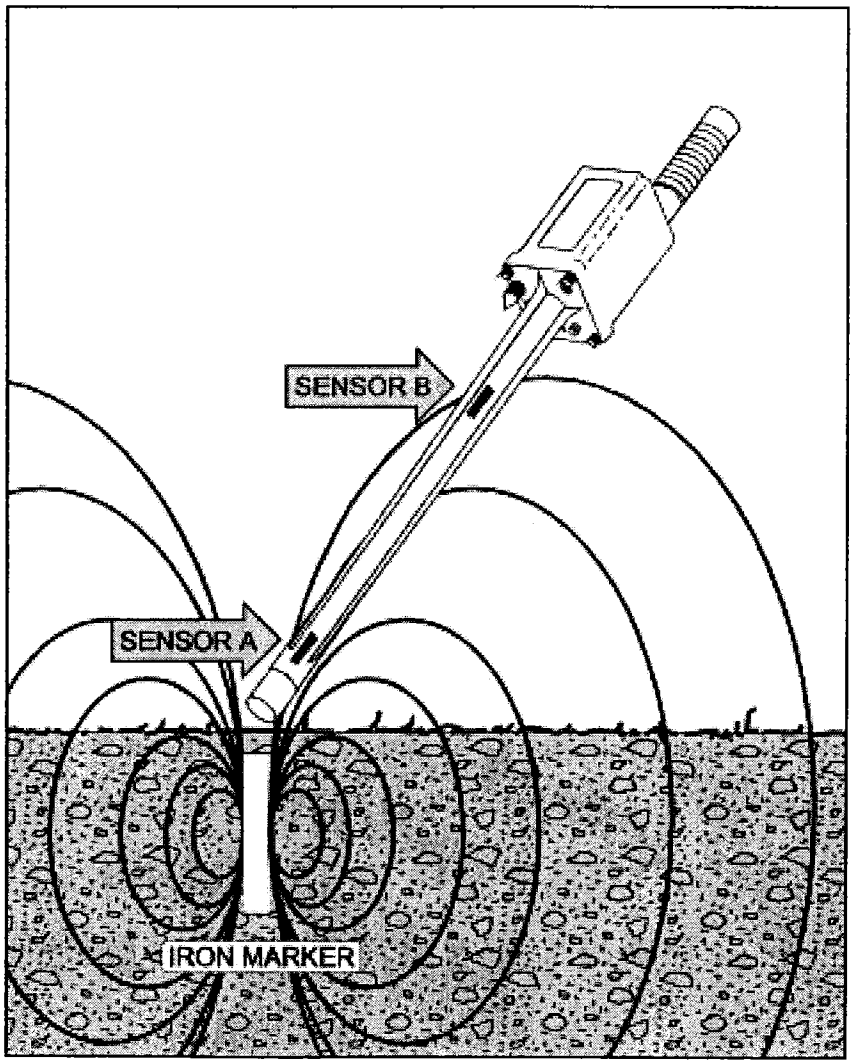


Figure 1. Detecting Magnetic Field of an Iron Marker

When shipped, the locator is set to provide an audio signal which is heard as long as the instrument is turned on. If desired, you can change this to an audio signal which is heard only when the instrument is within detection range of an object by using the internal Audio Output Switch as described on page 4 of this manual.

Turn-On, Sensitivity and Volume Settings

Turn on the GA-72Cd by rotating the On/Off-Sensitivity control knob clockwise to position 1. This sets the sensitivity to what is referred to as the Normal Range (the **L** meter indication). You can increase the sensitivity by rotating the Sensitivity control clockwise to select **M**, **H**, or **XH** settings as indicated on the meter's GAIN display. Adjust the Volume control for the desired audio output level.

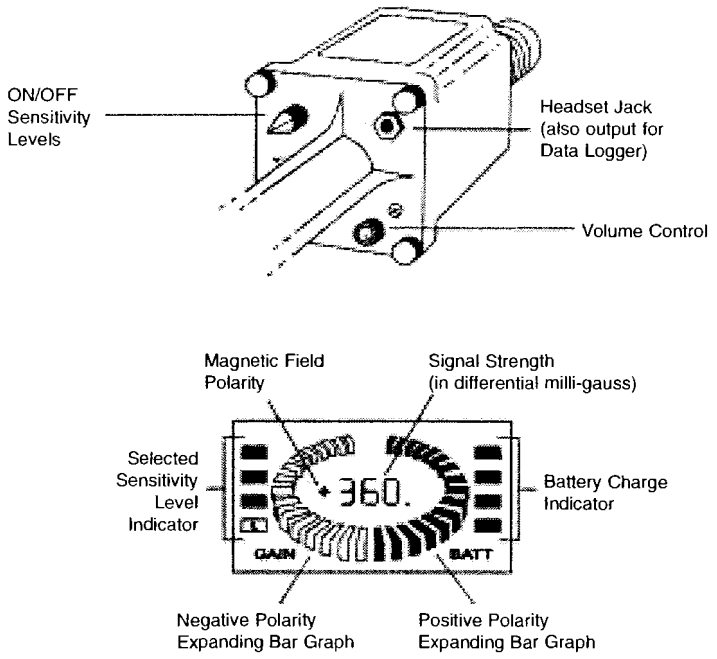


Figure 2. Control and Meter Indications

Battery Level Indication

The meter's BATT indication displays the batteries' voltage level. As shown in Figure 3, when all four segments are black the voltage level is between 100% and 25% (up to 60 hours of operation with intermittent usage). As the voltage decreases, the number of black segments decreases. Battery life varies with usage and the ambient temperature. Cold temperatures reduce battery life. Low temperatures may result in only two or three segments being black. This could be temporary and all segments will change back to black as the temperature increases.

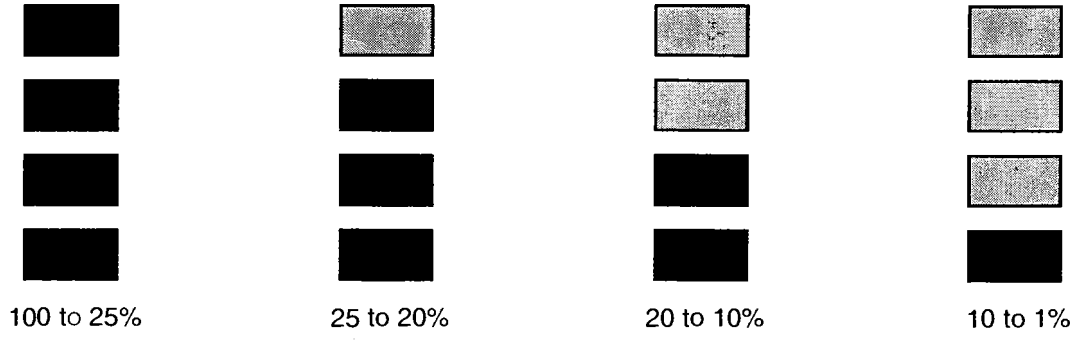


Figure 3. Battery Voltage Status Indications

Audio Output Selection

All GA-72Cds are shipped from the factory with the Audio Output Switch set to **"B"**. This provides an audio signal that is always present. If you prefer not to hear a signal until the locator is within detection range of a target, set the switch to **"A"**.

Audio Signal with Output Switch set to "A"

No audio signal is heard until the GA-72Cd comes within detection range of a ferromagnetic object. As you move the locator across the object, frequency of the signal does not change but unit **increases in volume** over the object, then decreases in volume and turns off when the locator is moved out of range.

NOTE: If you put the GA-72Cd down without turning the Sensitivity/Power switch to Off, the "power-on monitoring feature" (designed to conserve battery life) will initiate a beeping audio-alert signal after 15 seconds.

Audio Signal with Audio Output Switch set to "B"

As you move the GA-72Cd across a ferromagnetic object, the 40 Hz idling signal, which is always present, increases in frequency, peaks when the locator is directly over the object and then decreases to 40 Hz.

Regardless of which switch setting, the indication of signal strength and the polarity on the meter will always peak (positive or negative) when the locator is directly over a ferromagnetic object.

As shown, the cover must be removed to change the setting of the Audio Output Switch.

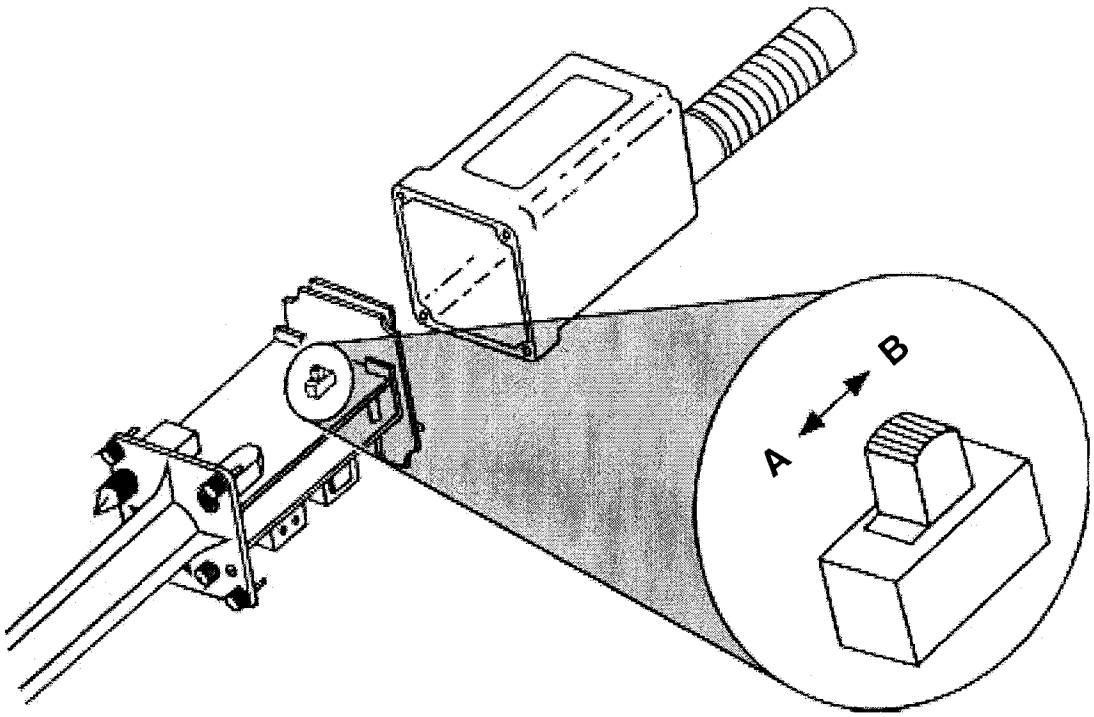


Figure 4. Location of Audio Output Switch

Search Procedure

Set the On/Off-Sensitivity control for **L** and grasp the locator as illustrated. Because the upper sensor is near the locator's handle, wristwatches may produce unwanted changes in the audio signal and in the meter indications, and should be removed. Keep the locator away from your shoes since they might contain magnetic material. To obtain maximum area coverage, sweep the locator from side to side. When the locator comes within range of an iron object, the audio signal will peak, the bar graph will expand positive or negative, and the digital readout will peak as shown in Figure 6.

Figure 5. Searching With the Locator

When the GA-72Cd is positioned directly over a vertical pipe, the audio and digital indications will peak. The expanding bar graph and digital readout may be either a positive or negative level.

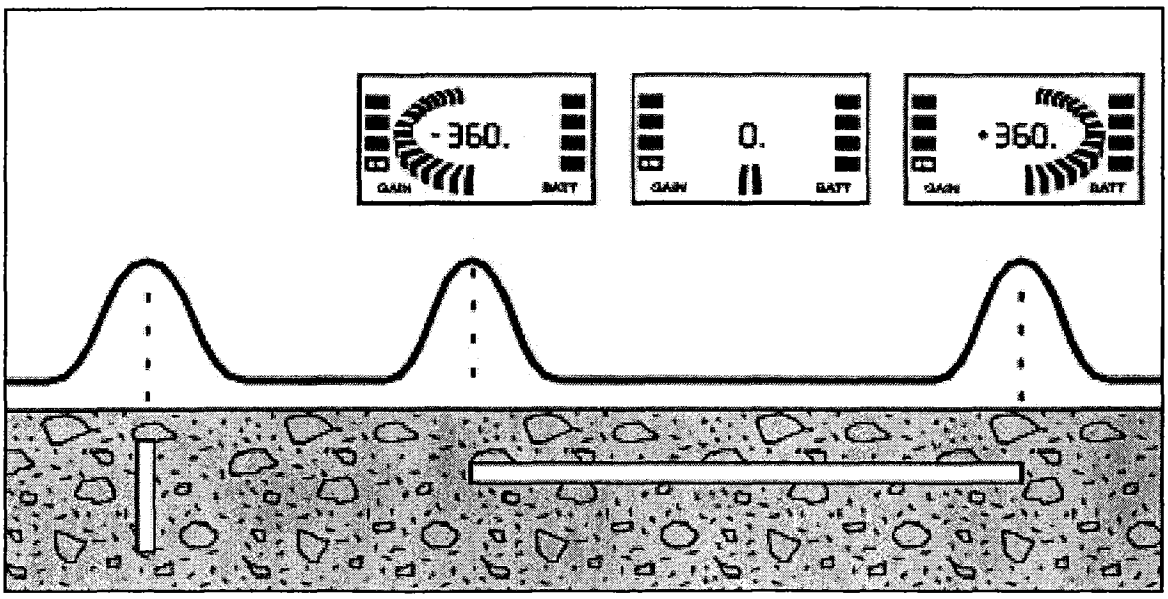


Figure 6. The Meter's Polarity Indications Help to Determine Target Orientation

The audio signal, bar graph and digital indications peak over each end of a horizontal pipe. One end is positive, the other is negative. This will help you to distinguish between two vertical pipes or one horizontal pipe. Usually two vertical pipes buried in close proximity will produce digital indications with the same polarity.

Basic Signal Patterns

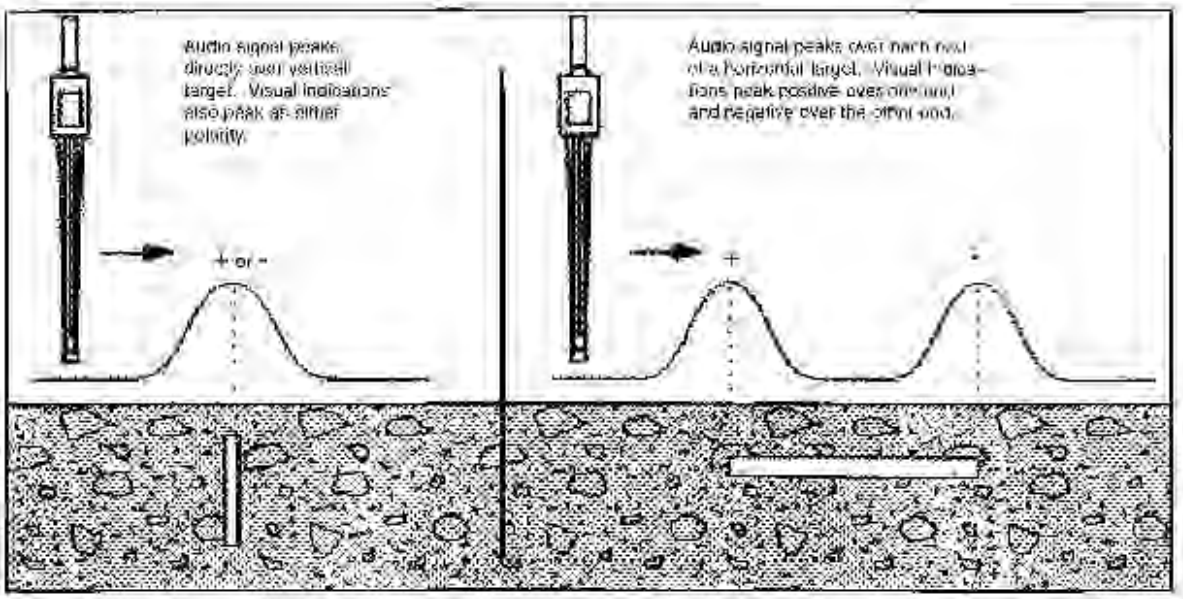


Figure 7. Signals from Vertical and Horizontal Targets

After you have detected the presence of a target, hold the locator vertically and slowly move it back and forth in an "X" pattern while observing the digital readout. The value of the number will be highest when the locator is directly over a target, and over the ends of a horizontal target. The "X" pattern is ideal for pinpointing small objects. A 1-1/4 inch PK nail buried up to 8 inches can be located so precisely with this technique that it can be uncovered using a 1/2 inch star drill.

