



**US Army Corps of Engineers
Kansas City District**

Final Accident Prevention Plan

(Revision 1)

**Slag Distribution Study
Raritan Bay Slag Superfund Site
Old Bridge/ Sayreville, New Jersey**

**USACE Contract No. W912DQ-08-D-0018
Task Order No. 018**

August 2010

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AUGUST 2010

Prepared for:



**U.S. Army Corps of Engineers
Kansas City District**

Prepared by:

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Acronyms and Abbreviations

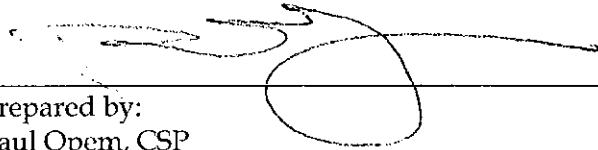
%	percent
ADCP	Acoustic Doppler Current Profiler
AHA	activity hazard analysis
ANSI	American National Standard Institute
APP	accident prevention plan
CDM	CDM Federal Programs Corporation
CFR	Code of Federal Regulations
CHSM	corporate health and safety manager
COE	U.S. Army Corps of Engineers
CPR	cardiopulmonary resuscitation
GPS	global positioning system
HSP	Health and Safety Program
IDLH	immediately dangerous to life or health
IDW	investigation-derived waste
MSDS	Material Safety Data Sheet
MSHA	Mine Safety & Health Administration
NIOSH	National Institute of Safety and Health
OSHA	Occupational Safety and Health Administration
PFD	personal flotation device
PID	photoionization detector
PPE	personal protective equipment
RI	remedial investigation
RPM	remedial project manager
SCBA	self-contained breathing apparatus
SHASP	site health and safety plan
SHSO	site health and safety officer
U.S.	United States

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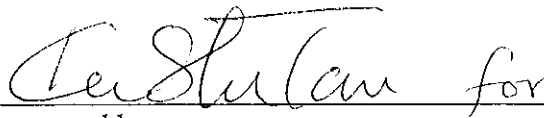
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Contract Number: W912DQ-08-D-0018



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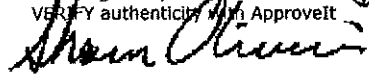


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VERIFY authenticity with ApproveIt



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Date

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Section 1

Introduction

1.1 Plan Preparations

This Accident Prevention Plan (APP) was developed for performing test trenching and soil sampling activities and *the early Remedial Investigation (RI) activities* at the Raritan Bay Slag Superfund Site located in Raritan Bay, New Jersey. *Early RI activities include the following: topographic and bathymetric surveys; a slag survey; hydrogeologic assessment; and sediment dynamics data collection.* This project is being performed for the United States (U.S.) Army Corps of Engineers under Contract Number: W912DQ-08-0018. This APP was developed in accordance with U.S. Army Corps of Engineers (COE) EM 385-1-1 (COE 2003).

The APP was approved by Shawn Oliveira, CDM Federal Programs Corporation (CDM) Director of Health and Safety Programs (HSP) 406-293-1547.

This Plan was prepared by Paul Opem, Health and Safety Manager, 303-383-2483.

This Plan was approved by Jackie Mosher, Program Manager, 816-444-8270.

Plan concurrence provided by Shawn Oliveira, Corporate Health and Safety Manager (CHSM).

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Section 2

Background Information

2.1 Project Information

Contractor: CDM

Contract Number: W912DQ-08-0018

Project Name: Raritan Bay Slag Distribution Study and *early RI activities*, Raritan Bay Slag Superfund Site

The scope of work includes performing: *topographic and bathymetric surveys; a slag survey; hydrogeologic assessment (stratigraphic boring; monitoring well drilling and installation; groundwater-surface water data collection; synoptic water level measurements; redevelopment of existing monitoring wells; current and sediment data collection)*; and test trenching, soil sampling, air monitoring, and fence maintenance.

Field activities to be performed include the following Definable Features of Work:

Topographic and Bathymetric Surveys

- *Using global positioning system (GPS) equipment to measure monitoring well locations*
- *Using depth sounding equipment to collect water depth measurements*

Slag Survey

- *Walking onshore or observing by boat the seawall and jetty slag distribution. Locations may be recorded with photographs and GPS.*
- *Probing for slag along seawall and jetty with hand tools (e.g., slambar, pick, shovel)*

Test Trenching

- *Excavating 30 test trenches, approximately 8-10 feet in depth and 20-30 feet in length*
- *Recording soil and slag encountered by visual observation*
- *Collecting soil samples from the excavated material*
- *Returning excavated soil to the same trench*
- *Decontaminating the backhoe bucket used during excavation*
- *Air Monitoring*

Monitoring Well Installation & Stratigraphic Boring

- *Drilling and well installation*
- *Performing air monitoring with a DataRAM to measure airborne particulate concentrations during trenching activities*
- *Collecting split-spoon samples and monitoring with a photoionization detector (PID) during stratigraphic boring*

Groundwater-Surface Water and Synoptic Water Level Data Collection

Existing Monitoring Well Redevelopment

- *Well development and groundwater sampling*

Current and Sediment Data Collection

- *Using an Acoustic Doppler Current Profiler (ADCP) to measure currents and sediment dynamics*
- Fence Maintenance
- Inspecting the fenced border between the work areas and a public park; repairing fence materials as needed

2.2 Activity Hazard Analysis

Field activities for this project requiring AHA may include:

- *Topographic and Bathymetric Surveys*
- *Slag Surveys*
- *Drilling and Well Installation*
- Test Excavation/Trenching
- Air Monitoring
- *Groundwater-Surface Water and Synoptic Water Level Data Collection*
- *Monitoring Well Development*
- *Current and Sediment Data Collection*
- Fence Maintenance

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Section 3

Statement of Health and Safety Policy

3.1 Health and Safety Philosophy

CDM's HSP is guided by the belief that our people are our greatest asset and that every employee's health and safety must receive top priority and support. CDM accepts ultimate responsibility for the prevention of occupationally related injuries and illnesses as an integral part of the firm's goals for quality service to clients, growth, and profit. CDM accepts full responsibility for its HSP in order to protect our greatest asset, which is our employees.

CDM will maintain a HSP designed to minimize the number of injuries and illnesses, with an ultimate goal of zero accidents and injuries. CDM's program will be equal or superior to the standard of practice in our industry. The firm, guided by management, shares responsibility for health and safety and will provide the appropriate supervision, training, and protective equipment to keep its employees safe and healthy, and to protect its client's property and interests. Full participation by all CDM employees is crucial to the overall success of the program.

3.2 Health and Safety Principles

To guide our employees in understanding and adhering to the company's HSP, CDM's health and safety goals can be summarized by the following principles. Our firm believes that:

- Occupationally caused injuries and illnesses are preventable.
- Preventing occupationally caused injuries and illnesses is one of our highest responsibilities.
- Providing safe working conditions in the office and in the field requires commitment from all involved parties.
- Employees have a right to information and training.
- Working safely is a condition of employment and a shared responsibility between management and staff.

Neither CDM nor its projects can succeed unless injuries and exposures are mitigated, managed, and prevented.

3.3 Health and Safety Expectations

All employees share the following responsibilities and expectations to implement the HSP effectively and prevent injuries, including:

- Learning and understanding the hazards of the tasks expected
- Following the guidelines and procedures outlined at safety meetings and safety training courses, and the instruction of supervisors
- Reporting unsafe conditions or practices and offering suggestions to maintain a safe work site

Section 3
Statement of Health and Safety Policy

- Inspecting equipment, tools, and work areas and maintaining safe working conditions by repairing and reporting deficiencies
- Reporting all injuries, illnesses, falls, and near misses to the site health and safety officer (SHSO) and project manager immediately
- Maintaining proper and positive health and safety attitudes during the performance of all tasks associated with project activities
- Advising the project manager and SHSO of any required medication to be taken during the performance of any site activity

Each employee and subcontractor must successfully implement the guidelines and procedures discussed in the CDM Health and Safety Manual. Employees and subcontractors can void the efforts and intentions of the CDM Health and Safety Manual by choosing to use unsafe work practices. It often takes only one bad decision to result in injury and erase the accident prevention efforts of many others.

Section 4

Responsibilities

4.1 Identification and Accountability of Personnel Responsible for Safety

CDM maintains responsibility for the implementation of a HSP. The following personnel have specific responsibilities to implement and manage the HSP:

- Project Manager (Edward Leonard) is responsible for managing all concerns identified by the SHSO, subcontractors, or client relative to the HSP
- The CHSM (Shawn Oliveira) is responsible for implementing all corporate HSP requirements
- The CDM SHSO (Edward Kulkusky) will be primarily responsible to oversee safety on a day-to-day basis during sampling activities. The SHSO will conduct tailgate safety meetings for all personnel on site at the beginning of field activities and daily thereafter. During the tailgate safety meetings, the SHSO will review all AHAs that coordinate to daily tasks
- A Competent Person shall be designated for work activities in accordance with Occupational Safety and Health Administration (OSHA) and EM 385-1-1 requirements. No work will be performed unless a designated competent person is present on the job site. Competent Persons are subject to change **and** shall be identified in the AHAs; **the names and proof of competencies for boat operators and drillers shall be provided to CDM prior to the start of any related activities.**

Resumes for the CHSM, SHSO, and Competent Persons are attached in Appendix F.

4.2 Lines of Authority

Overall accountability for implementing and enforcing this APP lies with the CDM CHSM. Day-to-day onsite accountability is delegated to the SHSO. Each CDM employee is responsible for performing the tasks assigned to him/her in this APP. Subcontractor competent persons/supervisors are also responsible for implementing and enforcing this APP and report directly to the CDM Project Manager and CHSM.

4.3 Employee Health and Safety Rules Non-Compliance

CDM has a zero tolerance policy. Employees who violate the HSP will be issued a Notice of Safety Infraction and Warning (form provided in Appendix A). Employees who knowingly or willfully violate HSP rules shall be subject to discharge without prior warning.

When a Notice of Safety Infraction and Warning is issued to an employee, a copy will be forwarded to their employer. A Notice of Safety Infraction and Warning may be issued to the contractor supervisor for not enforcing the HSP rules with the employees under their supervision. Employees terminated for violation of project health and safety rules shall not be eligible for rehire for the duration of the project.