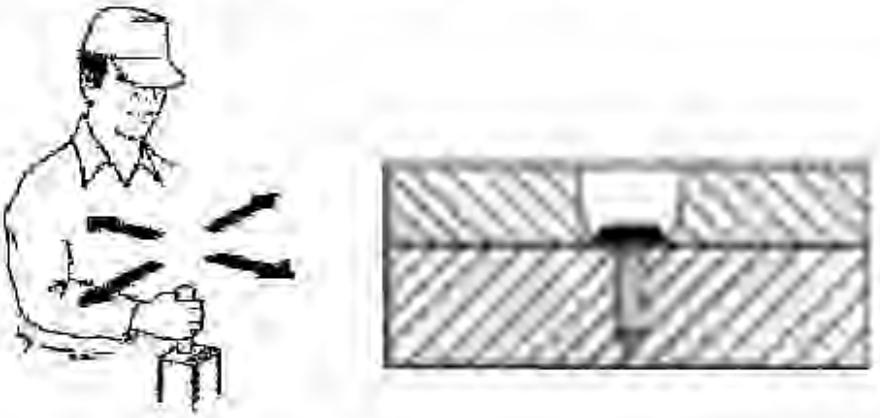


Figure 8. "X" Pattern provides Precision Locating

If you are looking for a corner marker and detect two or three signals in the same general vicinity, raise the locator several inches above the ground or reduce the sensitivity setting before you get a shovel. Any signal that disappears when the locator is held higher is probably coming from a shallow target. The signal from a rusty bolt or other small item (see Figure 9.) decreases much faster with distance than the signal from a larger target such as a 18 inch length of 3/4 rebar which can be located at depths up to 7 feet.

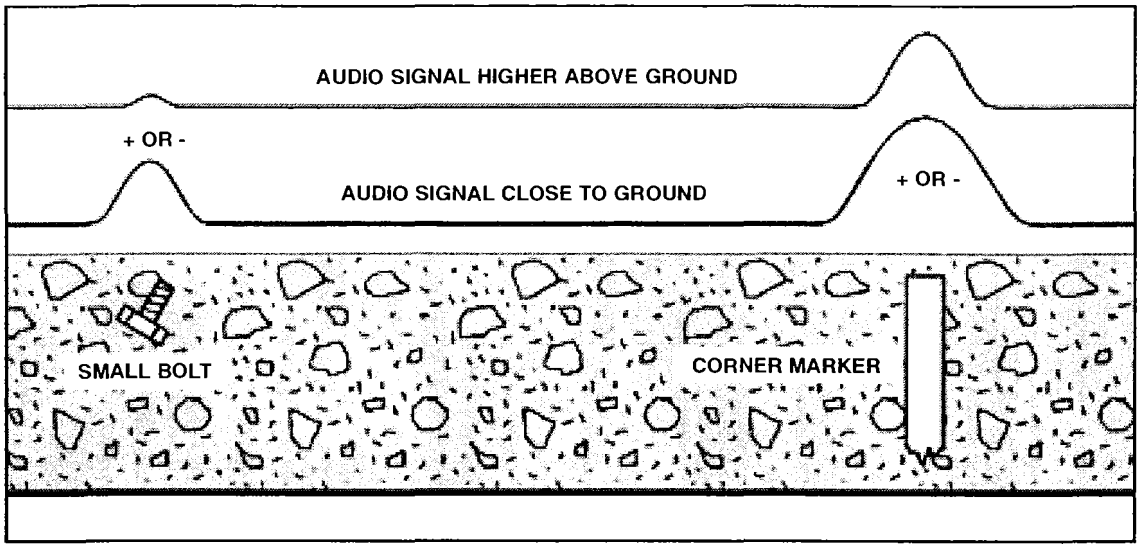


Figure 9. Raising the Locator Eliminates Unwanted Signals

Strongly Magnetized Markers

A strongly magnetized marker at or near the surface provides a weaker indication on both sides of the marker that could be mistaken for the marker.

The heavy line in Figure 10 represents the increase and decrease in the audio and digital indications as you move the locator over a marker. Between points **A** and **B** the signals increase slightly and then decrease. Just beyond **B** the signals increase rapidly, peaks directly over the marker and then decreases at point **C**. From **C** to **D** the signals increase and decrease again. So if you do not move the locator completely across the marker you might assume that the weaker indication on either side of the marker is its location.

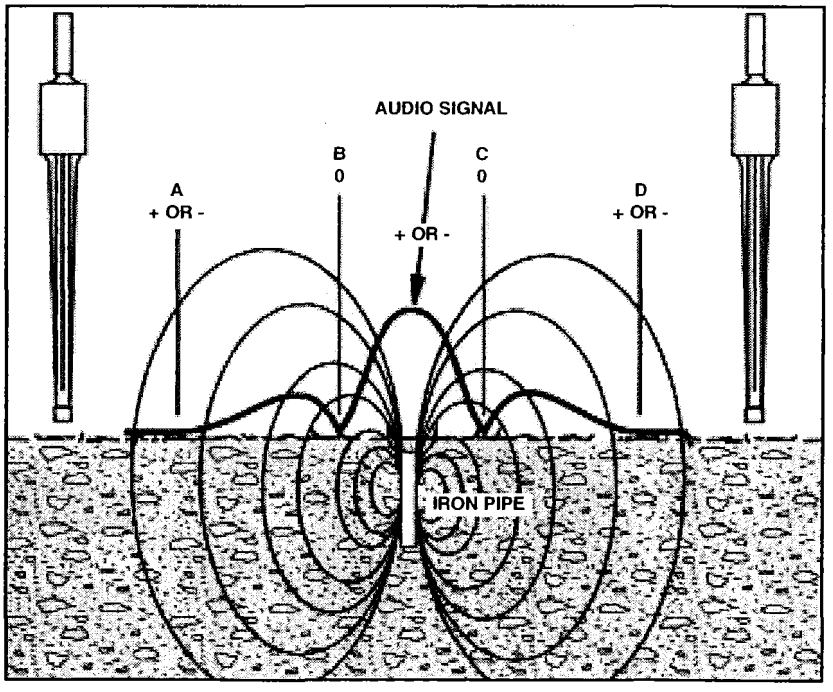


Figure 10. Signal Pattern from a Strongly Magnetized Marker

The two weaker indications occur because the locator is extremely sensitive to the magnetic field components parallel to its long axis. At point **B** and **C** the field is perpendicular to the locator so no peak audio of digital indications are produced at these points.

When Placing Stakes Correct Orientation is Important

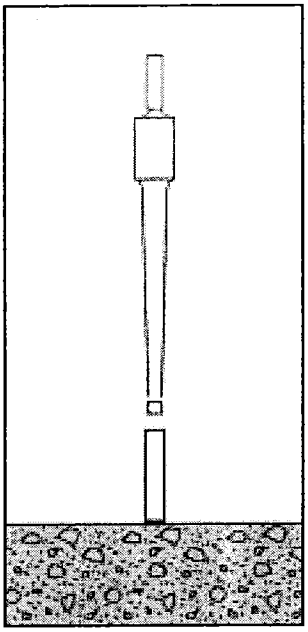


Figure 11. Checking a Stake's Orientation

For checking purposes, the orientation of the pin relative to the locator is shown in Figure 11. Check the pin with one orientation. Then rotate the pin 180°. The orientation which gives the largest reading is the one that should be used. This reading would be positive in the Northern Hemisphere, and negative in the Southern Hemisphere (Australia, New Zealand, etc.)

An iron pin has two types of magnetization. One is the magnetization induced by the Earth's magnetic field. The induced magnetization is always downward in the Northern Magnetic Hemisphere and produces a positive output no matter which end of the stake is driven into the ground. The other type of field is the permanent magnetization which is fixed to the pin. For maximum detection, the stake should be driven into the ground such that the permanent magnetization is in the same direction as the induced magnetization.

Locating Manholes, Septic Tanks and Well Casings

The magnetic field is strongest at the edge of a shallow manhole cover. You can easily trace the edges of covers near the surface. Locating depth ranges up to 8 feet.

The great length of a well casing provides a strong field at the surface that makes it easy to locate casings buried up to 15 feet deep.

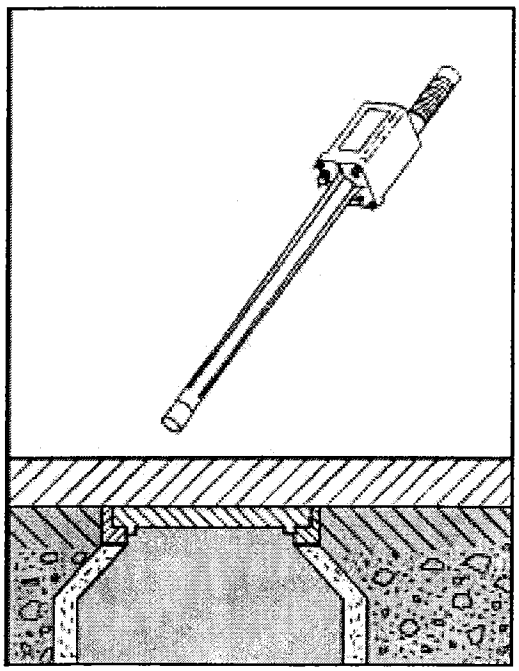


Figure 12. Locating Manhole Covers

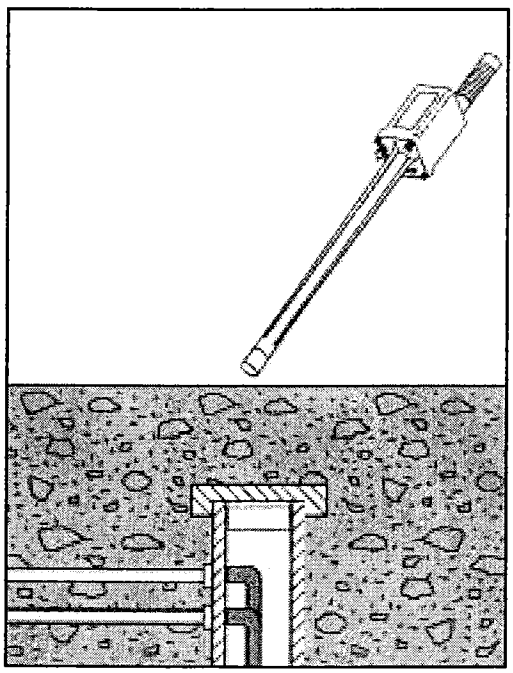


Figure 13. Locating Water Well Casings

The GA-72Cd can be used to precisely locate the metal handles or reinforcing bars on septic tank covers at depths up to 4 feet.

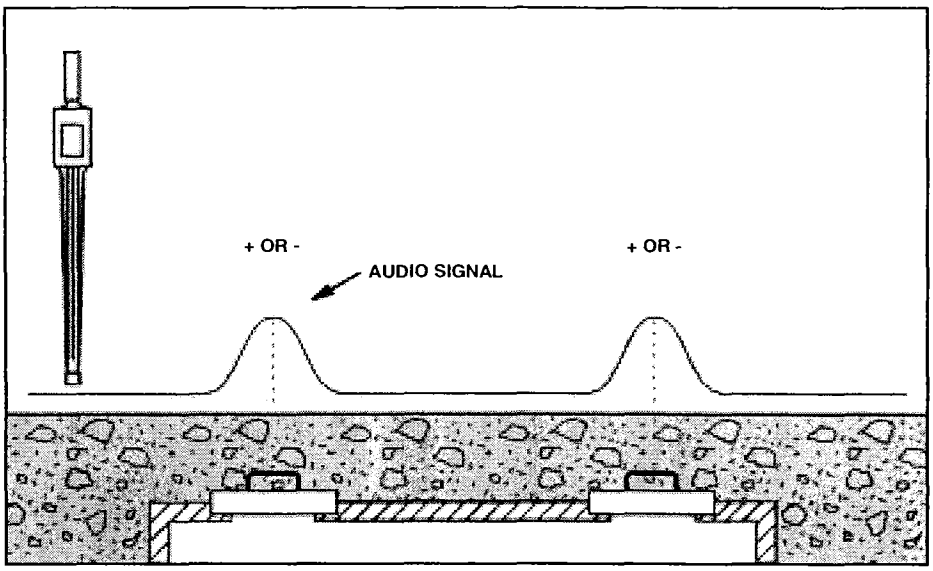


Figure 14. Signal Patterns Provided by Septic Tank Covers

Locating Objects Under Snow or Water and Tracing Barbed Wire

The locator can be used in snow or in flooded areas - just keep the electronic unit out of the snow or water.

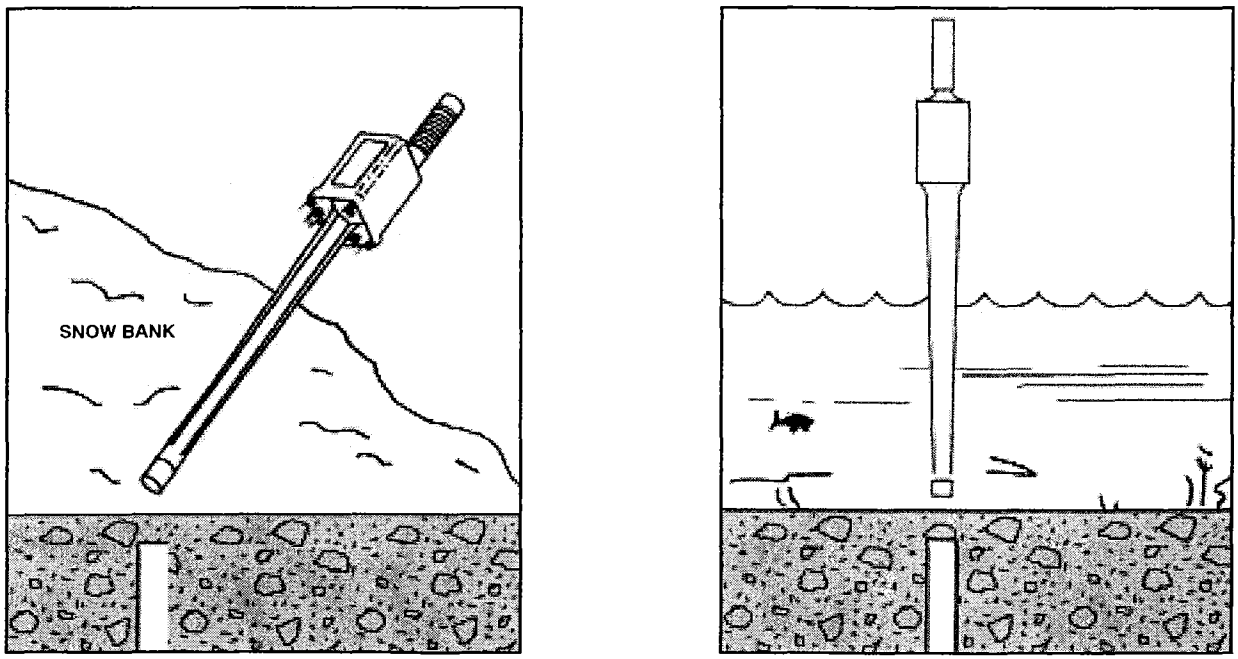


Figure 15. Locating Objects under Snow or Water

You can often trace barbed wire (from old fence lines) buried just beneath the surface. Even if the wire is only a trail of rust, it can still be detected near the surface. Tip the locator a little lower than usual - but not parallel with the ground.