Section 4
Responsibilities

- Discipline for each violation will result in an incremental discipline process per employee as follows:
 1. First violation will result in a written warning followed by mandatory AHA retraining for the individual and foreman (however, any flagrant violation will result in immediate removal from the site [and from CDM]).
 2. Second violation (of any kind) within a four month period will result in a 2 day suspension from site (without pay) followed by mandatory AHA retraining for the employee and foreman.
 3. Second violation within 2 weeks or third violation (of any kind) within a 6 month period will result in the employee's permanent removal from the site (and from CDM) and a written warning to the foreman.
- A second employee permanently removed from the site for a particular foreman will result in a two day suspension (without pay) for the foreman.
- A third employee permanently removed from the site for a particular foreman will result in the foreman's permanent removal from the site (and from CDM).

Section 5

Subcontractors and Suppliers

5.1 Identification of Major Subcontractors and Suppliers

Subcontractors to CDM for this project shall include those for: excavating and trenching; managing investigation-derived waste (IDW); and performing fence maintenance. This section will be updated as information becomes available and the subcontractors are identified.

5.2 Means of Controlling and Coordinating Subcontractors and Suppliers

Subcontractors and suppliers are to sign a contract and/or purchase order agreeing to follow all safety procedures contained within this APP. Field activities will be monitored to ensure compliance with the contract-mandated safety requirements for the project.

5.3 Safety Responsibilities of Subcontractors and Suppliers

Subcontractors and suppliers shall adhere to the APP and safety meetings.

Specific requirements for motorboat operators and drilling equipment operators are detailed in Sections 9.6.16 (Working Near or Over Water) and 9.6.17 (Safely Working Around Drill Rigs).

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Section 6

Training

6.1 Subjects to be Discussed with Employees in Safety Indoctrination

A site specific safety orientation will be provided to all new hires, and project personnel by the SHSO prior to starting work that shall include the following topics:

- Personal Protective Equipment
- Driving Practices
- First Aid
- Fire Prevention
- Emergencies
- Horseplay
- Substance Abuse
- Hazard Communication
- *Working Over or Near Water*
- Trenching
- Soil Sampling
- Heavy Equipment
- Lead Awareness
- Possible Other Contamination (e.g., arsenic, copper, etc.)
- Air Monitoring
- Hand Tools; and
- Investigation-derived waste (IDW)

6.2 Mandatory Training and Certifications Applicable to this Project

Prior to working onsite, all new and existing employees and subcontractor personnel will be trained in the issues identified above. *All required licensing and training for subcontractor personnel will be confirmed prior to subcontract award.*

Periodic safety training sessions will be conducted by the SHSO to address upcoming hazards. Additionally, the appropriate competent supervisor will train existing employees whenever new hazards are introduced to the work site.

All CDM employees performing field activities for this project will have 40-Hour HAZWOPER certification, and First Aid training. CDM subcontractors will also have the 40-Hour HAZWOPER certification.

Emergency response training will be provided to all employees on the jobsite and will be reviewed frequently during tailgate safety meetings.

The SHSO will facilitate supervisory and employee safety meetings.

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Section 7

Health and Safety Inspections

7.1 Inspections

Jobsite safety inspections will be performed daily by the SHSO; proof of the SHSO's training/qualifications will be available onsite. The SHSO will conduct inspections randomly without advance notice. The inspections will be documented appropriately, with identified health and safety issues and deficiencies, subsequent actions, timetables, and responsibilities for correcting the deficiencies included. Deficiencies, depending on severity, may require immediate remediation.

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Section 8

Accident Reporting

8.1 Reporting

All injuries, occupational illnesses, accidents, and unsafe conditions are to be investigated by the contractor's safety representative and the SHSO. The safety representative will report any occurrences to the SHSO immediately. The SHSO will report the following accidents to the Contracting Officer as soon as possible but no later than 24 hours following the event:

The following events require immediate notification to the Contracting Officer:

- A fatal injury
- A permanent total disability
- A permanent partial disability
- The hospitalization of three or more people resulting from a single occurrence
- Property damage of \$200,000 or more

CDM shall complete a thorough investigation of the accident and submit the investigation's findings, along with appropriate corrective actions, to the Contracting Officer in the prescribed format within five calendar days of the accident.

For a weight-handling equipment accident, the contractor's safety representative and the SHSO will conduct an accident investigation to establish the root cause(s) of the accident, complete an Initial Injury - Illness Report, and provide it to the Contracting Officer within 30 calendar days of the accident. In the event of a serious injury, fatality, property damage accident, or any damaging fire, CDM shall be immediately notified regardless of the day or hour. CDM will notify the Contracting Officer, or representative (Remedial Project Manager [RPM]) of any such occurrences as soon as possible but no later than within four hours.

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Section 9

Plans (Programs and Procedures) Required by the Safety Manual

9.1 Emergency Response Plan

The purpose of this plan is to detail the procedures that are to be followed in the event of an emergency. The following plan components as listed in Section 9 of EM 385-1-1 were considered as part of preparing this APP, but were determined to not be necessary or applicable to the type of work being performed:

- Layout Plan (04.A.01)
- Man Overboard/Abandon Ship (Section 19.A.04)
- Process Safety Management Plan (06.B.04)
- Lead Abatement Plan (06.B.05 & specifications)
- Access and Haul Road Plan (4.B)
- Asbestos Abatement Plan (06.B.05 & specifications)
- Radiation Safety Program (06.E.03.a)
- Abrasive Blasting (06.H.01)
- Crystalline Silica Monitoring Plan (Assessment) (06.M)
- Night Operations Lighting Plan (07.A.08)
- Wild Land Fire Management Plan (09.K)
- Excavation/Trenching Plan (25.A.01)
- Hazardous Energy Control Plan (12.A.01)
- Critical Lift Plan (16.H)
- Float Plan (19.F.04)
- Site-Specific Fall Protection & Prevention Plan (21.C)
- Demolition Plan (to include engineering survey) (23.A.01)
- Emergency Rescue (tunneling) (26.A.)
- Underground Construction Fire Prevention and Protection Plan (26.D.01)
- Compressed Air Plan (26.I.01)
- Formwork and Shoring Erection and Removal Plans (27.C)
- PreCast Concrete Plan (27.D)
- Lift Slab Plans (27.E)
- Steel Erection Plan (27.F.01)
- Blasting Safety Plan (29.A.01)
- Diving Plan (30.A.13)
- Confined Space Program (34.A)

9.1.1 Emergency Coordinator

If a hazardous substance leak, fire, release, or any other emergency condition should occur, the appropriate personnel listed in this plan will be immediately notified. The list will be updated whenever changes occur.

The SHSO will be responsible for emergency coordination activities. A supervisor will be designated by subcontractors prior to the start of work and will act as the primary

emergency coordinator in the absence of the SHSO during emergency situations. The SHSO/supervisor will be familiar with all aspects of the site emergency response plan, all operations and activities at the Site, the location and characteristics of hazardous substances handled, the location of all records, and the site layout. The SHSO and designated alternates have the authority to commit all the necessary resources needed to implement the emergency response plan.

Personnel training will be conducted by the SHSO or a qualified representative through initial briefings and periodic review for all personnel involved in site activities. Training elements will include an overview of the facility, detailed instructions on site-specific operations, and the use of emergency equipment such as first aid kits, fire extinguishers, and two-way radios if alternate communication is needed. Emergency response plan training will be documented and filed onsite.

9.1.2 Medical Emergencies

Emergency first aid treatment may only be administered by trained individuals. The purpose of treatment is to maintain life and/or prevent further injury until professional treatment can be obtained.

Emergency contact number is 911 for all medical emergencies. Personnel will have a cell phone with them while in the field and will review availability of service prior to starting work activities. A map with directions to the closest hospital is located in Appendix B.

9.1.3 Evacuation and Communications

When an evacuation is necessary, all field team members will go to the designated assembly point. This area will be located upwind of the Site and will be dependent on the normal prevailing wind. The SHSO will designate any other assembly points at the morning safety meeting, as appropriate.

All emergency communications will be conducted by direct vocal communication. If employees work on multiple areas concurrently, communication between employee groups will be by means of cell phones or hand-held radios.

9.1.4 Medical Support

Onsite Responsible Personnel

The following personnel are responsible for onsite medical duties:

- SHSO/Superintendent (First Aid/CPR)

Offsite Medical Facility

Bayshore Community Hospital
727 North Beers Street
Holmdel, New Jersey 07753
732-739-5900
Emergency 911

Emergency plans to ensure employee's safety in case of fire or other emergencies will be reviewed with all employees.

Emergency Medical Support

In the event of an accident requiring first aid, the site SHSO will be responsible for coordinating the first aid and/or requesting aid from a medical service. If the person requiring attention is capable of being moved without further injury, the site SHSO may transport the injured party to obtain medical assistance. Site support vehicles may be used to transport injured or ill personnel. Directions and maps showing the routes to the medical facility will be located in all vehicles. As aforementioned, the site SHSO will have CPR and first aid training. Depending on the seriousness of the injury, treatment may be given at the site by trained response personnel. Emergency first aid equipment, such as a first aid kit, will be in the vehicle onsite. For more serious injuries, additional assistance may be required at the site, or the victim may have to be treated at a medical facility.

9.1.5 Fire Emergencies

Every member of the field team will be responsible for observing and reporting any fire, and conditions that could potentially lead to fires.

If an employee observes a fire, the employee may attempt to quench the fire with a fire extinguisher if one is readily available. If the fire cannot be readily extinguished, the employee will notify all personnel on site to evacuate the area immediately. All onsite personnel shall convene at the reassembly point identified by the SHSO, who in turn will immediately notify the fire department and the primary emergency coordinator.

When an employee observes a condition that potentially increases the chance for a fire, the employee will immediately inform the SHSO of the condition. The SHSO will immediately cease any field activity that increases the risk of fire until appropriate controls are in place. The SHSO, with the advice of the primary emergency coordinator, is responsible to take whatever actions are necessary, including withdrawal from the area to eliminate or reduce the hazardous condition.

9.2 Alcohol and Drug Abuse Plan

CDM is committed to providing employee health and safety for all work being performed. As such, and in recognition of the problem of illegal drug, alcohol, and controlled substance abuse in our society and their potential for adverse, negative impacts on our commitment; the use, possession, distribution, or presence in the body of illegal drugs, alcohol, controlled substances, or their metabolic products is prohibited and will not be tolerated.

The objective of this policy is to provide a safe, healthy, and efficient work environment for the company's employees, business associates, and the public. To accomplish this, management will utilize every measure available to maintain an environment that is free from the effects of illegal drugs, alcohol, and controlled substances.

9.3 Hazard Communication Program

The following programs and procedures are from the *CDM Health and Safety Manual 2004*.

OSHA Standard 29 Code of Federal Regulations (CFR) 1910.1200, *Hazard Communication Standard and EM 385-1-1, 06.B.01*, requires that all employees handling or using materials which may be hazardous be advised and informed as to the hazard potential associated with those materials. The following sections outline CDM's program designed for compliance with the scope and intent of the standard. The main elements of this program include a health and biological surveillance program, employee education and training program, and employee exposure determination program. It is only through the proper implementation and maintenance of such programs that maximum employee health and safety protection can be assured.

The CDM CHSM has overall responsibility for implementation of the hazard communication program.

9.3.1 Material Safety Data Sheets

A Material Safety Data Sheet (MSDS) is an information sheet that provides specific identification information about a chemical or material. The MSDS information may include:

- Ingredients and hazards
- Physical data
- Fire and explosion information
- Reactivity data
- Health hazard information
- Spill risk and disposal procedures
- Special protection information
- Special precautions required for use

It is the manufacturer's responsibility to provide this information for any materials containing hazardous or potentially hazardous ingredients.

Prior to any project startup, it is the SHSO's responsibility to ensure that MSDSs are available for any material, expected to be utilized or encountered during project work, that represents a potential health and safety hazard to CDM employees through possible exposure.

Copies of all MSDSs for materials expected to be utilized or encountered during project work are to be available at each project site, and each employee is to be made aware that these exist and are available. Use a chemical inventory list to organize the MSDS notebook. This form can serve as the table of contents for the MSDS book.

9.3.2 Labels

It is the responsibility of the SHSO to ensure that all potentially hazardous materials brought to a project site are labeled as to the contents of each container and the appropriate usage of hazard warnings.

9.3.3 Non-routine Tasks

When employees are required to perform hazardous non-routine tasks including confined space entry, line breaking, or tank cleaning, a special training session will be conducted to inform those employees of the hazardous materials to which they may be exposed and the proper procedures and personal protective equipment to be utilized to minimize exposure potential.

9.3.4 Education and Training

Prior to any field project startup, a pre-project training session must be conducted with all employees involved in project work. Included in this training session are the following:

- An overview of the hazard communication requirement
- A review of the chemicals present and anticipated to be encountered during the course of the project
- Identification of the location and availability of the written hazard communication program, the inventory of chemicals expected to be utilized or encountered, and the MSDSs for those materials
- Discussion of the methods and observation techniques that may be used to detect the presence of a release of hazardous chemicals in the work area
- Discussion of how to lessen or prevent exposure to hazardous workplace chemicals;
- Instruction in emergency procedures to follow if employees are exposed to hazardous chemicals
- An explanation of the hazard communication program including how to read labels and MSDSs to obtain appropriate hazard information
- An explanation of the proper use of personal protective equipment (PPE)

9.3.5 Informing Other Employees

To ensure that the employees of subcontractors have access to information on the hazardous chemicals at a project site, it is the responsibility of the SHSO to provide the following information:

- The location of the MSDSs
- The name and location of the hazardous chemicals to which employees may be exposed and the appropriate protective measures
- An explanation of the labeling system

9.4 Respiratory Protection

Respiratory protection is not anticipated to be required during these field activities. Should conditions change, CDM H&S personnel will reevaluate the need for

respiratory protection and the types of equipment needed. The following section is provided for reference purposes.

To protect the health and safety of CDM employees and subcontractors, an awareness of the proper selection, use, and maintenance of respiratory protective devices is needed. These guidelines are applicable to all employees performing duties requiring the use of respiratory protection.

9.4.1 Definitions

Some commonly used terms utilized when describing respiratory devices and agents are described in the following list:

- Approved, tested, and listed as satisfactory by the National Institute for Occupational Safety and Health (NIOSH) or the Mine Safety and Health Administration (MSHA)
- Contaminant. A harmful, irritating, or nuisance material in concentrations exceeding those normally found in the ambient air
- Disinfections. The destruction of pathogenic organisms, especially by means of chemical substances
- Immediately Dangerous to Life or Health (IDLH). An atmospheric concentration of any toxic, corrosive, or asphyxiate substance that poses an immediate threat to life, would cause irreversible or delayed adverse health effects, or would interfere with an individual's ability to escape from a dangerous atmosphere
- Oxygen-Deficient Atmosphere. An atmosphere containing 19.5 percent (%) or less of oxygen by volume
- Particulate Matter. A suspension of fine solid or liquid particles or fibers in air such as dust, fog, fume, mist, smoke, or sprays
- Pneumoconiosis-Producing Dust. Dust which, when inhaled, deposited, and retained in the lungs may produce signs and symptoms of pulmonary disease
- Respirator. An approved device designed to provide the wearer with respiratory protection against inhalation of a contaminated atmosphere and, for some devices, oxygen-deficient atmospheres
- Vapor. The gaseous state of a substance that is solid or liquid at an ordinary temperature and pressure
- Dusts. Solid particles, mechanically produced, with a size ranging from submicroscopic to macroscopic
- Fumes. Solid particles generated by condensation from the gaseous state, generally after volatilization from molten metals, with a size usually less than one micrometer in diameter;
- Mists. Suspended liquid droplets generated by condensation or by breaking up of a liquid with a size ranging from submicroscopic to macroscopic
- Gases. Substances those are gaseous at ordinary temperature and pressures

9.4.2 General Requirements

Respirators will be considered an acceptable method of protecting the health of CDM personnel only under the following circumstances:

- When it has been determined that there are no feasible engineering or work practice controls that can be used to adequately control the hazard
- During intermittent, non-routine operations
- During interim periods when engineering controls are being designed or installed;
- During emergencies
- As part of a safety procedure where a possibility for an excessive or potentially hazardous condition has been defined
- When the site atmosphere contains at least 19.5 % and not more than 23.5 % oxygen; and
- When contaminants of concern, which must be discernable by the wearers, have warning properties below permissible exposure limits or threshold limit values, or the selected respirator provides the proper level of protection for reasonable anticipated exposure levels

The multiplicity of hazards that may exist in a given operation requires a careful and intelligent respirator selection. The selection is made complex by the many types of respirators available. Each type has its special limitations, application, operational, and maintenance requirements. For these reasons it is important that the individual responsible for the respiratory program is trained and knowledgeable in the basic principles of respiratory selection and use.

The standards governing the development of this program include but are not limited to the following:

- American National Standard Institution (ANSI), Practices for Respiratory Protection, Z88.2-1992
- OSHA, Respiratory Protection, 29 CFR 1910.134
- United State Army Corps of Engineering EM 385-1-1, 06.I

9.4.3 Medical Surveillance

Employees will not be assigned to tasks requiring the use of respiratory protection unless they have been determined to be physically able to wear such equipment in accordance with the Medical Surveillance Program described in Section 10 of the CDM Health and Safety Manual.

9.4.3.1 Selection of Respiratory Protective Devices

Selection of respiratory protective devices for projects which require the use of such PPE is performed during the generation of the site-specific APP and SHASP, as described in Section 8 of the CDM Health and Safety Manual. When selecting the correct respiratory protective devices, there are several factors that must be considered, including the:

- Nature of the Hazard. Before selecting a respirator, the nature of the inhalation hazard must be identified. Oxygen deficiencies, physical hazards, chemical properties, movement and work rate limitations, and actual chemical concentrations and warning properties are all factors that must be considered.
- Nature of Operation. The details of the actual operation or process creating the hazard are important in selecting appropriate respiratory protection.

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- **Respirator Capabilities and Limitations.** There are limitations associated with each type of respiratory protection devices. These limitations are discussed in Table 9-2.
- **Responsibility of Correct Selection.** The CHSM is responsible for the correct selection of respiratory protective devices. Generally speaking, when Level C personal protective equipment is required, it will consist of a full-face respirator with an MSA GMC-H, NIOSH approval number TC-23C-1283 cartridge, or equivalent. When supplied air respirators are required, they will be equipped with emergency escape bottles.

See Table 9-1 for a description of protection factors used in the selection process. The descriptions and limitations of respiratory protection devices included in Table 9-2 are extracted from 30 CFR 11.

Table 9-1 Respiratory Protection Factors*	
Respirator	Protection Factor
I. Particulate Filter Respirators	
- Powered air-purifying respirator with high-efficiency particulate filter (full-face)	1,000
- High-efficiency particulate filter respirator with a full face piece	100
- High-efficiency particulate filter respirator with a half face piece	10
II. Chemical Cartridge and Gas Masks	
- Powered air-purifying respirator with chemical cartridge (full-face)	1,000
- Chemical cartridge respirator with a full face piece	100
- Half-mask chemical cartridge respirator	10
III. Combination Particulate and Gas/Vapor Air Purifying	
- Powered air-purifying respirator with chemical cartridge and high efficiency particulate filter (full-face)	1,000
- Chemical cartridge respirator with a full face piece, chemical cartridge, and filter	100
- Half-mask chemical cartridge respirator with a chemical cartridge and filter	10
IV. Supplied-Air Respirators	
- Type C supplied-air respirator with a full face piece operated in pressure-demand or other positive pressure mode, or with full face piece, helmet, or hood operated in continuous flow	1,000
- Type C supplied-air respirator without full face piece, helmet or hood, operated in pressure-demand or other positive pressure or continuous flow mode	1,000
- Supplied-air respirator with full face piece helmet, or hood not operated in positive pressure or continuous mode	50
- Any other supplied-air respirator	10
V. Self-Contained Breathing Apparatus	
- Combination respirator including a Type C supplied-air respirator with a full face piece operated in pressure-demand or other positive pressure or continuous flow mode and an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode	10,000
- Self-contained breathing apparatus with a full face piece operated in pressure-demand or other positive mode	10,000
- Self-contained breathing apparatus with a full face piece operated in demand mode	50
- Self-contained breathing apparatus without a full face piece	10
<i>Footnote:</i>	
*Adapted from ANSI Z88.2-1992	
<i>Definition:</i> Ratio of contaminant concentration outside respirator to inside.	
<i>Use:</i> Allows calculation of maximum use concentration in which a particular type of respirator will provide adequate protection to wearer [i.e., (permissible exposure limit) x (permissible factor) = maximum use concentration].	