Examine trees for bench marks and bits of embedded barbed wire. Hold the locator parallel with the direction of the wire.

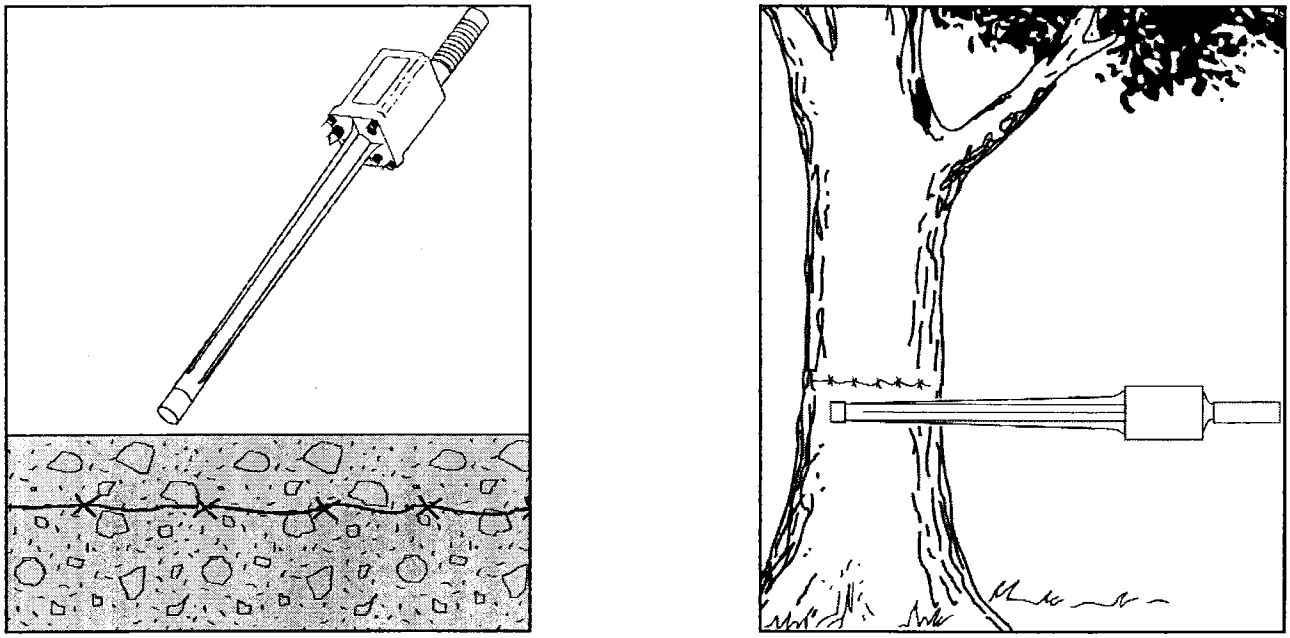
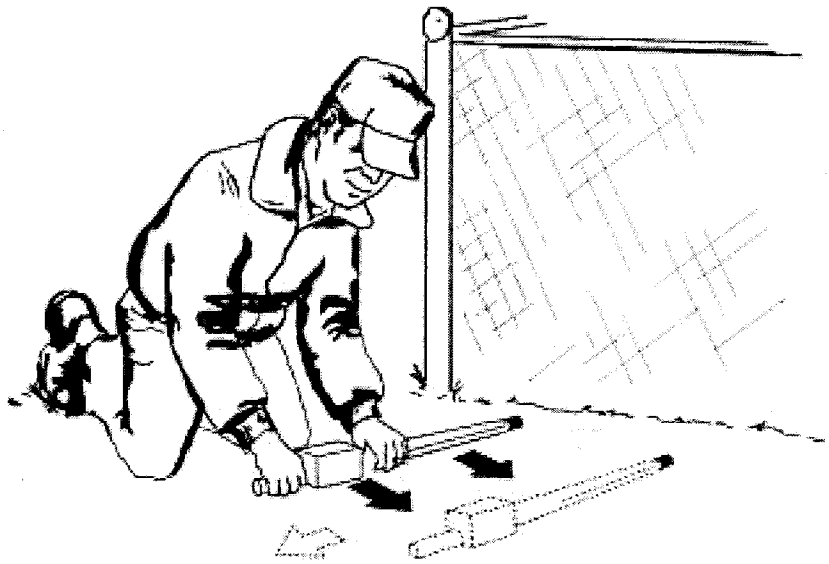


Figure 16. Tracing Barbed Wire from Old Fence Lines

Searching Areas Along a Chain Link Fence



Searching in the vicinity of a chain link fence requires a reduced sensitivity setting and some control over the orientation of the locator. Position the locator horizontally with its long axis perpendicular to the fence as illustrated in Figure 17. This insures that the upper sensor is kept away from the fence.

Perform the search by slowly moving the locator forward along the fence while also moving it to the right and to the left. This technique allows you to search an area several feet wide as you move forward. Listen for an abrupt drop in the signal (as shown by the null in Figure 18) that will occur when the lower sensor, located 1-5/8 inches from the end of the locator, is directly over the stake. Any variation in the position of the locator will produce an abrupt rise in the frequency of the signal.

Figure 17. Searching in the Vicinity of a Chain Link Fence

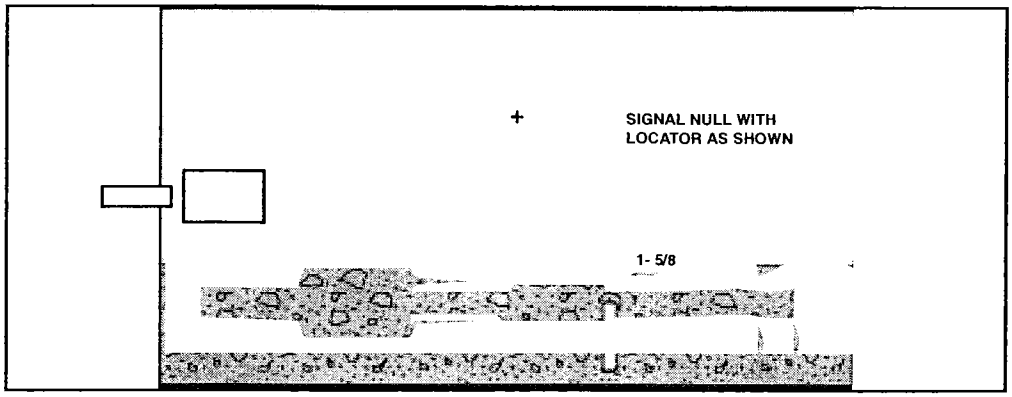


Figure 18. Placement of Locator while Searching along a Chain Link Fence

Locating Valve Boxes

Both the valve and its casing, when iron, provide strong magnetic fields which make them easy to locate. Plastic enclosures containing magnets are easily located at depths of 6 feet or more.

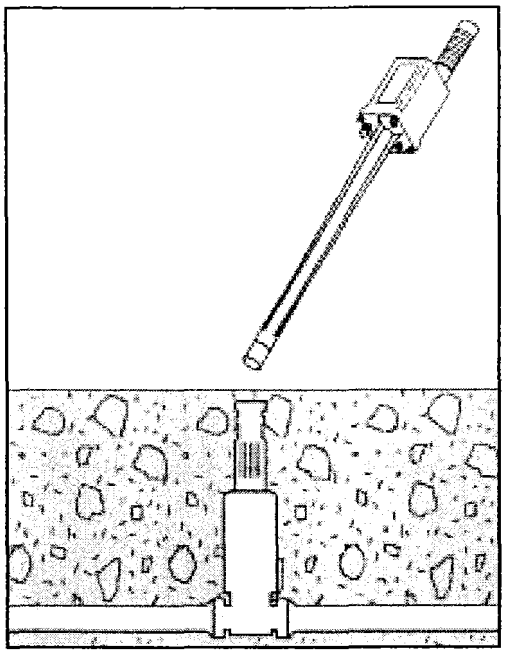


Figure 19. Locating Valve Boxes and Casings

Locating Cast-Iron Pipes

As illustrated in Figure 20, cast-iron pipes produce the strongest magnetic signals at their joints.

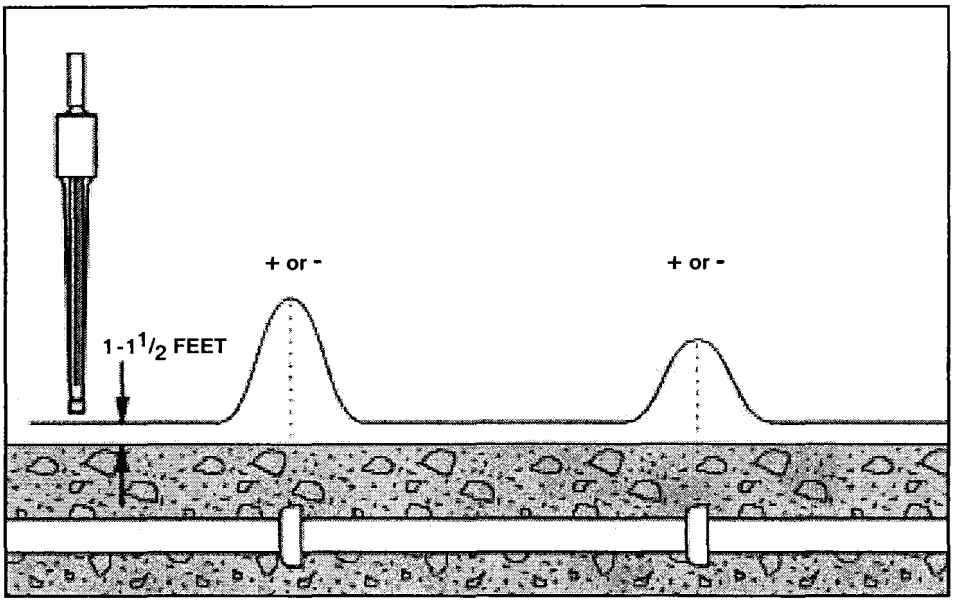


Figure 20. Signal Patterns Provided by Cast-Iron Pipes

The initial search should be performed as follows:

1. Set the Sensitivity control for maximum (XH indication).
2. Hold the locator vertically approximately 1 to 1-1/2 feet above the surface.
3. Walk along without turning or tilting the locator.
4. Mark the locations where the maximum signal levels occur.
5. Return to an area of maximum signal strength and hold the locator several inches above the surface. The sensitivity will probably have to be reduced during this second pass. Four-inch pipes can be located at depths up to 8 feet.

Locating Steel Drums

As shown in Figure 21, the GA-72Cd's signal pattern will vary depending on the vertical or horizontal orientation of the drum and also how deep it is buried. A fifty-five gallon drum can be located at depths up to 8 feet.

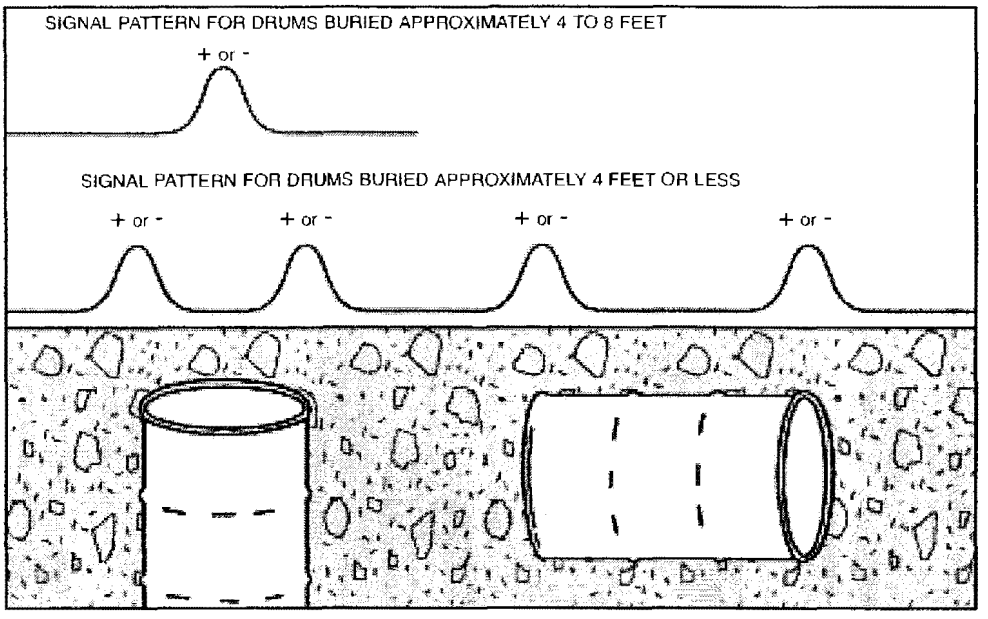


Figure 21. Signal patterns provided by steel drums

Locating Magnetized Nonmetallic Duct and Cable

Schonstedt's patented technology for incorporating magnetic materials into nonmetallic duct and cable makes it easy to locate these objects at various depths as listed in Table A.

This technology also provides "magnetic signatures" consisting of positive and negative polarities that alternate at specific intervals. Different intervals (see Table A) provide each of the three categories of duct and cable with a unique magnetic signature used for positive identification. Magnetic signatures also help to distinguish nonmetallic duct and cable from cast-iron or steel pipe.

Table A. Magnetic Signatures and Detection Depths for Magnetized Metallic Duct and Cable Applications

APPLICATION	MAGNETIC SIGNATURE (Meter alternates between positive and negative)	DETECTION DEPTH*
CATV (duct/cable)	Every 4 feet	Up to 4 feet
Telephone	Every 6 feet	Up to 5 feet
Electrical (duct)	Every 7 feet	Up to 5 feet

* Sensitivity set to XH

As shown in Figure 22, a magnetized nonmetallic fiber optic cable is easily identified by the GA-72Cd's visual indication which changes from positive to negative every six feet along with the audio signal which also peaks every six feet.