Table 9-2 Respiratory Protection Devices		
General Description	Limitations	CDM Requirements
Air Purifying Respirators		
A half-mask or full face piece respirator equipped with air purifying units to remove gases, vapor, and particulate matter from the ambient air prior to its inhalation. Some air purifying respirators are power-operated and provide respirable air to the face piece (or hood) under a slight positive pressure.	They do not protect against oxygen deficient (<19.5%) atmospheres or atmospheres that are immediately dangerous to life and health (IDLH). The method of purification is generally chemical or chemical group specific so they cannot be used in atmospheres that contain unknown concentrations of unknown materials. They cannot be used in atmospheres containing chemicals that present a health risk below their odor or taste thresholds. The useful life of this type of respirator is limited to the concentrations of contaminants, the breathing demand of the wearer, and the removal capacity of the purification medium.	When Level C respiratory protection devices are specified, they will consist of a full-face respirator with an MSA GMC-H (NIOSH approval number TC-23C-1283) cartridge or equivalent. Alternative respirators and cartridges must be approved by the CHSM.
Atmosphere-Supplying Respirators		
A respirable atmosphere is supplied independent of the ambient air surrounding the wearer. These devices provide protection against oxygen deficiency and most toxic atmospheres.	Some limitations of atmosphere supplying respirators include time limitations of supplied air, bulkiness of equipment, and inherent safety hazards associated with working while dragging an air line or while wearing an air cylinder.	Self contained breathing apparatus will be pressure-demand types of devices, and where appropriate, equipped with an emergency escape bottle.

9.4.3.2 Training

Respirators will not be issued to employees who have not been adequately trained in their use. At a minimum, all employees and supervisory personnel who may be required to wear respiratory protective devices will receive training in the following:

- Problems associated with improper respirator usage
- The nature of hazards associated with airborne contaminants
- The capabilities and limitations of respirator types
- The proper care, use, and maintenance of respirators
- The performance of positive and negative field fit checks each time respiratory protection is donned. This includes the importance of the face piece-to-face seal and of not using respirators when a good seal is not achievable
- Understanding that parts from different respirators are not interchangeable
- How to properly inspect respiratory protective devices prior to use
- Successful completion of a fit test for the specific respirator that is to be used

Documentation of training is completed for each individual and maintained in the CDM training tracking system.

9.4.4 Fit Testing and Field Checks

Fit testing will be performed on all employees assigned to project work that may require the use of respiratory protective devices. Testing will be performed by the CHSM or another trained and qualified individual in accordance with accepted fit test procedures. Documentation of fit testing is completed for each tested employee and

maintained in the CDM training tracking system. Positive and negative pressure field checks are performed immediately prior to use.

All respirators are inspected before and after use. Respirators stored for emergency use only are inspected monthly. Inspections generally cover the following elements:

- Condition of face piece, connecting tubes, cartridges, and straps.
- Condition of the lens. Lenses should be free of scratches and seated tightly in retainers.
- Flexibility of all rubber parts. Deteriorated pieces should be replaced.
- Condition of all valves. Exhalation and inhalation valves are to be checked to ensure correct seating.

Self-contained breathing apparatus (SCBA), air cylinder charges, regulators, and warning devices are to be inspected prior to use by individuals trained to perform these inspections. For units stored for emergency use, these inspections are to occur at least monthly.

9.4.5 Use, Maintenance, and Care

Employees are not assigned to tasks requiring the use of respiratory protection unless they have been determined to be physically able to wear such equipment, have been trained, and have completed a successful fit test. Once approved, the following rules must be followed:

- Employees requiring the use of respirators must be clean-shaven. Additionally, anything that interferes with the face piece-to-face seal such as glasses, long hair, or skullcaps, will not be permitted when respirators are required
- All respirators and cartridges are to be NIOSH/MSHA approved
- Maintenance on respirators is to be performed only by the CHSM or a designate. Only approved replacement parts will be used in respirator repair. Maintenance on SCBA will only be performed by individuals certified by the manufacturer
- Respirators assigned to and worn by one individual will be cleaned and sanitized after each use. Extreme care is to be taken during the cleaning process to prevent damage from handling

When not in use, respirators will be stored to protect them from physical damage, sunlight, extreme temperatures, and excessive moisture.

9.4.5.1 Breathing Air

When used, breathing air will be Grade D or better as per the specifications described by ANSI.

9.5 Site Sanitation Plan

CDM will provide and maintain hygienic sanitary facilities for all employees in accordance with EM-385-1-1, Sec. 2.

- Drinking water will be provided for all employees.

9.6 Safety Management on Site

9.6.1 Project Management

To control project safety, the most influential factor CDM possesses is effective project management by project managers and site superintendents. Listed below in descending order are the five most important tools that project managers and site superintendents can use to influence project safety:

- Effective project management
- Job coordination
- Safety emphasis by management
- Communication
- Safe work environment

Jobs that run smoothly and are planned properly will show good safety performances. The opposite also holds true; jobs that run poorly because of, for example, bad scheduling, understaffing, or poor equipment will ultimately show reduced safety performances.

9.6.2 Planning

Safety must be incorporated into the project from start to finish to maintain good safety performance. Incorporating safety into initial project planning enables site workers to perform tasks safely with adequate staff, time, and equipment. Up-front planning also allows for comprehensive hazard recognition and control planning by qualified staff. Activities such as shoring, confined space entry, emergency response, and site safety meetings must be recognized and coordinated early in the project planning stages.

When planning for safety, project managers and site superintendents should consider the following:

- Costs. Costs should be considered for safety equipment such as decontamination trailers, shoring equipment, air monitoring instruments, rescue equipment, protective clothing, and respirators.
- Staff. Project managers should plan for adequate, qualified staff to perform the job safely. Staffing considerations include rescue personnel, partners for the buddy system, staff to perform air monitoring, and preparation and implementation of the APP.
- Time. Time should be allotted for necessary safety activities, including site safety inspections, weekly Toolbox Safety meetings, and APP preparation and review.

9.6.3 Effective Job Coordination

Safety performance improves with improved job coordination. The following areas, when effectively coordinated by project managers and site superintendents, can improve project safety performance:

- Subcontractor activities
- Staff and crew size

- Local hospital, rescue, and fire departments
- Public notices, public meetings, and site security
- Prompt waste disposal
- Equipment and material deliveries.

9.6.4 Management Emphasis on Safety

Management emphasis on safety is a key component of site safety management. Project managers and site superintendents convey respect for safety and lead by example. Project managers and site superintendents should wear appropriate safety equipment, maintain safety as a routine topic of planning and progress meetings, and reward safe employees and discipline unsafe employees. Effective project managers and site superintendents will send a clear and consistent message that safe behavior is expected and anything less will not be tolerated.

9.6.5 Communication

Possessing good “people skills” is often a significant factor in project safety. Site superintendents and project managers need to communicate safety expectations and instructions effectively. Site employees should understand the site safety procedures and be aware that compliance with them is required. They should feel comfortable to ask questions, report injuries, incidents, and safety concerns, and to provide general feedback and recommendations to the site superintendent and project manager.

Toolbox Safety meetings offer not only the opportunity to provide technical safety instruction, but also provide occasion for feedback and suggestions from site employees. Personnel performing their craft can often suggest effective solutions to hazards, especially those pertinent to their trade. Overlapping hazards require effective communication and teamwork between the involved project staff. For example, welding in a contained asbestos abatement area requires communication between the site superintendent, the welder, and the asbestos abatement contractor to ensure ventilation is adequate and work zones are appropriate.

9.6.6 Safe Work Environment

Maintain a safe work environment by consistently implementing the APP and adhering to OSHA and USACE EM 385-1-1 standards and guidelines. Whether subcontractors have an approved APP of their own or follow the CDM APP, it should be consistently implemented. The CHSM should be consulted when tasks change and unanticipated hazards arise to discuss safety issues and amend health and safety procedures accordingly.

The first step in controlling hazards is the recognition of the hazard. Employees share responsibility for observing the work areas and procedures to identify potential or existing hazards. The SHSO or supervisors perform inspections to identify and direct the correction of unsafe conditions and work practices.

9.6.7 Safety Audits

Safety audits are an effective tool in identifying unsafe conditions and work practices. Safety audits may be conducted by the SHSO or project manager on a weekly basis, or

when new substances, processes, procedures, or equipment are introduced that pose a new occupational safety and health hazard and when new or unrecognized hazards are observed.

Completed audits shall be forwarded to the project manager and the CHSM. Subcontractor operations will be included in the assessment in addition to CDM operations. Subcontractor operations are audited to evaluate compliance with federal, state, and local regulations. The CHSM performs audits as necessary to supplement the local management audits.

9.6.8 Correcting Unsafe Conditions

Unsafe conditions noted during safety audits are assigned to a responsible person(s) for required follow-up action. The project manager and CHSM review safety audits to assure follow-up actions adequately control the hazard(s). Project managers and the CHSM will not close a site safety audit report file until the required follow-up action is complete.

For situations presenting an imminent hazard to employees, the auditor directs work to cease and workers to exit the area immediately until the hazards are controlled. The site superintendent, SHSO, CHSM, and project manager have the authority to stop work until hazards are abated.

Hazards shall be controlled as quickly as possible, based on the severity of the hazard as determined by the SHSO, project manager, or the CHSM.

9.6.9 Standard Site Procedures

There are standard procedures that are applicable to activities performed at all hazardous, or potentially hazardous, waste sites. This section summarizes some of the key OSHA and EM 385-1-1 standards and procedures that may be applicable to Site Assessment activities.