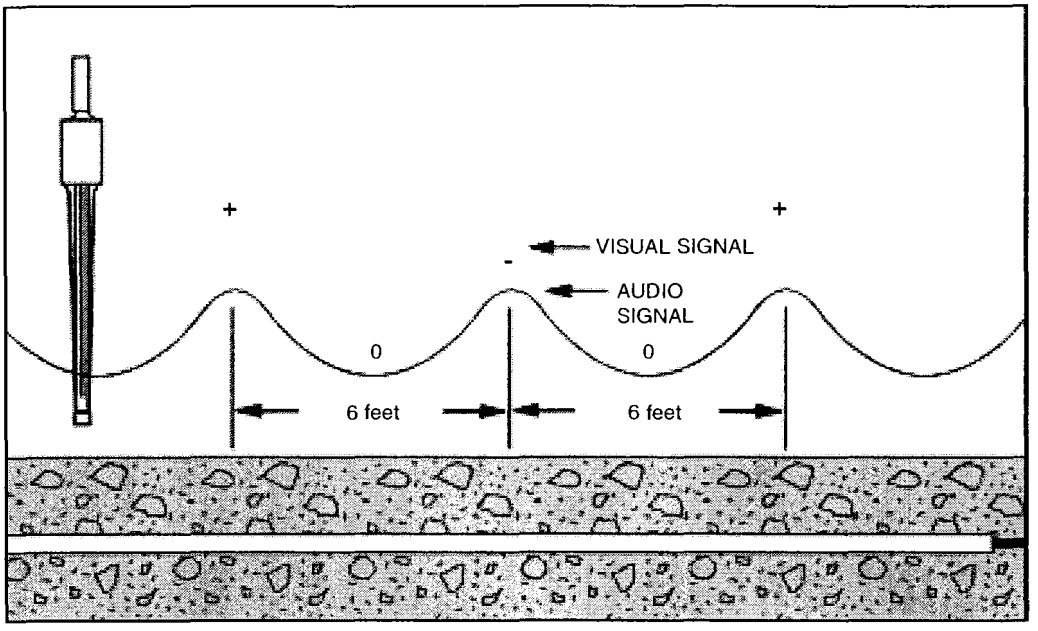
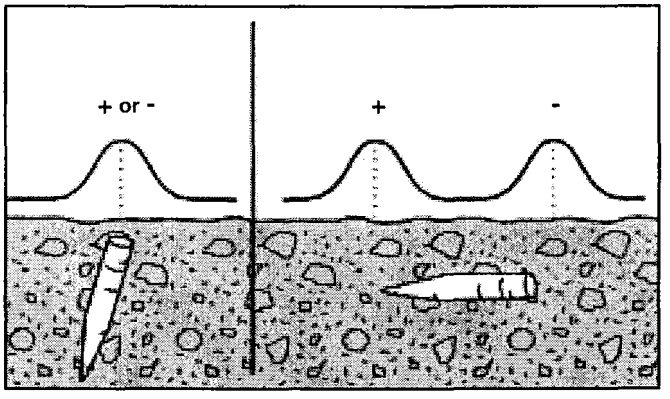


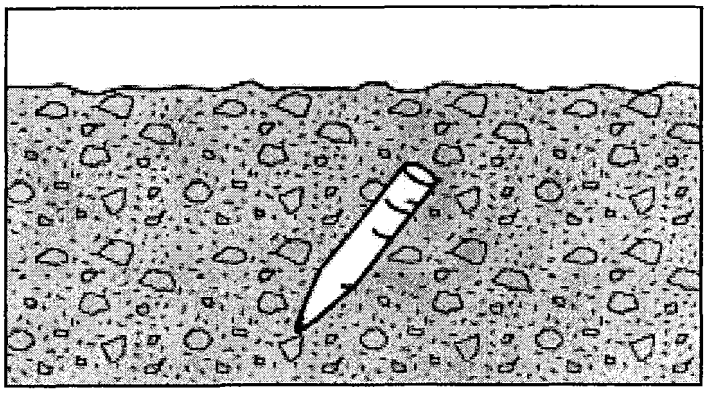
Figure 22. Magnetically Detectable Nonmetallic Cable Provides a Unique Magnetic Signature

Locating Ordinance and Weapons

The versatile, lightweight, cost-effective GA-72Cd is also designed to aid EOD technicians and law enforcement officers during area search operations.

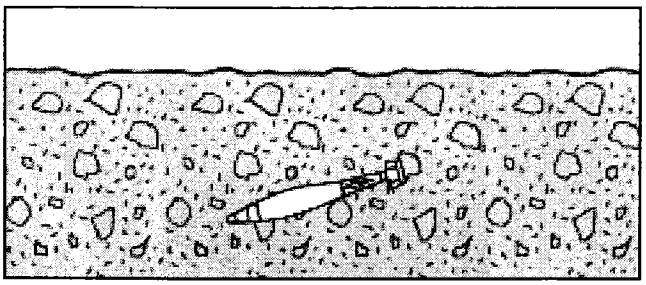


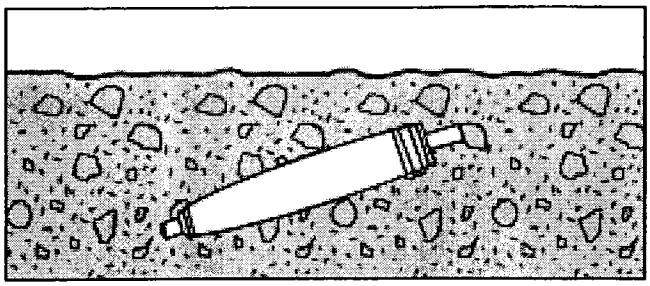
Basic signal patterns from vertical and horizontal targets help to determine target orientation.



A 175mm projectile can be located up to 5 feet deep.

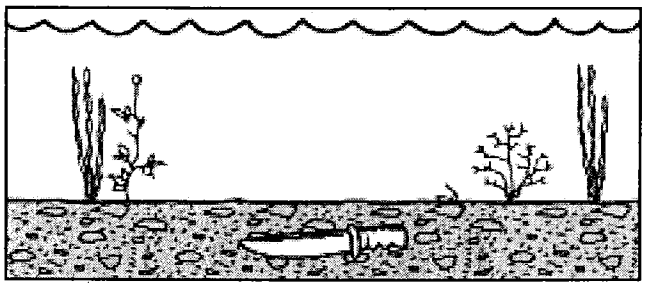
An 81mm mortar can be located up to 12 inches deep.

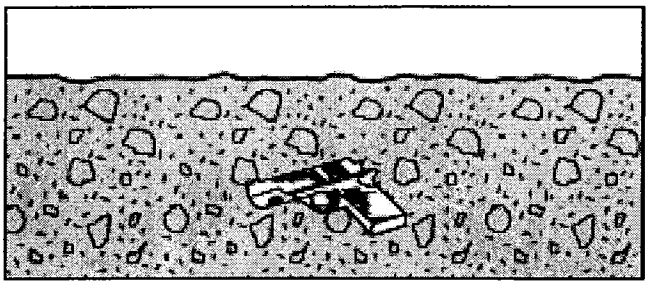




MK81 Low drag bombs can be located up to 9 feet deep.

A hunting knife under water can be located in up to 16 inches of silt.





A discarded hand gun can be located up to 12 inches deep

Additional Applications

1. People drilling in an area where hazardous materials might be encountered should use the GA-72Cd to search the area prior to drilling. Other Schonstedt gradiometers are available that can be lowered down the drill hole for periodic checks as drilling progresses.

Other Notes

1. A burbling sound indicates the presence of an energized power line. This will not influence the meter indication unless associated with a magnetic structure.

2. The instrument will not respond to nonmetallic materials such as gold, silver, copper, brass and aluminum.

DATA LOGGER OUTPUT

The headset jack also provides an analog output signal for input to a data logger. This +/-4 volt signal varies in proportion to signal strength and is accessible by wiring a standard stereo plug as illustrated in Figure 23.

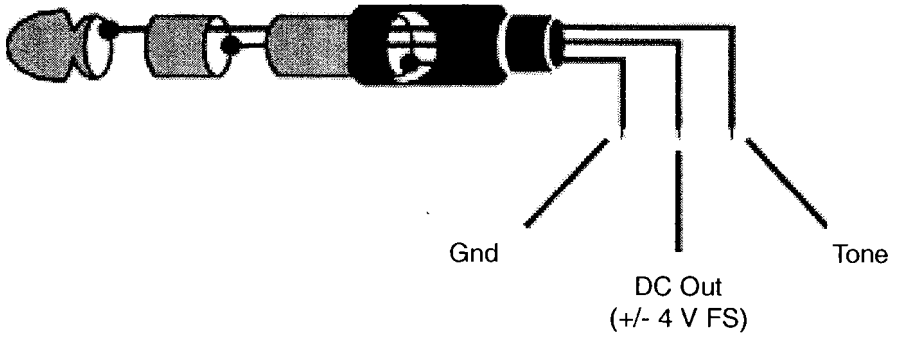


Figure 23. Stereo Plug Connections for Analog Output Signal

MAINTENANCE

The GA-72Cd is designed and built to give trouble-free operation. Normally, maintenance is limited to the occasional replacement of the batteries. In the event a malfunction does occur, refer to the Troubleshooting Guide on page 15 for a few problems that you can correct in the field.

Replacement of Batteries

The GA-72Cd is powered by two 9-volt lithium batteries which have a shelf life of ten years, and provide twice the operating life of alkaline batteries. Access to the batteries is obtained by loosening the four captive screws and removing the electronics cover as shown in Figure 24.

CAUTION

Always use lithium batteries. Alkaline batteries produce magnetic fields that will affect performance of the locator particularly when set to the H or XH sensitivity range.

The locator is shipped with a spare set of lithium batteries conveniently stored in the carrying case. It is recommended that when you use the spare batteries, replace them as soon as possible so that you will never be without batteries in the field.

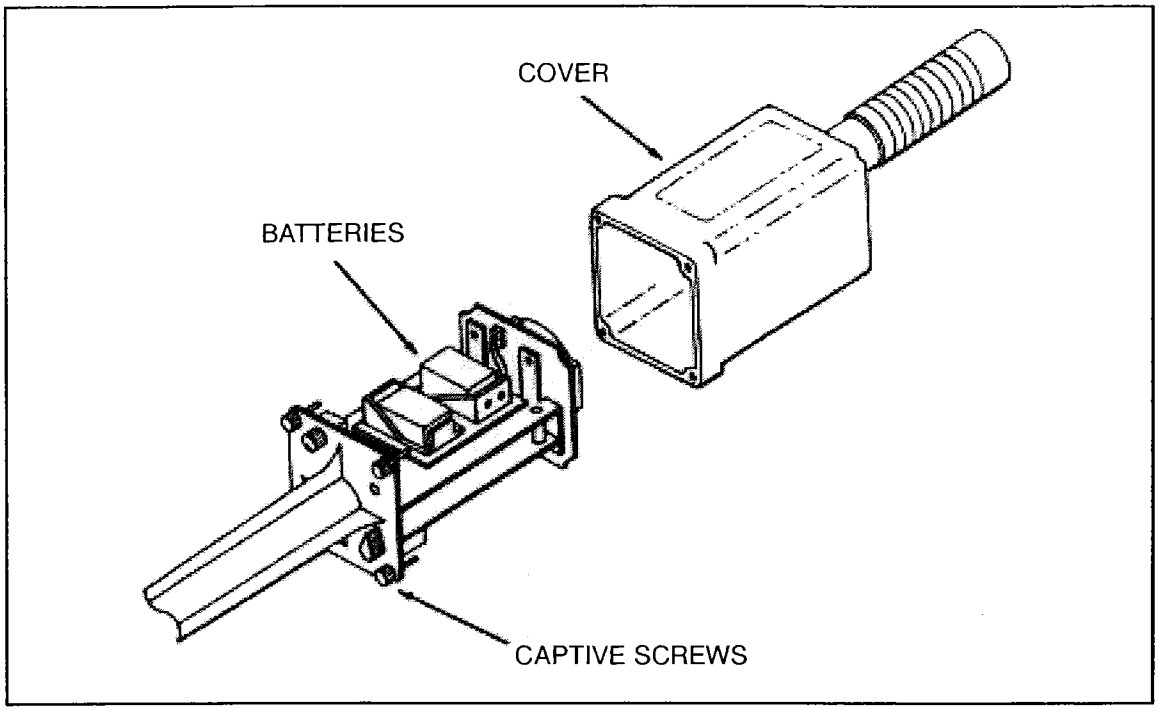
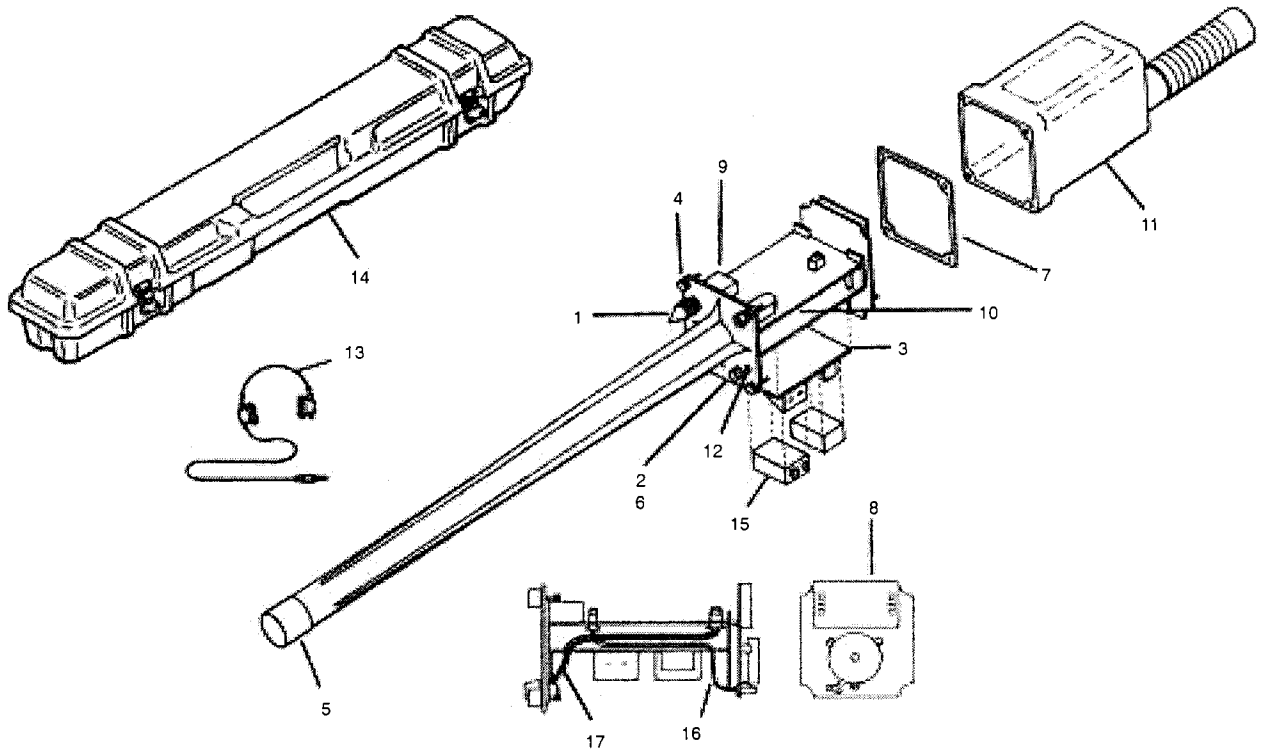


Figure 24. Exploded View of the Electronic Unit Cover

Troubleshooting Guide

Symptom	Possible Cause	How to Check	How to Fix
No response	Dead batteries	Replace	—
	Batteries not making contact	Check for contact corrosion	Clean contacts
	Battery leakage	Do not remove batteries*	Return unit to factory
	Loose connector(s)	Visually inspect	Reconnect
Intermittent	Batteries not making good contact	Check for corrosion	Clean contacts
	Loose connector(s)	Visually inspect	Reconnect
Uncontrollable screaming	Weak batteries	Replace	—

*Most battery manufactures' warranties cover the cost of repair or replacement of any device damaged by their batteries. Removing batteries that leak will void their warranty.