The following project HSP rules are adopted for the protection of all persons involved on all CDM projects. These rules apply to management, owner, and contractor personnel as well as visitors while on the jobsite. These rules are general in nature and are not to be considered all-inclusive, nor do they relieve CDM, subcontractors, or their employees from applicable occupational health and safety regulations promulgated by governmental authorities.

9.6.10 Housekeeping

For the protection of all persons involved with all CDM projects, the following housekeeping rules apply:

- Leads, hoses, and extension cords shall be hung up with a nonconductive material, off all floors, stairways, and walkways. Trash such as drinking cups, cans, and scraps from lunch are not to be thrown down, but disposed of properly in marked containers

- Available material, equipment, concrete forms, pipe, etc., are to be stacked orderly away from walkways, doors, stairways, and ladders.
- Oil, grease, and other such liquid spills shall be cleaned up at the time of spill and are not to be left unattended
- Each craft is responsible for housekeeping in their respective work areas
- Where such items as protruding rebar or anchor bolts create a tripping hazard, they shall be properly protected and conspicuously marked

9.6.11 Material Handling

For the protection of all persons involved with all CDM projects, the following material handling rules apply:

- An employee shall obtain assistance in lifting heavy objects or power equipment shall be used. Back belts or back braces shall be used as required.
- When two or more persons carry a heavy object that is to be lowered or dropped, there shall be a prearranged signal for releasing the load.
- When two or more persons are carrying an object, each employee, if possible, should face the direction in which the object is being carried.
- The right way to lift is easiest and safest. Crouch or squat with the feet close to the object to be lifted, secure good footing, take a firm grip, bend the knees, keep the back vertical, and lift by bending at the knees and using the leg and thigh muscles. Employees shall not attempt to lift beyond their capacity. Caution shall be taken when lifting or pulling in an awkward position.
- Employees should avoid twisting or excessive bending when lifting or setting down loads.
- When moving a load horizontally, employees should push the load rather than pull it.
- When performing a task that requires repetitive lifting, the load should be positioned to limit bending and twisting. The use of lift tables, pallets, and mechanical devices should be considered.
- When using such tools as screwdrivers and wrenches, employees should avoid using their wrists in a bent, flexed, extended, or twisted position for long periods of time. Employees should maintain their wrists in a neutral or straight position.
- When gripping, grasping, or lifting an object such as a pipe or board, the whole hand and all the fingers should be used. Gripping, grasping, and lifting with just the thumb and index finger should be avoided.

9.6.12 Working Around Heavy Equipment

Good work practices while working around heavy equipment include:

- *Assume the operator cannot see you. The operator's vision may be blocked by blind spots. He or she is frequently concentrating on their work and equipment and may not notice a site visitor.*
- *If you must approach the operator, be sure you have made eye contact with the operator and they know you will be approaching them before approaching the equipment. Verbal contact, direct or by radio, is even better. Do not approach if the equipment is moving or in operation.*

- *Stay clear of pinch points and swing areas of equipment. At CDM projects, these areas should be taped or barricaded off; however, when equipment moves frequently, you cannot count on other organizations to mark these zones.*
- *Do not walk near a moving piece of equipment. It could turn or rotate any minute. Modern construction equipment moves fast and in any direction.*
- *On a noisy site, you may not notice the equipment's back-up alarm. Keep aware of what is happening around you.*
- *Never walk under a load on a crane or hoist. Indeed, avoid the area under the hook or bucket.*
- *Do not cut across the path of equipment backing up.*
- *Wear your hardhat and safety glasses. The safety glasses protect your eyes from dust and debris and the hardhat provides protection for your head and makes you more visible on the site.*
- *On sites where there is frequent vehicle or construction equipment movement, wear high-visibility clothing.*

Maintain a clearance of at least 10 feet between any part of the machine or its load and any electrical line or apparatus carrying up to 50,000 volts. One foot of additional clearance is required for every additional 30,000 volts.

9.6.13 Hand Tools

For the protection of all persons involved with all CDM projects, the following hand tools rules apply:

- All tools, regardless of ownership, shall be of an approved type and maintained in good condition. Tools are subject to inspection at any time. A foreman has the authority and responsibility to condemn unserviceable tools, regardless of ownership.
- Defective tools shall be tagged to prevent their use or they shall be removed from the jobsite.
- Employees shall always use the proper tool for the job performed.
- Hammers with metal handles, screwdrivers, knives with metal continuing through the handle, and metallic measuring tapes shall not be used on or near energized electrical circuits or equipment.
- Tools shall not be thrown from place to place or from person to person; tools that must be raised or lowered from one elevation to another shall be placed in tool buckets or firmly attached to hand lines.
- Tools shall never be placed unsecured on elevated places.
- All impact tools such as chisels, punches, drift pins, etc., that become mushroomed or cracked shall be dressed, repaired, or replaced before further use.
- Chisels, drills, punches, ground rods, and pipes shall be held with suitable holders or tongs, not with the hands, while being struck by another employee.
- Shims shall not be used to make a wrench fit.
- Wrenches with sprung or damaged jaws shall not be used.
- Pipe shall not be used to extend a wrench handle for added leverage unless the wrench was designed for such use.
- Tools shall be used only for the purposes for which they have been approved.

- Tools with sharp edges shall be stored and handled so that they will not cause injury or damage. They shall not be carried in pockets.
- Wooden handles that are loose, cracked, or splintered shall be replaced. The handle shall not be taped or lashed with wire.
- All cutting tools such as saws, wood chisels, knives, or axes shall be kept in suitable guards or in special compartments.
- Tools shall not be left lying around where they may cause a person to trip or stumble.
- When working on or above open grating, a canvas or other suitable covering shall be used to cover the grating to prevent tools or parts from dropping to a lower level where others are present or the danger area shall be barricaded or guarded.
- The insulation on hand tools shall not be depended upon to protect users from shock.

9.6.14 Portable Electronic Tools

For the protection of all persons involved with all CDM projects, the following rules apply when portable electric tools are used:

- The noncurrent-carrying metal parts of portable electric tools such as drills, saws, and grinders shall be effectively grounded when connected to a power source unless the tool is an approved double-insulated type, or the tool is connected to the power supply by means of an isolating transformer or other isolated power supply, such as a 24-volt direct current system.
- All power tools shall be examined prior to use to ensure general service-ability and the presence of all applicable safety devices. The electric cord and electric components shall be given an especially thorough examination.
- Power tools shall be used only within their capability and shall be operated in accordance with the instructions of the manufacturer.
- All tools shall be kept in good repair and shall be disconnected from the power source while repairs are being made.
- Electrical tools shall not be used where there is a hazard of flammable vapors, gases, or dusts.
- Ground fault circuit interrupters will protect all power tools and cord sets.

9.6.15 Heat Stress/Cold Stress

Personnel may be subject to heat stress and cold stress depending on certain conditions at the site. CDM guidelines for observing and managing heat and cold stress are provided in Appendix C.

9.6.16 Working Near or Over Water

All motorboat operators shall complete the following training, in accordance with EM 385-1-1 19.F.05.

- *A boating safety course meeting the criteria of the USCG Auxiliary, National Association of Safe Boating Law Administrators, or equivalent;*
- *Motorboat handling training, based on the types of boats they will operate, provided by qualified instructors (in-house or other). Operators must pass a written and operational test;*

- *Current USCG licensed personnel are exempt from the boating safety training, but they shall complete the written exam and operational test;*
- *Government employees shall complete a USACE-approved 24-hour initial boating safety course and refresher as prescribed in ER 385-1-91.*

The motorboat operator shall submit documentation of this training to CDM prior to the start of any related boating activities.

When working on, over, or near water, basic water safety precautions must be taken. Such areas include riverbanks, channels, dock areas, working from vessels of any kind, aeration basins, or other areas where a danger of drowning may exist. Depending on the circumstances, precautions needed may include any or all of the following:

- *Employees should wear Coast Guard-approved personal floatation devices (PFDs) (either vests or jackets) where a potential danger of drowning exists. PFDs are required when working from any type of boat or floating platform.*
- *The PFDs should be inspected before and at the end of each use for wear, torn stitching or straps, inoperable buckles, or other defects.*
- *Ring buoys with at least 90 feet of line shall be provided and readily available for emergency rescue operations. Distance between ring buoys shall not exceed 200 feet.*
- *At least one lifesaving skiff shall be immediately available at locations where employees are working over or adjacent to water, unless the width of the water body is small enough to allow any potential rescue to occur from the bank (as would be the case with most aeration basins).*

9.6.17 Safety Working Around Drill Rigs

Drilling equipment operators shall comply with the requirements of EM 385-1-1 18.H, and all other applicable requirements identified in EM 385-1-1 18. Drilling equipment operators are also required to be licensed to operate such equipment by the State of New Jersey. The drilling operator shall submit documentation of their competency and licensing to CDM prior to the start of any related drilling activities. The above requirements shall also apply to operators of Direct Hydraulic Push Technology as described in Section 9.6.18.

The use of mechanical drill rigs to collect soil samples and install monitoring wells presents significant hazards to operators and helpers, as well as technicians and engineers who may work in proximity to such rigs. CDM employees that manage or oversee drilling operations should be aware of the basic hazards of drilling equipment and operations and have an awareness of safe drilling work practices. The guidelines and work practices described below should be implemented on all projects where mechanical drill rigs are used.

9.6.17.1 Preparation

- *Contract documentation with drillers contracted with CDM should include CDM's standard contract between "Engineer & Subcontractor for Drilling*

Services,” and “Health and Safety Protocol for Subcontractors” available on the Office of General Council’s page of contract forms at <http://cdmweb/legalforms/inc.htm>.

- *Before drilling or other subsurface operations, a survey should be conducted to identify any overhead or underground utilities, unexploded ordnance, tanks, pipes, or other underground structures. The local agency or organization for utility location should be contacted to identify underground utilities. In some cases, ground penetrating radar or magnetometer studies may be needed to identify the location of underground obstructions.*
- *The work area for the drill rig and crew should be cleared of sticks, logs, brush, and trash. Inspect the area for any potential tripping hazards and remove them. If they cannot be removed, they should be identified with caution tape or cones.*
- *Before rig setup, the planned arrangement of equipment should be such that it does not present a dangerous condition. Take into account slopes of hills, mud, standing water, overhead power lines, etc.*
- *OSHA regulations require that any part of the rig must be at least 10 feet away from power lines under 50kV or less. For higher voltage lines, 1 foot of additional clearance is required for every additional 30,000 volts.*
- *If working in an area of moving vehicular traffic, appropriate traffic control systems should be in place. Contact local police or traffic control officer, before placing any traffic control equipment.*
- *Define an exclusion zone around the drill rig that is at least 1.5 times the height of the mast. Only personnel necessary for the immediate task being performed should be inside the exclusion zone.*

9.6.17.2 Drill Rig Inspection

- *After the rig is set up, but before operation, the work area should be inspected for eye, bump, and tripping hazards.*
- *The driller should inspect the rig daily before operation of the rig. The inspection should include the following:*
 - *Condition of the vehicle. Brakes should work and tires should have adequate tread. It should have a back-up alarm. If it is driven over the road, it should have all necessary brake lights, headlights, horn, license plates, etc.*
 - *All welds should be solid, with no sign of visible cracks.*
 - *All gauges should be functional and legible.*
 - *All machine guards should be in place.*
 - *Emergency kill switches should be functional. All site personnel should be aware of the location and function of the kill switches. Have the driller review these with site personnel.*
 - *Cable and wire rope should be inspected for fraying, decay, “bird caging,” broken strands, kinking, or flattening.*
 - *All hoses should be secure and in good shape. They should not be loose, bulging, or leaking.*
 - *High-pressure fittings should be secure and have whip checks (a pin or wire to prevent the hose whipping in the event of a failure of the connection).*
 - *High-pressure relief valves should be in working order.*
 - *Wire rope loops should be secure with at least two clamps.*

- *The rig should have a fire extinguisher and first aid kit.*
- *All tools should be clean and in good working condition. Hooks, eyes, pins, etc. should not be corroded or bent. Rod clamps should be in good condition.*
- *If a cathead is used, it should be clean and free of burrs. The cathead rope should be in good condition and not be frayed or have excessive wear.*
- *Back-up alarms should be functional.*
- *Vehicles should have all lug nuts and they should all be tight.*

9.16.17.3 Work Practices

- *All personnel working around drilling operations should wear appropriate PPE including a hard hat, safety glasses, and hard-toed work boots.*
- *Drill crews should wear work gloves.*
- *On hazardous waste sites, additional PPE such as respirators, protective clothing, gloves, etc. may also be required.*
- *In areas where there is vehicular traffic, personnel should also wear high-visibility vests or clothing.*
- *Maintain an organized work area free from tripping hazards.*
- *Drill rods or other equipment should not be stored leaning up against equipment.*
- *Drill holes should be completed or secured before leaving the site for the day. Drill holes should not be left open at an unattended site.*
- *Boring locations should be placed to minimize the possibility of contacting underground utilities or structures. Clearance should be obtained from the site project manager before drilling begins.*
- *Do not move the rig with the mast in the upright position.*
- *Use a spotter when moving the rig from one location to another on the site.*
- *When sampling activities require working in proximity with heavy equipment or drill rigs, sampling personnel will stand clear of the equipment until sampling is required. They will notify the operator they are going to take a sample and must receive acknowledgment from the operator.*
- *Do not wear loose clothing such as hooded sweatshirts, parkas, or clothing with hanging drawstrings around drill rigs.*
- *Monitor weather conditions. Drilling operations should be terminated and the area near the drill rig evacuated during high winds and or storms with the potential for lightning strikes. The lead driller should be consulted to help assess if weather conditions are safe for drilling.*
- *Drill crew personnel should wear a personal fall arrest harness, connected to a secure tie-off point, when climbing the mast or working where fall exposures exceed 6 feet.*
- *Hearing protection should be worn during operations that produce significant noise exposures. (If you cannot hold a conversation using a normal voice with someone within 3 feet of you because of background noise, the use of personal hearing protection is recommended.)*

9.6.18 Working Safely with Direct Hydraulic Push (Geoprobe™) Technology

These guidelines apply to the use of direct hydraulic push (Geoprobe™ or similar) technology during site investigations. In addition to the safety precautions listed below, the equipment shall be operated and maintained according to the manufacturer's instructions.

- *Contract documents for subcontractors using a Geoprobe should include CDM's standard contract between "Engineer & Subcontractor for Drilling Services" and "Health and Safety Protocol for Subcontractors" available on the Office of General Council's page of contract forms at <http://cdmweb/legalforms/inc.htm>.*
- *The probe rig should be equal to the task. Hiring a contractor who uses a pneumatic hammer when direct hydraulic push is more appropriate, requires unacceptable compromises on safety.*
- *Before using the Geoprobe or other subsurface operations, a survey should be conducted to identify any overhead or underground utilities, unexploded ordnance, tanks, pipes, or other underground structures. The local agency or organization for utility location should be contacted to identify underground utilities. In some cases, ground penetrating radar or a magnetometer may be needed to identify the location of underground obstructions.*
- *The work area for the Geoprobe and crew should be cleared of sticks, logs, brush, and trash. Inspect the area for any potential tripping hazards and remove them. If they cannot be removed, they should be identified with caution tape or cones.*
- *Before rig setup, the planned arrangement of equipment should be such that it does not present a dangerous condition. Take into account slopes of hills, mud, standing water, overhead power lines, etc.*
- *OSHA regulations require that any part of the rig must be at least 10 feet away from power lines under 50kV or less. For higher voltage lines, 1 foot of additional clearance is required for every additional 30,000 volts.*
- *The Geoprobe should be operated by one person at a time, including assembly and disassembly of probe rod and accessories. Other field personnel shall stay clear of the probe and vehicle while the probe is in operation, being assembled, or disassembled. This is to ensure the unit is not inadvertently engaged while the operator's hands, fingers, or feet are touching or near moving parts.*
- *Keep feet clear of the probe as it descends.*
- *Do not place hands on top of probe rod while the rod is under the probing machine.*
- *The hydraulic system should be turned off at the control panel when changing probe rods, inserting the hammer, anvil, or attaching any accessories.*
- *Do not exert downward pressure on the probe to lift the probe foot over 6 inches off the ground.*
- *Always take the carrier vehicle out of gear and set the emergency brake before starting the push unit up.*
- *Always extend the probe unit out from the carrier vehicle and deploy the foot to clear the vehicle roofline before folding the probe unit out.*

- *The operator should stand to the control side of the probe machine and stay clear of the probe foot and derrick while operating the controls.*
- *Do not exert downward pressure on the probe so that the carrier vehicle tires lift off the ground. Reducing the load on the carrier vehicle may allow the vehicle to shift or slide unexpectedly.*
- *Be aware that the carrier vehicle's catalytic converter may be hot and has the potential to be a fire hazard if the vehicle is parked over combustible material such as dry leaves, grass, etc.*
- *The hydraulic system should be shut down and the vehicle engine stopped before attempting to clean or service the probe.*
- *Use extreme caution when using the machine while parked on loose, soft, or uneven surfaces.*

9.7 Fire Prevention and Protection/Flammable and Combustible Liquids

Fire prevention and protection activities will be performed in accordance with EM-385-1-1, Sec. 9. For the protection of all persons involved with all CDM projects, the following rules apply for use of flammable and combustible liquids:

- "Danger" and "No Smoking" signs shall be posted around all flammable and combustible liquid storage areas.
- All aboveground tanks shall have adequately sized concrete containment, such as slab and walls, to contain spills.
- Tanks shall be vented with a pipe not less than 13 inch inside diameter and shall be 12 feet high from the adjacent ground level.
- Portable fire extinguishers shall be provided where needed as specified in EM-385-1-1, Sec. 9, Table 9-1. Fire extinguishers shall be inspected monthly and maintained as specified in NFPA 10. Records shall be kept on a tag or label attached to the extinguisher, on an inspection check list maintained on file, or by an electronic method that provides a permanent record. The date the inspection was performed and the initials of the person performing the inspection shall be recorded.
- Tanks shall be kept 20 feet from buildings.
- All tanks shall be properly grounded.
- All tanks shall be labeled with the contents and owner's name.
- Temporary heating devices will be utilized and managed in accordance with EM-385-1-1, Sec 9.D. For the protection of all persons involved with the construction of all CDM projects, the following rules apply around the use of heaters:
 - All temporary heating devices must be approved prior to use on the jobsite.
 - Heaters shall be kept at least 20 feet from buildings and other combustible items.
 - Job-made heaters, solid fuel salamanders, and open fires are prohibited on the jobsite.

9.8 Severe Weather Response Plan

The basic components of this severe weather response plan provide a framework to manage early warning notification and response if severe weather conditions are encountered during the course of operations at the site.

The SHSO is responsible for implementation of this severe weather plan.

The SHSO shall have the capability to obtain local weather forecasts 24 hours in advance of expected operations. A means of obtaining real time weather reports for local conditions shall be maintained during all site operations. The SHSO is responsible for communicating severe weather conditions to the field team, and ensuring that an appropriate rally point is established.

Efforts shall be made to secure equipment and materials in a severe weather event.

Severe weather events also impact driver safety, and must be emphasized during a severe weather evacuation event.

9.8.1 Expected Weather Hazards

9.8.1.1 Lightning

If lightning is observed during work activities, work shall be halted until weather conditions improve and lightning is not observed in the general proximity of the site.

Prior to the start of field activities, the SHSO will work with the field team to identify a site evacuation and rally point capable of providing protection from a lightning strike.

9.8.1.2 High Winds

If high winds are expected, or are encountered during work activities, appropriate action shall be taken to ensure the protection of site workers and the surrounding community.

9.8.1.3 Thunderstorms

Flooding resulting from a thunderstorm presents a significant safety hazard, and must be continually monitored if a severe weather event is expected.

9.9 Air Monitoring Plan

This air monitoring plan requires real-time monitoring for particulates (i.e., dust) at the downwind perimeter of each designated work area when *drilling* or excavating/trenching activities are in progress at the Raritan site. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown.