ITEM	PART NO.	DESCRIPTION
1	K20015	Knob, Pointer
2	K20013	Knob, Round
3	208306	Battery Bd. Assy.
4	208282	Captive Screw (4 Req'd)
5	208195	Tip
6	208345	Potentiometer Assy.
7	208323	Gasket, Base
8	302375	LCD - Satellite Bd. Assy.
9	302372	Main Bd. Assy.
10	302276	Chassis
11	208348	Cover & Handle Assy.
12	SMVIN6C500	Screw (2 Req'd)
13	H30006	Headset (Optional)
14	302145	Case
15	B11014	9V Lithium Battery (2 Req'd)
16	208349	Interface Cable Assy.
17	208347	Speaker Cable Assy.

SERVICE INFORMATION

If your locator needs service, please return it to the factory along with the following information: Name, Address, Telephone, Fax number, Where Purchased, Date, and Description of Trouble(s). An estimate will be provided prior to service work being done. See shipping information on page 19.

SPECIFICATIONS

(Specifications subject to change without notice)

Input Power: ..... Supplied by two lithium 9-V batteries

Battery Life: ..... 60 Hours (intermittent usage)

Output:

Audio

Output Option ..... Signal increases or decreases in volume
Switch at "**A**" ..... with gradient-field intensity
Output Option ..... Signal increases or decreases in frequency
Switch at "**B**" ..... with gradient-field intensity

Visual ..... Digital readout expanding bar graphs
Indicate polarity (positive or negative) and
Relative strength of the magnetic field

Battery Check: ..... BATT 4-segment LCD

Weight: ..... Approximately 2.5 lbs. (1.14 kg)

Operating Temperature: ..... -13° to 140°F (-25° to 60°C)

Overall Length: ..... 34.5 in. (87.6cm)

Waterproof Length: ..... 21 in. (53.3cm)

Nominal Sensor Spacing: ..... 14 in. (35.6cm)

Construction: ..... Rugged, all solid state

LIMITED WARRANTY

The Schonstedt Instrument Company (Schonstedt) warrants each product of its manufacture to be free from defects in material and workmanship subject to the following terms and conditions. The warranty is effective for 5 years (with the return of the Customer Registration Card) after the shipment by Schonstedt to the original purchaser.

Schonstedt's obligation under the warranty is limited to servicing or adjusting any product returned to the factory for this purpose and to replacing any defective part thereof. Such product must be returned by the original purchaser, transportation charges prepaid, with proof in writing, to our satisfaction, of the defect. If the fault has been caused by misuse or abnormal conditions of operation, repairs will be billed at cost. Prior to repair, in this instance, a cost estimate will be submitted. Service or shipping information will be furnished upon notification of the difficulty encountered. Model and serial numbers must be supplied by user. Batteries are specifically excluded under the warranty.

Schonstedt shall not be liable for any injury to persons or property or for any other special or consequential damages sustained or expenses incurred by reason of the use of any Schonstedt product.

FOR SERVICE OR REPAIR

Please ship locator (in its case) to:

Schonstedt Instrument Company
4 Edmond Road
Kearneysville, WV 25430
Attn: Customer Service Dept.

PATENTS

Manufactured under one or more of the following Patents: United States: 4,163,877; 4,258,320; 4,803,773; 4,839,624; 5,097,211; 5,136,245; 5,138,761; 5,239,290. Other United States and foreign patents pending.

APPENDIX B:
Picture Collage of Reacquire Methods

Picture Collage with Captions of Reacquire process:

(a) Relocation of positions using GPS;

(b) Initial Flagging and Schonstedt Interrogation;

(c) Pin-Pointing Peak Response & Flag Adjust;

(d) Flags in final location prior to investigation;

(e) GPS position recording if flags moved significantly during interrogation process.

High Vacuum Scrubber Operation Procedure

Revision 0

Remediation of Compressed Gas Cylinders
Pensacola, Florida

Prepared for:
CH2M Hill

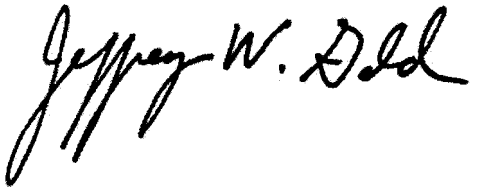
Prepared by:

INTEGRATED ENVIRONMENTAL SERVICES, INC.
Atlanta, Georgia

Integrated Environmental Services, Inc.

Date: January 17, 2007

Project Director: Jeffrey W. Gold



Revison Log

Revision No.	Summary	Page

Procedure Number: Date: January 17, 2007

High Vacuum Scrubber Operation Procedure

Title: High Vacuum Scrubber Operation Procedure

Purpose: To provide instructions for operation and maintenance of high vacuum scrubber system.

Scope: Qualified and trained IES personnel only are permitted to execute this procedure.

Acronyms:

IES	Integrated Environmental Services, Inc.
HP	Health Physics/Radiological Control
RWP	Radiation Work Permit

General Information:

Coverage of this document is limited to operations involving use and maintenance of any IES high vacuum gas scrubbing unit. Air/gas scrubbing units are used to neutralize vapors resulting from uncontrolled releases, routine operations, and purging activities.

Scrubber System:

The high-vacuum scrubber is designed to create a high vacuum (~25"Hg) inside a pipe, vessel, compressed gas cylinder, or other container. The high-vacuum scrubber system consists of a stainless steel primary reactor vessel containing liquid reagent. The primary reactor is coupled to a liquid-driven venturi reactor which induces a vacuum over the headspace of the primary reactor allowing target gas to be drawn into the reactor reagent through a dip-tube arrangement. Exhaust from the venturi scrubber may be directed to a vertical column packed with dry pellets of alumina oxide. A schematic illustration of the system is shown in Figure 1.

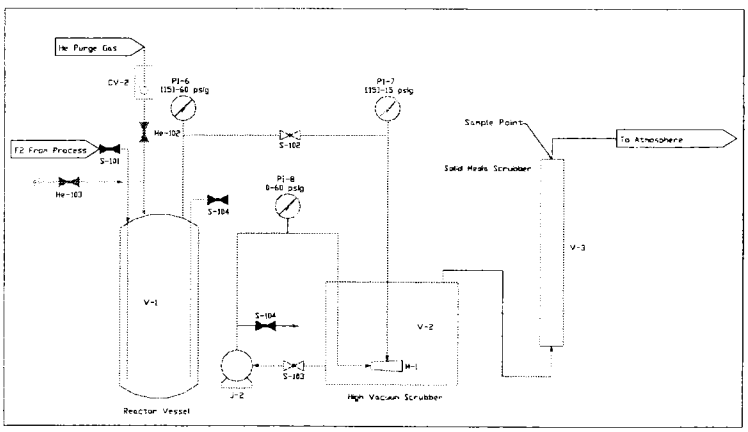


Figure 1
High-Vacuum Scrubber Schematic

The small scrubber sump is a 65-gallon polyethylene tank filled with an aqueous reagent that serves as both the motive agent and the neutralizing reagent when the scrubber is used as part of the treatment train. Dual venturi ejectors are mounted in-line with a circulation pump that is fed from the main sump. The pump moves reagent through the ejector which, by means of venturi effect, establishes a high vacuum within an inlet hose. The scrubber weighs approximately 300 pounds when full and has a four-foot by three-foot footprint. A solid media "polishing" column containing activated alumina is attached to the

Figure 7

exhaust port of the low flow scrubber to remove residual vapors which might escape from the scrubber solution.

PPE Requirements:

Personal protective equipment for operations governed by this procedure depends on the nature of the work being performed. In general, the following PPE is appropriate for use with this equipment:

1. Level B gas protective suit (Trelleborg or impermeable polymer)
2. Supplied air respirator
3. Nitrile or SilverShield gloves
4. Chemical protective boots.
5. Additional attire as required by RWP

Action Steps:

A. Documentation

The daily safety checklist is reviewed and current issues related to operations and safety are discussed and documented prior to initiating any gas scrubber operation activities. This review meeting is referenced in the logbook.

B. Equipment Inspection

IES personnel will check the following conditions at the beginning of each workday prior to operation of any gas scrubbing units.

1. All liquids are filled to the levels indicated on each scrubber and reactor and pH tested for alkalinity. For caustic reagent, pH should read between 10 and 14.
2. Power sources checked to ensure that power is available to scrubber. Breaker switches in the main and auxiliary (if provided) load centers are verified to be in the "ON" position.
3. On/Off switches tested for operability. Each scrubber motor is "bumped" on to ensure proper operation and direction of motor rotation.
4. Pump seals (for units not equipped with magnetic-drive pumps) are inspected to ensure they are leak free and functional. Each pump seal is observed both while the pump is off and while it is on to determine if any leakage is present. Leakage from the seal indicates the seal needs adjustment or is defective and requires replacement.
5. Pipe fittings, couplers, and flange interfaces checked for leaks while pump is in operation.
6. Couplings, fittings, and connections on the polishing column and dry scrubber are checked to ensure they are tight.

C. Charging Scrubber Reagent

1. Personnel responsible for charging or re-charging scrubber reagent will don protective

garment (Tyvek® or equivalent), chemical resistant gloves, and face protection in the form of goggles and a face shield.
2. Liquid level in the scrubber sump is checked to ensure overfilling will not occur.
3. Remove filling cap from the scrubber sump.
4. Place charging reagent container and a five gallon bucket with three gallons of clean water next to scrubber sump.
5. Use a bung wrench to remove the cap from reagent container. Lower drum pump inlet pipe into reagent container.
6. Place discharge hose into scrubber inlet or hatch opening.
7. Hold the discharge hose firmly and turn the drum pump on.
8. Activate the pump and allow chemical feedstock to transfer to scrubber system.
9. Disengage pump when scrubber sump has reached desired level.
10. Follow procedures found in "Liquid Chemical Transfer Procedure" to purge and clean transfer pump.
11. Replace lid on scrubber sump.
12. Cap reagent container and return to chemical storage area.
13. Scrubber outlets are monitored periodically during the project to verify that no process gas is passing through due to media saturation and break-through.

D. Scrubber Operation

Scrubber operation occurs intermittently during site operations; it is used to purge process lines, induce vacuum over the primary reactor, and at any time it is necessary to remove process gas from the manifold or tubing system. IES technicians have the requisite knowledge to operate all scrubbers located at the project site.

1. Check reagent tank level and pH using either pH paper or an electronic probe.
2. Add reagent if necessary.
3. Inspect pump motor and piping connections.
4. Inspect area around scrubber; paying special attention to standing water, tools, or other materials lying on or around the scrubber.
5. Inspect vacuum hose and fitting (normally a Swagelok or AN connection).
6. Attach vacuum hose to line coming from target line (using a crescent or box wrench).
7. Start scrubber and open valves on process line to allow target gas to flow into the scrubber.
8. Monitor vacuum gauge and adjust process line valves to maintain desired vacuum for specific operation.
9. Target fluorine evacuation: ~ -24" Hg
10. When scrubbing operation is complete, open suction end of process line to atmosphere, de-activate scrubber motor, close process line valves when pump has stopped.

5. Spill Response and Management

Spillage of caustic or caustic reagent may occur during operation of the high-vacuum scrubber and other gas processing equipment used on this project. The following actions will be followed in the event of a spill of process reagent or chemical feedstock.

1. Cease operation of equipment experiencing the leak and causing the spill.
2. Stop leak.
3. Contain the spill using absorbent pillows, pads, or absorbent granules.
4. Notify the client on-site representative of the spill.
5. Remove spilled material using a wet-dry vacuum or if the spill has occurred on soil or gravel, place contaminated material into a bucket or drum.
6. Apply granular absorbent to spill area and remove after a minimum of 30 minutes to a waste containment drum.
7. Transfer contained spilled material into the waste storage area.

High Vacuum Scrubber Operation Procedure

Acknowledgment Form

I have read and understood all aspects of the High Vacuum Scrubber Operation Procedure.

Name	Date

Low Pressure Penetrator and Saddle Access Procedure

Revision 0

Remediation of Compressed Gas Cylinders
Pensacola, Florida

Prepared for:
CH2M Hill

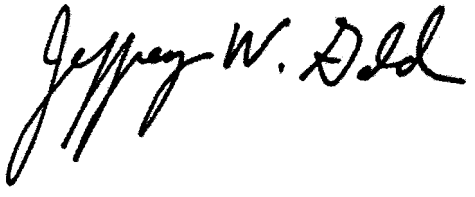
Prepared by:

Integrated Environmental Services, Inc.
Atlanta, Georgia

Integrated Environmental Services, Inc.

Date: January 17, 2007

Project Director: Jeffrey W. Gold



Revison Log

Revision No.	Summary	Page

Title: Low Pressure Penetrator and Saddle Access of Target Containers

Purpose: To provide instructions for accessing target containers using an IES penetrator and saddle system.

Scope: Qualified and trained IES personnel only are permitted to execute this procedure.

Acronyms:

IES	Integrated Environmental Services, Inc.
HP	Health Physics/Radiological Control
RWP	Radiation Work Permit

General Information:

This procedure details the process of using a specialized low pressure penetrator and saddle to gain access to target container contents. The method is employed whenever access through the valve is impossible due to valve failure, blockage, or damage. The system may also be employed on containers that simply do not possess a conventional valve or accessible opening.

It is essential that the right size saddle be employed with a target container to assure a secure seal between the container sidewall and the saddle itself. It is also vital that the section of container sidewall selected for penetration be smooth and free of large irregularities such as corrosion pits or blisters.

IES employs both high-pressure and low-pressure penetrator and saddle assemblies. The low pressure assemblies are limited to use on low-pressure containers such as chlorine, sulfur dioxide, and propane. The low-pressure assemblies are limited to pressures below 300 psig. The high-pressure units may be used on containers pressurized up to 2,500 psig.

IES has employed the penetrator and saddle system on hundreds of compressed gas containers from 2 inches to 30 inches in diameter and on pressurized pipelines requiring evacuation of hazardous chemicals. The system is very reliable, robust, and effective.

PPE Requirements:

Personal protective equipment for operations governed by this procedure is as follows:

1. Level B gas protective suit (Trelleborg or impermeable polymer)
2. Supplied air respirator
3. Nitrile or SilverShield gloves
4. Chemical protective boots.
5. Additional attire as required by RWP

These requirements may be altered in consultation with HP personnel.

Action Steps:

A. Documentation

The daily safety checklist is completed and current issues related to operations and safety are discussed and documented prior to initiating any decontamination activities. This meeting is referenced in the logbook.

B. Saddle Attachment

8. Set up and prepare emergency scrubber for immediate use should a system leak develop at any time during the access or sampling operation.
9. Select saddle base and tension bands (bales) and inspect each component for obvious defects or damage.
10. Check saddle O-ring gasket for proper positioning in saddle body.
11. Lubricate area on the target container where the O-ring will make contact and the face of gasket with a fluorinated lubricant (eg. LOX 8® or Krytox®).
12. Coat all exposed faces of the saddle gasket with lubricant
13. Carefully begin mounting the saddle body onto the container by first placing the saddle body on the container over the lubricated area.
14. Install bales around container and on saddle body. Washers should be placed on the open lug side of the saddle. Care must be taken not to slide the saddle around the container once the bales have been attached to prevent damage to the saddle O-ring gasket.
15. Tighten nuts evenly until saddle body conforms snugly to container. Each bolt should be tightened to a torque value of 40-50 ft-lbs.
16. Attach penetrator connection assembly consisting of a tee-fitting with ball valves on each tee outlet. Threads on the assembly tee that mate with the saddle should be prepared by application of Teflon® tape. The assembly should be threaded into the saddle port until very snug with the branch tee leg facing out towards one side of the target container.

C. Container Breaching and Access

(Refer to Figure 1 for system component notations)

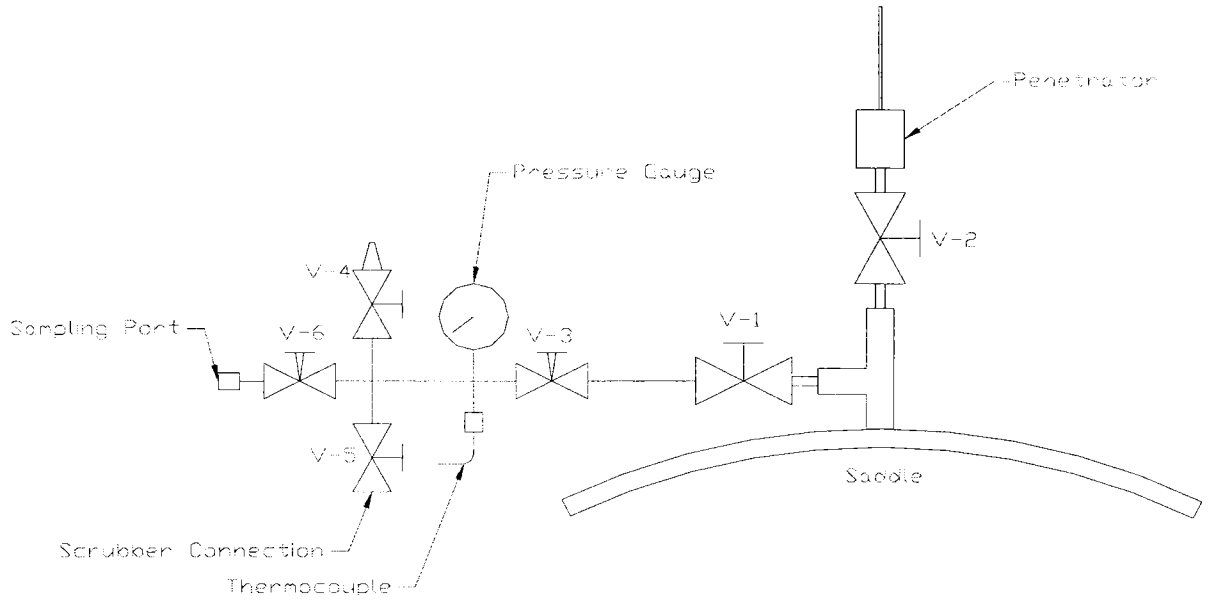


Figure 1
Container Penetrator, Saddle, and Sampling Manifold Configuration

1. Attach a 3/8" NPT - 1/4"Swagelok male connector to outlet of valve **V-1**. Ensure NPT threads are wrapped with Teflon tape prior to installation.
2. Attach penetrator assembly to valve **V-2**.
3. Attach sampling manifold assembly to outlet of valve **V-1**.
4. Attach scrubber suction piping to valve **V-5** outlet.
5. Check each connection and fitting on the penetrator mechanism with appropriate wrenches to insure they are tight.
6. Attach nitrogen supply hose to inlet of valve **V-4**. Nitrogen supply should be regulated to approximately 25 psig.
7. Close valve **V-6**, **V-5**, and **V-2**.
8. Open valve **V-1** and **V-3**.
9. Open valve **V-4** slowly and pressurize the penetrator/saddle assembly with nitrogen to a pressure of at least 20 psig.
10. Observe manifold pressure gauge to monitor pressure build-up in manifold and saddle assembly.
11. Close valve **V-4**.
12. Observe manifold pressure gauge for any pressure loss over a 30-second period.
13. Using liquid leak detector solution, check each fitting and connection to insure there are

no gas leaks. (The gas leak is evidenced by bubbles around the leaking connection).

14. Open valve **V-6** to exhaust leak check gas from the system until the pressure gauge reads 0 psig.
15. Close valves **V-1** and **V-3**.
16. Start high-vacuum scrubber. Maintain valve **V-5** in the closed position.

*If leakage is observed during the accessing sequence, valves **V-1**, **V-3**, and **V-5** may be opened to direct gas from the tee assembly and target container directly to the scrubber.*

17. Attach electric drill to the end of the penetrator drill bit. The drill shaft is approximately 18 inches long which allows it to pass through the penetrator connections and seals while permitting the bit to easily breach the target sidewall.
18. Energize the drill and check for proper rotation of drill bit. While the drill bit is rotating, tighten gland nut around the drill bit packing until the drill begins to encounter some friction resistance from the packing.
19. Gently apply pressure to move the drill bit against the container sidewall and commence cutting.
20. Continue to apply pressure against the drill until resistance ceases and the drill bit passes freely through the container wall.
21. While continuing to energize the drill, gently withdraw the drill bit out of the target container through the penetrator cross fitting and up through valve **V-2**.
22. Close valve **V-2** once the entire drill shaft has been withdrawn past the ball closure.
23. De-energize the drill motor.
24. Disconnect the drill from the drill bit.
25. Disconnect penetrator assembly from valve **V-2**.

D) Vapor Extraction

1. Open valve **V-1**.
2. Collect sample or direct to treatment as required. (See procedure "Container Sampling")

Acknowledgment Form

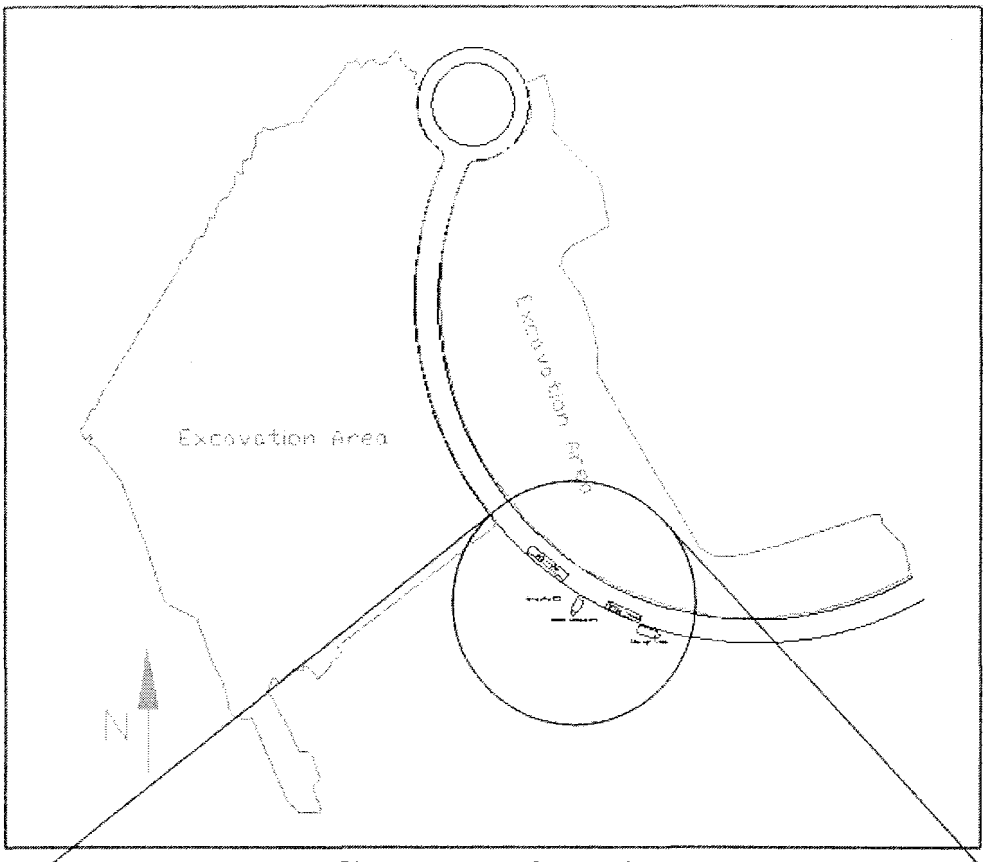
I have read and understood all aspects of the Low Pressure Penetrator and Saddle Access and Sampling of Target Containers Procedure.

Name	Date

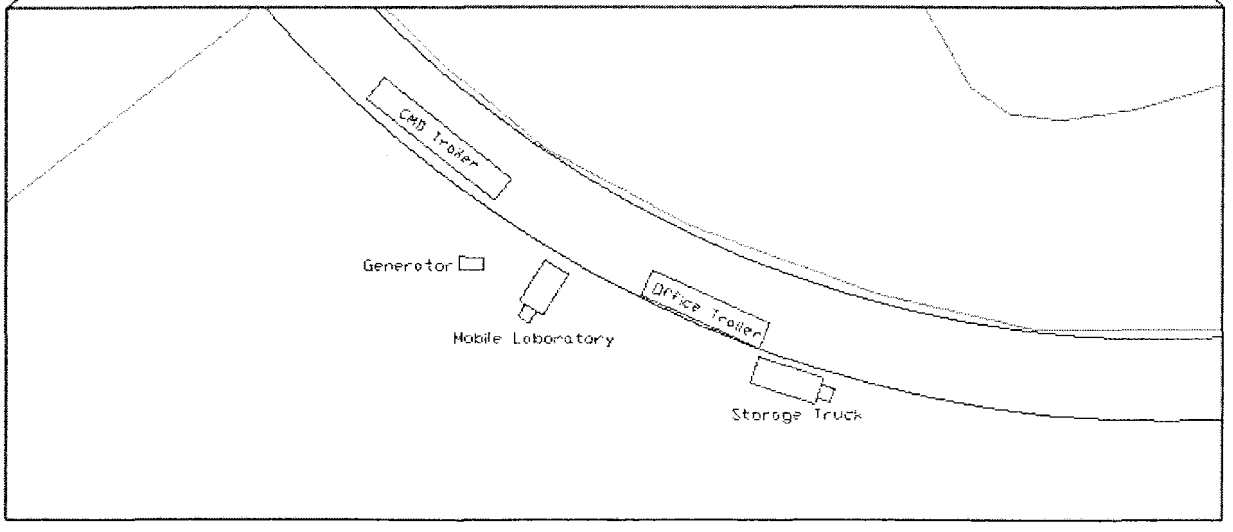
Appendix B
Project Site Layout

Gas Cylinder Remediation Project

Project Site Layout



IES Site Layout - General Area



IES Site Layout - Command and Processing Area Detail

Air Knife Operation Procedure

Revision 0

Remediation of Compressed Gas Cylinders
Pensacola, Florida

Prepared for:
CH2M Hill

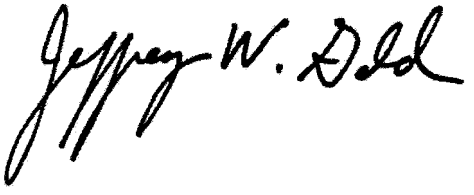
Prepared by:

INTEGRATED ENVIRONMENTAL SERVICES, INC.
Atlanta, Georgia

Integrated Environmental Services, Inc.

Date: February 20, 2007

Project Director: Jeffrey W. Gold



Revison Log

Revision No.	Summary	Page

Air Knife Operation Procedure

Title: Air Knife Operation Procedure

Purpose: To provide instructions for operating an air knife for use in excavation of impact-sensitive items.

Scope: Qualified and trained IES personnel only are permitted to execute this procedure.

Acronyms:

IES	Integrated Environmental Services, Inc.
CFM	Cubic feet per minute
PSI	Pounds per square inch

General Information:

Coverage of this document is limited to operations involving use of the IES air knife. The air knife is a specialized tool used when it is necessary to excavate delicate items while minimizing the danger of damaging the item through physical impact and is typically used when excavating for buried gas cylinders that are suspected of being in deteriorated condition or which are difficult to remove by other means. The air knife functions by using a stream of pressurized air to "blast" soil or debris from the target area and thereby uncover objects without physically touching them. This tool is often used in combination with hand probes and metal detectors used by operators to gently test subsurface areas for the presence of target objects prior to removal of overlying soil.

Effectiveness of the air knife is in large part dependent on the soil type and consistency in the excavation area with sandy and loose soils responding better to the air knife's removal effects that clay or tightly packed soils. The air knife is often used in conjunction with a high-volume vacuum removal system capable or removing the soil loosened by the knife. This vacuum system is most often a truck-mounted unit that can take up loose soil, transport it to a spoil deposition area, and dump the collected soil.

Air is supplied to the air knife via a conventional air hose connected to an industrial compressor capable of providing at least 300 cfm. The compressor is typically powered by a diesel engine and is located near the usage site.

PPE Requirements:

Personal protective equipment for operations governed by this procedure depends on the nature of the work being performed. In general, the following PPE is appropriate for use with this equipment for applications involving buried compressed gas cylinders:

1. Level B gas protective suit (Trelleborg or impermeable polymer)
2. Supplied air respirator with protective cover over face-mask lens
3. Face shield (supplemental)
4. Nitrile inner gloves

5. Leather outer gloves
6. Chemical protective boots or rubber booties over top of garment booties and standard work boots

Action Steps:

A. Documentation

The daily safety checklist is reviewed and current issues related to operations and safety are discussed and documented prior to initiating any air knife operation activities. This review meeting is referenced in the logbook.

B. Equipment Inspection

IES personnel will check the following conditions at the beginning of each workday prior to operation of the air knife and support units.

1. Proper operation of the air knife trigger control.
2. Proper operation of the air compressor.
3. Fuel level in air compressor.
4. Condition and position of air knife blast deflector on knife shaft.
5. Condition of air hose is checked to ensure it is in good condition without any worn areas, kinks, or damaged portions.
6. Couplings, fittings, and connections on all hoses are checked to ensure they are tight.

C. Air Knife Operation

The air knife is used as necessary to remove overlying soil from potential excavation targets. Overburden is typically removed using a conventional backhoe or trackhoe and the underlying area probed with a metal detector and fiberglass probes. Once a potential target is located, the air knife is used to remove the remaining material and expose the target.

As noted, the air knife is usually used in conjunction with a vacuum truck capable of removing the material loosened by the air knife. In situations where the soil is loose enough, suction from the vacuum truck alone may be sufficient to remove the desired overburden. The two tools, however, are most commonly used in concert with the vacuum intake hose positioned directly next to the air knife and taking in the material loosened by the air knife.