Due to the potential for exposure to certain hazardous particulates at each site, real-time air monitoring for particulate levels at the perimeter of the exclusion zone or work area will be necessary.

Continuous monitoring will be required for all ground intrusive activities. Ground intrusive activities include, but are not limited to, *all drilling activities*, soil excavation and trenching, and fencing repair requiring soil removal.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored **continuously** at the downwind perimeter of the exclusion zone at a temporary particulate monitoring station. The particulate monitoring should be performed using a DataRAM to measure airborne particulates in real-time. The equipment should be capable of measuring particulate matter at sizes appropriate for the prescribed action levels and capable of integrating over a period of 5 minutes for comparison to the airborne particulate action level.

The equipment must be equipped with an audible alarm to indicate exceedance of the action level.

In addition, fugitive dust migration should be visually assessed during all work activities. There will be no visible dust emissions allowed at the site during any activities.

- If the downwind particulate level is measured at 1 milligram per cubic meter (mg/m^3) or greater over a 5 minute average, or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind particulate levels do not meet or exceed the $1 \text{ mg}/\text{m}^3$ action level and provided that no visible dust is migrating from the work area.
- If, after implementation of dust suppression techniques, downwind particulate levels are still measured at $1 \text{ mg}/\text{m}^3$ or greater over a 5 minute average, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind particulate concentration to within acceptable levels and in preventing visible dust migration.

Section 10

Activity Hazard Analysis (AHA)

10.1 Activity Hazard Analysis

For every Definable Feature of Work indicated for the completion of this project in Section 2, an AHA will be developed. The project superintendent will assist the SHSO by identifying job tasks and equipment that will be used to accomplish the task. The SHSO will identify hazards associated with the tasks and the necessary controls and training necessary to mitigate those hazards. Prior to performing work, AHA review will be performed and acknowledgement of training documented. AHAs are located in Appendix B.

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Section 11

Personal Protective Equipment

11.1 Personal Protective Equipment Requirements

For the protection of all persons involved with the field activities, application of the following personal protective equipment is required.

11.1.1 Eye Protection

Eye protection shall comply with ANSI Z87.1 requirements.

Safety glasses shall be worn at all times at the site.

11.1.2 Head Protection

Hard hats which comply with ANSI Z89.1 shall be worn at all times in the work areas unless noted below. No modification to the shell or suspension is allowed unless approved by the manufacturer in writing (05.D.02a.). Hard hats will be worn with the bill facing forward (05.D.02b.).

11.1.3 Foot Protection

In the work area, steel-toed shoes or boots are required. All foot gear must meet the requirements of ANZI Z41.1.

11.1.4 Hand Protection

Latex/nitrile gloves will be worn if necessary to handle any soil or material encountered during the trenching activities. Cut-resistant work gloves shall also be worn if necessary to handle any rough or sharp objects.

11.1.5 Respiratory Protection

Respiratory protection will not be required for the anticipated field activities.

11.1.6 Safety Vests

ANSI-compliant Class II safety vests must be worn when working near motorized traffic or heavy machinery, and are required at all times in the exclusion zone.

11.1.7 Vehicle Safety

Seat belts shall be worn when operating vehicles. Riding in the bed of pickups is prohibited.

11.1.8 Personal Flotation Devices (PFDs)

United States Coast Guard-approved PFDs are required when working over or near water, in accordance with EM 385-1-1, 21.N.

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Section 12

References

American National Standards Institute. 1992. *Practices for Respiratory Protection*. June.

California Code of Regulations. Title 8 Section 1539. *Construction Safety Orders*.

Code of Federal Regulations. 29 CFR 1910.134. *Respiratory Protection*.

_____. 29 CFR 1910.1200. *Hazard Communication Standard*.

United States Army Corps of Engineers. 2003. *Safety and Health Requirements Manual*, EM 385-1-1.

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Appendix A

Miscellaneous Forms and Directions to Hospital

Notice of Safety Infraction and Warning Form

Employee _____ Date _____

Employee Number _____ Office Location _____

Employee's Supervisor _____ Location of Violation _____

Violation Date _____ Time _____ a.m./p.m. _____

Warning Classification

- | | | |
|--|---|--|
| <input type="checkbox"/> Attendance/Tardiness | <input type="checkbox"/> Insubordination | <input type="checkbox"/> Theft |
| <input type="checkbox"/> Safety Infraction | <input type="checkbox"/> Workplace Harassment | <input type="checkbox"/> Work Quality |
| <input type="checkbox"/> Sexual Harassment | <input type="checkbox"/> Inappropriate Action or Behavior | <input type="checkbox"/> Substance Abuse |
| <input type="checkbox"/> Failure to Perform Duties | <input type="checkbox"/> Other | |

Company Statement

Summary of Corrective Action (Include dates for improvement and plans for follow up)

Consequences of Failure to Improve Performance or Correct Behavior

- Termination Reassignment Other

Employee Statement

- I do concur with the Company's Statement I do not concur with the Company's Statement

Notes:

Signatures

I have read this performance warning and understand the form and its contents and hereby acknowledge that I have been given the opportunity to respond.

Employee's Signature _____ Date _____

Signature of Person who Prepared Warning _____ Date _____

Supervisor's Signature _____ Date _____

Copy Distribution: Employee, Supervisor, Foreman,
 Personnel Department Manager
 Original, Employee File/Denver

CDM

Distance from 2 Bayview Dr, Laurence Harbor, NJ 08879 is 4.9 miles

Hospital Name: Bayshore Community Hospital

Route: Head southwest on Wilson Ave. towards Roosevelt Ave. (351 ft), Turn right at Roosevelt Ave. (197 ft), Turn right at County Rd 689/Laurence Pkwy (174 ft), Turn left towards County Rd 689/Laurence Pkwy (105 ft), Turn left at County Rd/Laurence Pkwy (0.2 miles), Take the third left onto Sunset Ave. (0.1 miles), Turn right at NJ-35 south (3.2 miles), Slight right at Beers St (1.2 miles), Hospital will be on the left.

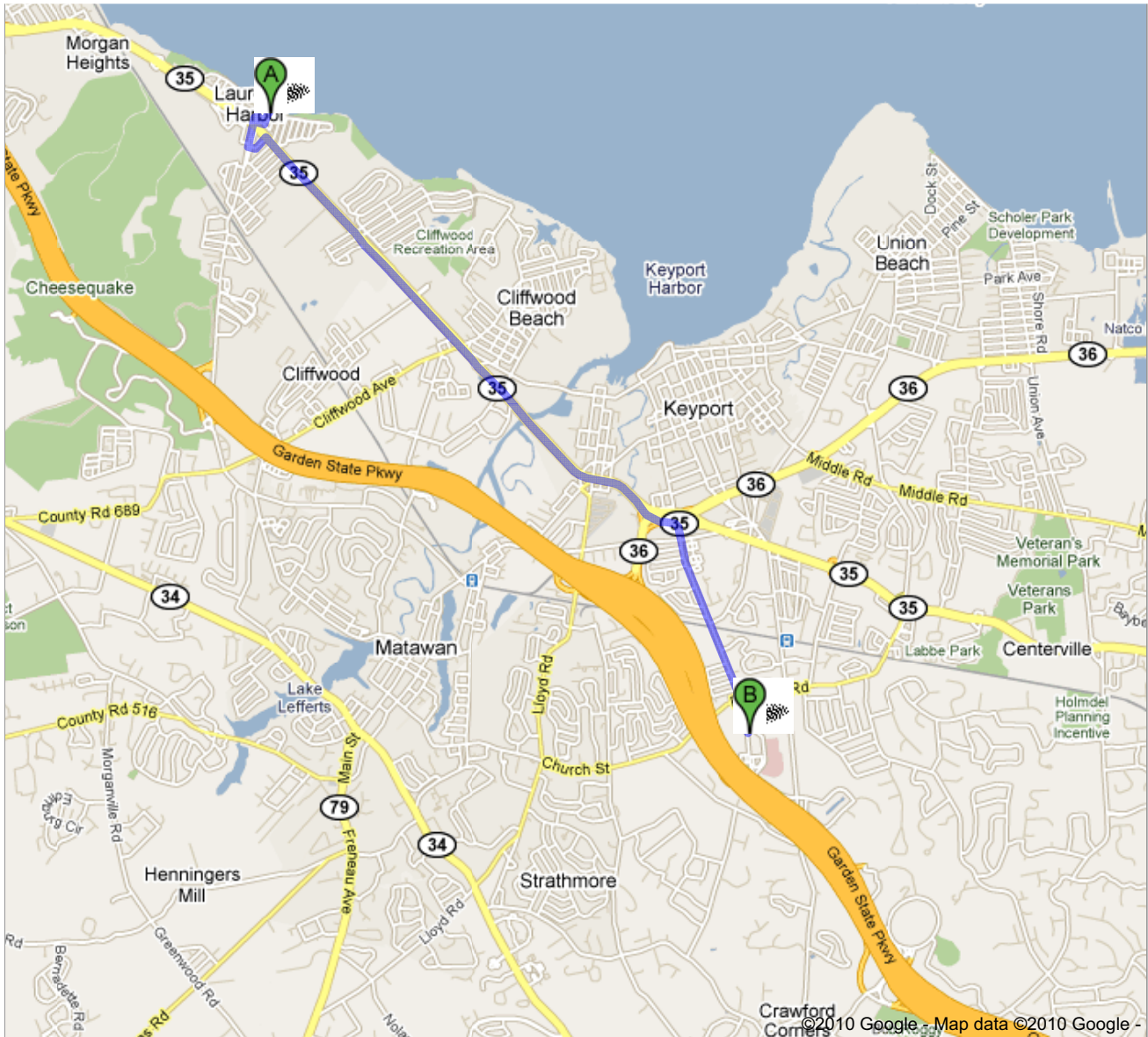
Bayshore Community Hospital

727 North Beers Street

Holmdel, New Jersey 07753

732-739-5900

Emergency 911





CDM Constructors Inc.