The following steps outline the general procedure to be used when operating the air knife.

1. Connect air supply hose from compressor to air knife and ensure all connections are tight and secure.
2. Position the particulate blast deflector plate on the air knife shaft to a point approximately mid-way up the tool.
3. Test the operation of the hand trigger to ensure free and easy movement.
4. Start the air compressor and monitor its operation to ensure it produces at least 50 psi.

5. Signal the vacuum truck operators to begin operations to produce a suction at the vacuum hose inlet positioned next to where the air knife will be operating.
6. While wearing appropriate PPE, hold the air knife with both hands and activate the trigger. The air knife outlet should be placed approximately 2-4 inches from the material that is to be removed although this distance will vary with the material being excavated.
7. Move the air knife in a manner which removes material at the desired rate and depth. It is generally advisable to remove soil from around targets beginning at the top and working around each side and end so that the target can be easily grasped and moved by mechanical and manual means.

Shutting down the air knife requires only that the air compressor be de-activated. At the end of each day's operations, the tool and its connecting hose should be inspected for any damage or abnormal wear which may have occurred during its use. Regular maintenance as specified by the vendor should be followed in maintaining operation of the air compressor.

Air Knife Operation Procedure

Acknowledgment Form

I have read and understood all aspects of the Air Knife Operation Procedure.

Name	Date

Cylinder Venting Procedure

Revision 0

Remediation of Compressed Gas Cylinders
Pensacola, Florida

Prepared for:
CH2M Hill

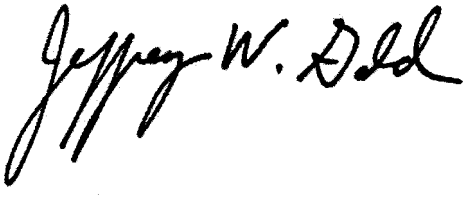
Prepared by:

INTEGRATED ENVIRONMENTAL SERVICES, INC.
Atlanta, Georgia

Integrated Environmental Services, Inc.

Date: February 23, 2007

Project Director: Jeffrey W. Gold



Revison Log

Revision No.	Summary	Page

Cylinder Venting Procedure

Title: Cylinder Venting Procedure

Purpose: To provide instructions for venting compressed gas cylinders with operable valves containing inert, noble, atmospheric or non-toxic gases and in most cases, laboratory and field analytical calibration gases.

Scope: Qualified and trained IES personnel only are permitted to execute this procedure.

Acronyms:

IES	Integrated Environmental Services, Inc.
CFM	Cubic feet per minute
PSI	Pounds per square inch

General Information:

Coverage of this document is limited to operations involving release of inert, noble, atmospheric gases or non-toxic gases as well as laboratory and field analytical calibration gases to the atmosphere via venting. Prior to venting, cylinder contents are verified to ensure target gas belongs to one of these categories of gases. Verification is assured by either laboratory analysis or the presence of a label and gas appropriate valve. Gases are vented in the open so as to preclude the possibility of oxygen deprivation.

PPE Requirements:

Personal protective equipment for operations governed by this procedure depends on the nature of the work being performed. In general, the following PPE is appropriate for use with this equipment for applications involving buried compressed gas cylinders:

1. Ear plugs
2. Safety glasses
3. Leather work gloves or nitrile gloves

Action Steps:

A. Documentation

The daily safety checklist is reviewed and current issues related to operations and safety are discussed and documented prior to initiating any cylinder venting activities. This review meeting is referenced in the logbook.

B. Equipment Inspection

IES personnel will check the following conditions at the beginning of each workday prior to starting any venting operations.

1. Cylinder venting location clear of obstructions or debris
2. Cylinder stand system operational to hold cylinders in upright position

C. Venting Operation

Once a cylinder is vented, it may be passed to recycle or disposal. As such, it is important that the venting crew make certain that the cylinder is, in fact, empty prior to passing on to recycle or disposal.

1. Secure cylinder in upright position.
2. Confirm content is qualified for venting.
3. Insure earplugs and eye protection are in place.
4. Rotate valve
5. If content is noted, adjust valve to allow a safe release.
6. If content not noted, cylinder may be empty or valve blocked. Inject nitrogen or air into the cylinder outlet and listen for movement of gas.
7. If no movement heard, valve is blocked. Set aside for CMD management.
8. If movement is heard, cylinder is empty and may be decommissioned.

Cylinder Venting Procedure

Acknowledgment Form

I have read and understood all aspects of the Cylinder Venting Procedure.

Name	Date

Acetylene Cylinder Venting Procedure

Revision 0

Remediation of Compressed Gas Cylinders
Pensacola, Florida

Prepared for:
CH2M Hill

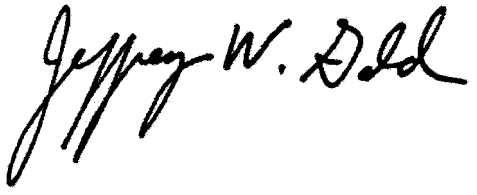
Prepared by:

INTEGRATED ENVIRONMENTAL SERVICES, INC.
Atlanta, Georgia

Integrated Environmental Services, Inc.

Date: February 23, 2007

Project Director: Jeffrey W. Gold



Revison Log

Revision No.	Summary	Page

Acetylene Cylinder Venting Procedure

Title: Acetylene Cylinder Venting Procedure

Purpose: To provide instructions for venting acetylene cylinders with operable valves and containing and managing the carcasses which contain asbestos and residual acetone.

Scope: Qualified and trained IES personnel only are permitted to execute this procedure.

Acronyms:

IES	Integrated Environmental Services, Inc.
CFM	Cubic feet per minute
PSI	Pounds per square inch

General Information:

Coverage of this document is limited to operations involving release of acetylene to the atmosphere via venting. Acetylene is a flammable but non-toxic gas and therefore is an acceptable candidate for open venting if the cylinder is not to be recycled through an approved acetylene packaging company. This procedure is based on the recommendations of the Compressed Gas Association (CGA) as they relate to managing acetylene cylinders intended to be taken out of service.

It should be noted that venting the acetylene gas is only the first part of managing these cylinders responsibly. Acetylene cylinders are unique in that they contain a monolithic mass that typically contains varying amounts of asbestos fibers. In addition, acetylene is dissolved in acetone while inside the cylinder and this solvent must be managed as part of the disposal process. Once the gas and acetone have been allowed to leave the cylinder, the carcass is generally regarded as asbestos-containing material (ACM) and is packaged, labeled, transported, and landfilled according to local regulations governing asbestos waste material. Care should be taken to avoid cutting or puncturing the cylinder itself which could result in a release of ACM to the environment.

PPE Requirements:

Personal protective equipment for operations governed by this procedure depends on the nature of the work being performed. In general, the following PPE is appropriate for use with this equipment for applications involving acetylene gas cylinders:

1. Ear plugs
2. Safety glasses
3. Leather work gloves or nitrile gloves

Action Steps:

A. Documentation

The daily safety checklist is reviewed and current issues related to operations and safety are discussed and documented prior to initiating any cylinder venting activities. This review meeting is referenced in the logbook.

B. Equipment Inspection

IES personnel will check the following conditions at the beginning of each workday prior to starting any venting operations.

1. Cylinder venting location clear of obstructions, debris, hot surfaces, open flames, or spark-producing equipment.
2. Cylinder stand system operational to hold cylinders in upright position

C. Venting Operation

Once a cylinder is vented, it may be passed to recycle or disposal. Once the pressurized contents of an acetylene cylinder have been released, the gas will continue to leave the cylinder for a number of days. The gas flow rate after the initial pressure release is difficult to detect but must be assumed to be present until the cylinder has been left open for at least 30 days.

1. Ensure that at least one fire extinguisher is in place at the venting location at all times.
2. Remove the valve cap. If the valve cap is stuck, only non-sparking tools may be used to remove it. If tools fail, use the cap cutter.
3. Open the valve slowly and allow the gas to escape. If no sound is heard or no smell of acetone noted, the cylinder may be empty or the valve may be blocked. Check valve operability by injecting nitrogen and listening for back flow.
4. After the acetylene as been vented, remove the valve from the cylinder body per the instructions found in Section D.

D. Devalving Acetylene Cylinders

1. Secure the cylinder using the vise or using a pipe wrench and slowly loosen the cylinder valve while checking for pressure. Check that no one is standing in the travel path of the valve should the cylinder be under pressure.
2. Remove the valve and then remove the felt pad beneath the valve.
3. Remove the cylinder to the pre-disposal storage area where the cylinder must sit, in the vertical position, for a period of 30 days (and it must be above 32°F for at least one week).
4. At the end of the extended venting period, package, label, transport, and dispose of the cylinder as asbestos-containing material.

Acetylene Cylinder Venting Procedure

Acknowledgment Form

I have read and understood all aspects of the Acetylene Cylinder Venting Procedure.

Name	Date

Flammable Gas Flaring Procedure

Revision 0

Remediation of Compressed Gas Cylinders
Pensacola, Florida

Prepared for:
CH2M Hill

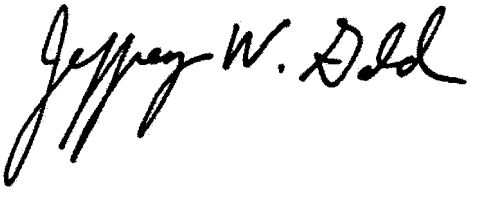
Prepared by:

INTEGRATED ENVIRONMENTAL SERVICES, INC.
Atlanta, Georgia

Integrated Environmental Services, Inc.

Date: February 23, 2007

Project Director: Jeffrey W. Gold



Revison Log

Revision No.	Summary	Page

Flammable Gas Flaring Procedure

Title: Flammable Gas Flaring Procedure

Purpose: To provide instructions for flaring the gaseous contents of cylinders with operable valves that contain flammable gas.

Scope: Qualified and trained IES personnel only are permitted to execute this procedure.

Acronyms:

IES	Integrated Environmental Services, Inc.
CFM	Cubic feet per minute
PSI	Pounds per square inch

General Information:

The flare equipment will be used for thermally oxidizing flammable gases encountered during the project and may be used as an alternative to venting. In most cases, gases to be flared will be contained within intact cylinders and the cylinders will be physically brought to the flare location, connected, and their contents disposed of. In other cases, gases may be flared directly out of the CMD.

Flaring directly from the CMD is intended for use in situations where a cylinder containing a flammable gas has been cut releasing the gas into the CMD. This flammable gas would then require disposition in a manner other than recontainerization. This situation may arise as a result of complete "flashing" of the target compound from a liquid to a vapor phase, leaving only flammable vapors in the CMD. Most flammable gases liquefy at relatively low pressures and are therefore not amenable to recontainerization by compression.

Flaring operations will not occur until cylinders have been sampled and determined to meet the requirements for flaring. Cylinders of gases not meeting the requirements for flaring will be removed from the flare area and be processed through an alternative means.

Prior to flaring, an exclusion zone, approximately 20 feet in diameter. No spark producing activities are to be performed within the flaring operation exclusion zone while cylinders are being flared or are being staged to flare.

PPE Requirements:

Personal protective equipment for operations governed by this procedure depends on the nature of the work being performed. In general, the following PPE is appropriate for use with this equipment for applications involving non-toxic flammable gas cylinders:

1. Ear plugs
2. Safety glasses
3. Leather work gloves or nitrile gloves

If the gas to be flared is considered toxic, the following PPE shall be worn:

1. Supplied-air respirator
2. Tyvek or comparable protective garment
3. Nitrile inner gloves
4. Leather outer gloves (as necessary)
5. Steel-toed work boots

Action Steps:

A. Documentation

The daily safety checklist is reviewed and current issues related to operations and safety are discussed and documented prior to initiating any cylinder venting activities. This review meeting is referenced in the logbook.

B. Equipment Inspection

IES personnel will check the following conditions at the beginning of each workday prior to starting any venting operations.

1. Line and hose connections are tight.
2. Each valve and regulator on the flare operates freely without binding.
3. Spark ignitor operates correctly and produces a strong spark. Note: A sparking striker may be used to ignite the flare burner as an alternate to the electronic sparker.

C. Operating Procedure

Valve number designations listed in this procedure relate to those numbers found on the flare unit itself.

Preparation

1. Locate flare at safe distance from operations and storage area.
2. Check flare burner and backflow preventer for signs of wear due to potential chemical incompatibilities prior to flaring any target cylinder. If damaged to prevent proper function replace backflow preventer before using flare.
3. Open main valve on propane supply cylinder.
4. Crack open valve MV-01.
5. Crack open valve MV-02.
6. Set PCV-1 between 2-4 psig.
7. Depress the reset button located on the safety valve SV-01 (omit if striker is used)
8. Press ignition switch and light pilot flame (omit if striker is used).
9. Continue to hold the reset button for 30-45 seconds or until the burner flame continues to burn when the button is released (optional if striker is used.
10. Main burner will ignite.

11. Do not touch main burner at anytime following ignition.
12. Extinguish all flames by closing manual shut-off valve MV-01 and then verify that SV-01 has closed within 90 seconds (You will hear an audible click).
13. Close valve MV-02.
14. Position 3-way valve MV-03 to position A (away from the bypass).
15. Inspect spark plug tip.
16. Inspect thermocouple lead.

Connecting Target Cylinder

1. Ensure valve outlet on target cylinder is clean and free of debris.
2. Select appropriate CGA fitting, wrap NPT end with teflon tape, and connect to target gas feed line.
3. Open MV-05 and allow nitrogen to flow while connecting target cylinder.
4. Close MV-05.
5. Open MV-06 and allow nitrogen to vent from system.
6. Close MV-06 and attach retaining nut and septum.

Waste Gas Ignition

1. Open main valve on propane supply cylinder.
2. Crack open valve MV-01.
3. Crack open valve MV-02.
4. Set PCV-1 between 2-4 psig.
5. Depress the reset button located on the safety valve SV-01 (a sparking tool may be used as a substitute).
6. Press ignition switch and light pilot flame.
7. Continue to hold the reset button for 30-45 seconds or until the burner flame continues to burn when the button is released.
8. Slowly open main valve on target cylinder.
9. Set PCV-2 to 5 psig.
10. Open MV-04 allowing waste gas flow to main burner.
11. Observe main burner to ensure waste gas ignition. Adjust flame accordingly.
12. Do not touch main burner anytime following ignition.

Flaring from CMD

The following steps initiate after a target cylinder has been cut, a sample has been taken and the gas identified as a flammable gas and steps A and B above have been completed.

1. Rotate the target cylinder within the CMD to ensure that if any liquid is present, all of it has exited the cylinder into the CMD.
2. Connect a suitable conduit (flexible or rigid line) to the "Atmosphere" outlet of the CMD. This line will be standard hose used in flaring of typical flammable gasses such as hydrogen, propane, etc. Chemical incompatibility between the target gas and hose material should be evaluated on a case by case basis to ensure the hose does not

degrade while target gas is passing through it.

3. Route the conduit from the R&R, out of the environmental enclosure, to the flare waste gas inlet.
4. Pressure test the flare conduit and fittings.
5. Follow the instructions outlined in step C of this procedure as appropriate, noting that the CMD is now considered the target cylinder described in step C, instruction 8. The pressure regulator setting described in instruction 9 cannot be made until gas from the CMD is allowed to flow to the flare.
6. Open CMD outlet valve allow target gas to flow from the CMD to the flare.
7. Observe inlet pressure at the flare waste gas inlet gauge and verify that inlet pressure is at least one (1) psig. If pressure is below one psig, open CMD nitrogen inlet to allow nitrogen to flow into the CMD and increase pressure at the flare waste gas inlet. Allow nitrogen to flow only until waste gas inlet pressure reaches a maximum of ten (10) psig.
8. Allow flare to operate while continuously observing waste gas inlet pressure.
9. As pressure decreases near the one psig point, introduce nitrogen again up to a maximum where waste gas inlet pressure equals approximately ten psig.
10. Repeat step 9 a total of three additional times.
11. Following the nitrogen purge cycle, allow the waste gas pressure to drop as far as possible.
12. Shut down the flare.
13. The CMD may now be opened. As with normal operations, the high-flow scrubber should be used by the operator when the hatch is opened to sweep any residual vapors from the vessels forward section. Once this is complete, the operator may remove the target cylinder carcass from the CMD.

Recovery From Flame-Out

1. Close valves MV-01 and MV-04.
2. Open valve MV-01.
3. Ensure PCV-1 is set between 2-4 psig.
4. Adjust MV-02 to allow pilot re-ignition.
5. Depress the reset button on SV-01 and light the pilot burner (omit if striker used).
6. Continue to hold down the reset button on SV-01 for 30-45 seconds or until the pilot flame continues to burn when the reset button is released (omit if striker used).
7. Open valve MV-04 to main burner and observe to ensure waste gas ignition.

Note: The thermal oxidation unit comes equipped with a main burner bypass feed. The bypass feature may be employed under various conditions, including, but not limited to the following:

1. Mixtures - e.g. calibration gases
2. Marginally flammable gases
3. Main burner blockage or failure

Flammable Gas Flaring Procedure

Acknowledgment Form

I have read and understood all aspects of the Flammable Gas Flaring Procedure.

Name	Date

Appendix G

Project QC Manager's Resume and Appointment Letter

CH2M HILL
115 Perimeter Center Place, N.E.
Suite 700
Atlanta, GA
30346-1278
Tel 770.604.9095
Fax 770.604.9282

CH2MHILL
Constructors, Inc.

February 16, 2007

Ms. Phyllis Zerangue
CH2M HILL
1766 Sea Lark Lane
Navarre, FL 32566-7472

RE: Contract No. N62467-01-D-0331
Contract Task Order No. 0043
Naval Air Station (NAS) Pensacola – Pensacola, Florida
Project Quality Control Manager Letter of Appointment

Dear Ms. Zerangue:

Herein describes the responsibilities and authority delegated to you in your capacity as the Project QC Manager at NAS Pensacola, Contract Task Order (CTO) 0043 under RAC Contract No. N62467-01-D-0331.

In this position, you assist and represent the Program QC Manager in continued implementation and enforcement of the Project QC Plans. Your primary role is to ensure all requirements of the contract are met. Consistent with this responsibility, you will: (i) implement the QC program as described in the Navy RAC contract; (ii) manage the site-specific QC requirements in accordance with the Project QC Plans; (iii) attend the coordination and mutual understanding meeting; (iv) conduct QC meetings; (v) oversee implementation of the three phases of control; (vi) perform submittal review and approval; (vii) ensure testing is performed; (viii) prepare QC certifications and documentation required in the Navy RAC Contract; and, (ix) furnish a Completion Certificate to the Contracting Officer or designated representative, upon completion of work under a contract task order , attesting that "the work has been completed, inspected, and tested, and is in compliance with the contract."

Your responsibilities further include identifying and reporting quality problems, rejecting nonconforming materials, initiating corrective actions, and recommending solutions for nonconforming activities.

You have the authority to control or stop further processing, delivery, or installation activities until satisfactory disposition and implementation of corrective actions are achieved. You have the authority to direct the correction of non-conforming work. All work requiring corrective action will be documented on daily reports, and, in the event non-conforming work is not immediately corrected you are required to submit a non-conformance report to the PM and copy the Program QC Manager. A status log will be kept of all non-conforming work. You shall immediately notify the Program QC Manager in the event of any stop work order.

It is imperative that you comply with all terms of the basic contract. In particular, Section C, Paragraph 6.5.2, which states:

"No work or testing may be performed unless the QC Program Manager or Project QC Manager is on the work site."

In the event that you are not able to be at the work site when work or testing is to be performed, it is your responsibility to inform the Program QC Manager and Project Manager, in advance, so that other arrangements can be made.

Further, if you are requested to perform the duties of the Site Supervisor, it is your responsibility to inform the Program QC Manager so that approval can be obtained in advance from the Contracting Officer or designated representative, in accordance with Section C Paragraph 6.6.2.1 of the contract.

You are a key member of the Project Manager's team. You ensure that work meets the specific requirements and intent of the work plan, the Navy's scope of work and the basic contract. Should you have any questions regarding this role, you should immediately contact the Program QC Manager, Theresa Rojas. Your day-to-day activities on the site should be coordinated with all site personnel and the Project Manager. In event of any deficient items, the Superintendent and Project Manager should be advised immediately so they have opportunity to remedy the situation.

Sincerely,

CH2M HILL Constructors, Inc.

Michael Halil
Deputy Program Manager

cc: Greg Wilfley/ATL
Eric Burrell/ATL
Project File No: 333808

Phyllis A. Zerangue
Project QC Manager

Ms. Zerangue is QA/QC Manager and task manager for CTOs 071 and 088 for the Navy RAC. As task manager she is responsible for organizing and supervising a variety of tasks which include sampling, drilling, excavation and remediation system installation. She is Property Control Manager and Data Base Manager for AFCEE contracts managed in the Navarre office. Ms. Zerangue coordinates all field work on Eglin AFB, Hurlburt AFB, NAS Pensacola, and any other field work supported by the Navarre, Florida, office. The CH2M HILL Navarre office provides environmental, engineering, construction and management services for Eglin Air Force Base, Hurlburt Air Force Base, NAS Pensacola, and other government and private-sector clients in North West Florida. Environmental work accounts for a significant portion of the Navarre office's business base in the local area providing environmental restoration services.

Ms. Zerangue has experience in groundwater, surface water, soil, sediment and benthic sampling using a variety of techniques and equipment. In the past two years, she gained experience working on construction sites as QA/QC Manager assisting CCI Site Supervisors. Work included site sampling, excavation, remediation and restoration.

Prior to joining CH2M HILL, Ms. Zerangue was an Environmental Specialist with a manufacturer of acrylic fibers. This position included duties as laboratory manager (primary) and industrial permitting and safety management (secondary). The primary functions of the environmental laboratory were to analyze the wastewater and soil for contaminants produced in the production process. As laboratory manager for an industrial wastewater laboratory facility, Ms. Zerangue was responsible for organizing, operating and maintaining laboratory equipment for the environmental laboratory. Training new lab personnel, purchasing, and writing lab procedures were also included in the duties. The lab participated in split sampling with FDEP and other local labs as part of its Quality Assurance/Quality Control (QA/QC) practice. Parameters tested for include the following:

Nutrient Concentrations
Phosphates
Ammonia
Nitrate
Nitrite

Water Quality
pH
conductivity/salinity
turbidity
temperature
dissolved oxygen (DO)

Solids
dissolved
total

Others

Total Organic Carbon (TOC)
Total Inorganic Carbon (TIC)
Chlorides
Oil & Grease
Sulfates
Alkalinity
Cyanide

Dissolved oxygen testing included chemical oxygen demand (COD) and biological oxygen demand (BOD) of lagoon-water used in the biological treatment system.

Ms. Zerangue received training in industrial permitting (RCRA, Title V, and drinking water permitting) and safety management.

Education

B.S., Environmental Science, 1999
University of West Florida, Pensacola, Florida
Graduated Magna Cum Laude

A.A., Natural Resource Conservation
Pensacola Junior College, Pensacola, Florida

Training Courses

2003 – Fire Training
2002/03 - 8 hour refresher
2002/03 - First Aid and CPR
2002 – Hydric Soils and Wetland Delineation Conference
2001 – FDEP workshop, Freshwater Sediment Quality Assessment
2001 – Quality Control Orientation (NRAC)
2001 – Environmental Sampling and Testing (NRAC)
2001 – Environmental Regulations Course, Lion Technology Inc.
2001 – 40 Hour HAZWOPER Certified
2001 – Risk Management and Quality Control
2001 – First Aid and CPR trained, American Red Cross
2000 – ISO 9000
1999 – EPA Safety Training
1999 – Wetland Plant Identification
1999 - Co-writer of an Environmental Impact Study of the Fort Pickens area
1997 – Statistical Analysis

Lab Equipment Experience

Total Organic Carbon Analyzer (TOC)
TOC and TIC
Nitrogen Analyzer
pH Meter
Spectrophotometer

Analytic Balance
Turbidity Meter
Flowcytometer
Gas Chromatograph
Autoclave
Centrifuge
Stirring plates and burners
Dissolved Oxygen Meter (BODs)
Microscopes
*Stero
*compound
Pipettes and Pipettors

Methodology

Winkler titration
Kjeldahl Digestions
Nesslerization

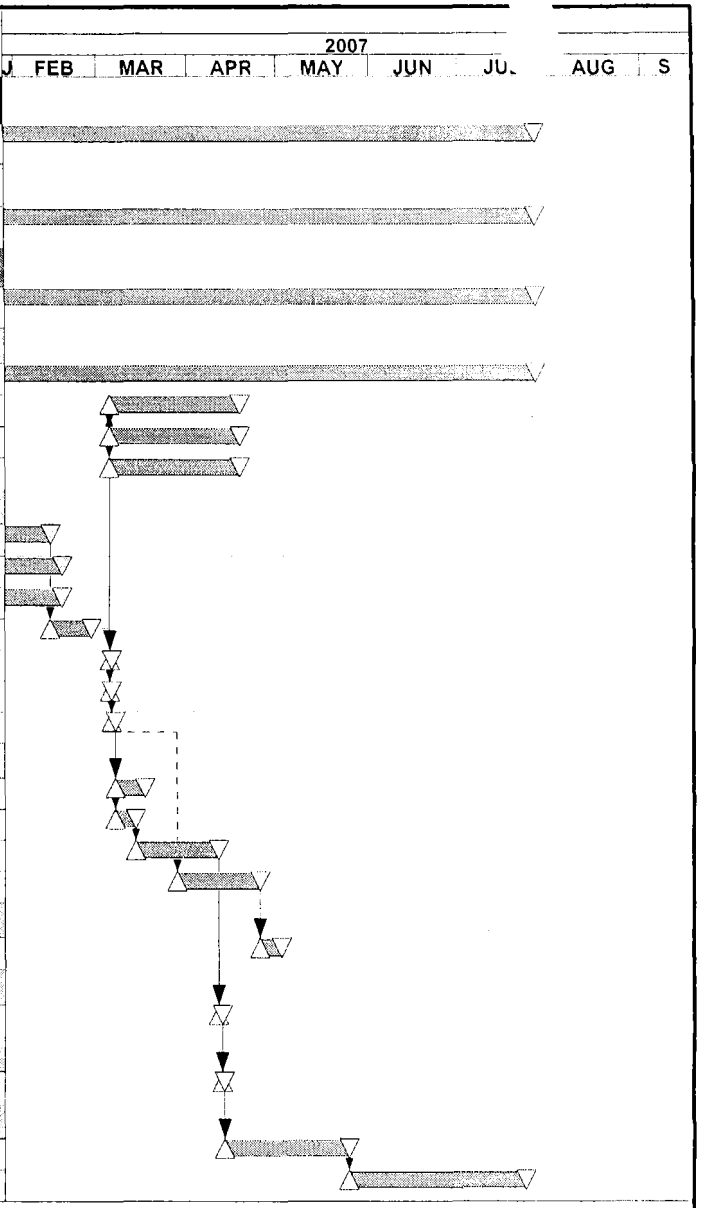
Field Equipment Experience

Organic Vapor Analyzer (OVA)
Water Quality Meter: Horiba U-22 & U-10
Oxygen Meter: YSI
Water Level Indicator
Turbidity Meter (HACH)
Peristaltic & Submersible Pumps
Gas Monitor: GasTech
Global Positioning System (GPS)
Data Logger
Oil/Water Interface Probe
Ponar Dredgr
Sieves and Augers

Appendix H

Project Schedule

Activity ID	WBS	% Comp	Activity Description	Orig Dur		Early Start	Early Finish
CTO #0043 NAS PENSACOLA							
Total		16		153	127	20DEC06A	26JUL07
PHASE 3							
Subtotal		16		153	127	20DEC06A	26JUL07
GAS CYLINDER REMOVAL							
Subtotal		16		153	127	20DEC06A	26JUL07
PROJECT MANAGEMENT							
BG98220103	99.22.01.03	12	CCI Management Office Off-site	157	127	02JAN07A	26JUL07
BG98220101	99.22.01.01	0	CCI Project Management Field	32	32	05MAR07*	17APR07
BG98220102	99.22.01.02	0	CCI Management - Office On-site	32	32	05MAR07	17APR07
BG99220425	99.22.04.25	0	QA/QC Audit	32	32	05MAR07	17APR07
MOBILIZATION & PREPARATORY WORK							
BG32010338	32.01.03.38	30	Air Permit Exemption	30	11	20DEC06A	12FEB07
BG32010313	32.01.03.13	50	Work Plan	30	15	05JAN07A	16FEB07
BG32010390	32.01.03.90	50	Sub's Pre-Con Submittals	30	15	05JAN07A	16FEB07
BG3201039		0	Air Permit Exemption Approval	10	10	13FEB07	26FEB07
BG32010101	32.01.01.01	0	Subcontractor Mobilization	1	1	05MAR07	05MAR07
BG98010291	99.01.02.91	0	CCI Mobilization	1	1	05MAR07	05MAR07
BG98010401	99.01.04.01	0	Initiate Job-Site Presence	1	1	06MAR07	06MAR07
SAMPLING & ANALYSIS							
BG32029090	32.02.90.90	0	Reacquire Anomalies	8	8	07MAR07	16MAR07
BG98010402		0	Site Set-up	5	5	07MAR07	13MAR07
BG32079090	32.07.90.90	0	Excavation/Recovery/Sampling	20	20	14MAR07	10APR07
BG32020905	32.02.09.05	0	Waste Characterization	20	20	28MAR07	24APR07
TRANSPORTATION AND DISPOSAL							
BG32192201	32.19.22.01	0	Off-Site T&D	5	5	25APR07	01MAY07
SITE RESTORATION							
BG32200402	32.20.04.02	0	Sodding	1	1	11APR07	11APR07
DEMOBILIZATION							
BG98210590	99.21.05.90	0	Demobilization	1	1	12APR07	12APR07
REPORTING							
BG32210606	32.21.06.06	0	Sub's Submittals	30	30	13APR07	24MAY07
BG32210607	32.21.06.07	0	Construction Documentation Report	40	40	25MAY07	23JUL07



Start Date	03JAN06
Finish Date	26JUL07
Data Date	27JAN07
Run Date	19FEB07 09:18

Early Bar
Progress Bar

RAC4 - CO43 Sheet 1 of 1

CTO #0043 NAS PENSACOLA
CTO COMPLETION SCHEDULE
NAVY RAC SOUTHERN DIVISION

CH2MHILL