Rev: 00 09/15/08

SUBJECT: Trench/Excavation Permit

Effective: 10/01/08

Project Name: _____ Project #: _____
 Contractor(s): _____ Date work will start: _____
 Competent person: _____ Date work will end: _____
 Specific location and description of work: _____

Sketch of location attached? Yes No

Size of trench or excavation: _____ Depth _____ Length _____ Width

Soil type: Type A Type B Type C Solid Bedrock

Lines in vicinity of work:

- Electrical Steam Telephone Water Sewer Alarm
- Drain Process Other: _____

Other known obstructions:

- Footings Pilings Concrete Encasements Other: _____

Precautions to be taken:

- Ground Tools Hand Excavate Insulate Operator De-energize lines

Protective System:

- Sloping Shoring Benching

The above data has been checked with blueprint data on file. When close clearances are indicated hand excavation must be used to determine the exact location. Existing lines and interference in the vicinity of work must be marked.

Signatures:

Contractor's Signature: _____

Constructors Safety Coordinator Signature: _____

Appendix B

Activity Hazard Analysis

- *Topographic and Bathymetric Surveys*
- Excavation and Trenching
- *Slag Surveys*
- *Geotechnical Drilling*
- Fence Maintenance
- Air Monitoring
- *Groundwater-Surface Water and Synoptic Water Level Data Collection*
- *Monitoring Well Development*
- *Current and Sediment Data Collection*

ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC)
(Use highest code)

L

Date: 3/15/ 2010 Project: Raritan Bay Early RI Activities

Activity: Air Monitoring

Activity Location: Raritan Bay Slag Superfund Site

Prepared By: Paul Opem, CSP

Risk Assessment Code Matrix

E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

		Probability				
		Frequent	Likely	Occasional	Seldom	Unlikely
Severity	Catastrophic	E	E	H	H	M
	Critical	E	H	H	M	L
	Marginal	H	M	M	L	L
	Negligible	M	L	L	L	L

Add Identified Hazards

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Set up DataRAM	Slips, trips, falls; pinches; cuts; back injury; heavy equipment.	Survey for level location away from obstacles and equipment prior to set up. Utilize proper lifting procedures. Proceed deliberately according to manufacturer's instructions. Communicate with any operators in area.	L
X	Monitor Equipment	Slips, trips, falls; pinches; cuts; heavy equipment.	Communicate with personnel and operators in area; survey area for any new hazards such as tools laying on ground.	L
X	Remove DataRAM from location	Slips, trips, falls; pinches; cuts; back injury; heavy equipment.	Utilize proper lifting procedures. Proceed deliberately according to manufacturer's instructions. Communicate with any operators in area.	L

Add Items

	EQUIPMENT	TRAINING	INSPECTION
X	DataRAM	Manufacturer's instructions	Daily

Involved Personnel:

CDM and associated subcontractors

ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC)
(Use highest code)

L

Date: 7/28/10 Project: Raritan Bay Early RI Activities

Activity: Current and Sediment Data Collection

Activity Location: Raritan Bay Slag Superfund Site

Prepared By: Paul Opem, CSP

Risk Assessment Code Matrix

E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

		Probability				
		Frequent	Likely	Occasional	Seldom	Unlikely
S e v e r i t y	Catastrophic	E	E	H	H	M
	Critical	E	H	H	M	L
	Marginal	H	M	M	L	L
	Negligible	M	L	L	L	L

Add Identified Hazards

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	(If using boat-towed ADCP) Prepare and launch boat	Slips, trips, falls; back injury; pinches; cuts; drowning; heat stress	Follow established plan from captain of boat; where PDFs at all times; utilize proper lifting procedures; be aware of grade changes, holes, trip hazards.	L
X	Collect current and sediment data from boat	Drowning ; pinches; cuts; back injury; heat stress; sun exposure.	Proceed with depth measuring device according to manufacturer's instructions; remain in boat; wear PDF at all times; wear sunscreen; do not lift equipment when leaning or twisting body.	L
X	Boat docking and demob of equipment	Slips, trips, falls; back injury; pinches; cuts; heavy lifting; drowning; heat stress	Follow established plan from captain of boat; wear PDFs at all times; utilize proper lifting procedures; be aware of grade changes, holes, trip hazards.	L
X	Collect current and sediment data onshore using the ADCP	Slips, trips, falls; back injury; pinches; cuts; drowning; heat stress; sun exposure	Be aware of changing tides. Wear PDFs at all times; utilize proper lifting procedures; be aware of grade changes, holes, trip hazards; wear sunscreen.	L

Add Items

	EQUIPMENT	TRAINING	INSPECTION
X	Acoustic Doppler Current Profiler	Manufacturer's instructions	Daily

Involved Personnel:
CDM and associated subcontractors

ACTIVITY HAZARDS ANALYSIS

Acceptance Authority (digital signature):

ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC)
(Use highest code)

M

Date: 7/28/10 Project: Raritan Bay Early RI Activities

Activity: Geotechnical Drilling

Activity Location: Raritan Bay Slag Superfund Site, New Jersey

Prepared By: Paul Opem CSP

Risk Assessment Code Matrix

E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

		Probability				
		Frequent	Likely	Occasional	Seldom	Unlikely
S e v e r i t y	Catastrophic	E	E	H	H	M
	Critical	E	H	H	M	L
	Marginal	H	M	M	L	L
	Negligible	M	L	L	L	L

Add Identified Hazards

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Drill Rig Setup	Bodily Injury - hand, head, foot, back	Leather work gloves for all work with potential for cuts from sharp edges or pinch points. Hard hats required for all activities involved with setting up drilling unit. Steel-toed boots required for all activities involved with setup. Personnel instructed to lift with legs, not backs, and to ask for assistance with heavy, bulky items.	L
X	Drill Rig Setup	Emergency Notification	Cell phone will be available at all times. Personnel will be trained with respect to emergency numbers for assistance.	L
X	Drill Rig Setup	Environmental Release	Re-fueling will be conducted over plastics.	L
X	Drill Rig Setup	Electrical Shock	All electrical equipment inspected prior to each use. GFCI will be required for all wiring and/or extension cords.	L
X	Drill Rig Setup	Defective Equipment	All equipment will be inspected prior to being brought onsite. Prior to each use, personnel will perform pre-inspection to ensure it is safe to operate. SHSO will also perform routine audits and inspections.	L
X	Drill Rig Setup	Severe Weather	Operations will stop when weather interferes with safety or in event of severe weather. Personnel will move out of work zone and gather at assembly points.	L
X	Drill Rig Setup	Fire	Proper Fire extinguishers will be available on unit.	L
X	Drill Rig Setup	Slips, Trips, and Falls	Good housekeeping requirements will be applied to work areas.	L
X	Drill Rig Setup	Heat Stress	Personnel will be briefed on signs and symptoms of heat related illnesses. SHSO will observe for heat related illnesses.	L
X	Drill Rig Setup	Injury from Motorized Equipment or Moving Parts	Personnel will be aware of location of motorized equipment, especially those with limited visibility. Back-up alarms will be required on equipment. All extremities will be kept clear of moving parts and machinery.	M

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Direct Push Activities	Bodily injury - hand, head, foot, eye	Leather gloves required for work with potential for cuts from sharp steel, push/drill steel, cutting sample sleeves, pinch points, etc. Pinch points will be guarded. Hard hats, steel-toed boots, and safety glasses with side shields required for all personnel in the work zones.	L
X	Direct Push Activities	Emergency Notification	Cell phone will be available at all times. Personnel will be trained with respect to emergency numbers for assistance.	L
X	Direct Push Activities	Work Zones	Drilling area will be marked off and set up as an exclusion zone. Signs identifying PPE requirements will be located outside of the zone.	L
X	Direct Push Activities	Heat Stress	Personnel will be briefed on signs and symptoms of heat related illnesses. SHSO will observe for heat related illnesses.	L
X	Direct Push Activities	Untrained Personnel	Only trained and certified personnel will operate the drilling equipment.	L
X	Direct Push Activities	Ultra-violet exposure	Sunscreen is recommended on all areas exposed to the sun.	L
X	Direct Push Activities	Injury from Motorized Equipment or Moving Parts	Personnel will be aware of location of motorized equipment, especially those with limited visibility. Back-up alarms will be required on equipment. All extremities will be kept clear of moving parts and machinery.	M
X	Direct Push Activities	Noise	Drilling equipment operator will be required to wear hearing protection when rig is in operation. Other personnel required to wear hearing protection when in work zone.	L
X	Direct Push Activities	Insects, snakes, and spiders	Be aware snakes may be in area. Anyone bitten by a snake should be transported immediately to nearest medical facility. Permanone can be used to control exposure to ticks and other insects. Personnel shall follow directions for use of permanone and ensure that it is not sprayed directly on skin. Be aware of spiders, do not pick up debris without carefully checking area, and wear gloves when moving debris to protect bare hands from exposure.	L
X	Direct Push Activities	Slips, Trips, and Falls	Good housekeeping requirements will be applied to work areas.	L
X	Direct Push Activities	Severe Weather	Operations will stop when weather interferes with safety or in event of severe weather. Personnel will move out of work zone and gather at assembly points.	L
X	Sleeve Removal and Sample Collection	Bodily Injury - hand, head, foot, eye, back	Leather gloves required for work with potential for cuts from sharp steel, push/drill steel, cutting sample sleeves, pinch points, etc. Hard hats, steel-toed boots, and safety glasses with side shields required for all activities in the work zone. Personnel instructed to lift with legs, not backs, and to ask for assistance with heavy, bulky items.	L
X	Sleeve Removal and Sample Collection	Emergency Notification	Cell phone will be available at all times. Personnel will be trained with respect to emergency numbers for assistance.	L
X	Demobilization	Bodily Injury - hand, head, foot, eye	Leather gloves required for work with potential for cuts from sharp steel, push/drill steel, cutting sample sleeves, pinch points, etc. Pinch points will be guarded. Hard hats, steel-toed boots, and safety glasses with side shields required for all activities in the work zone.	L
X	Demobilization	Heat Stress	Personnel will be briefed on signs and symptoms of heat related illnesses. SHSO will observe for heat related illnesses.	L
X	Demobilization	Severe Weather	Operations will stop when weather interferes with safety or in event of severe weather. Personnel will move out of work zone and gather at assembly points.	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Demobilization	Injury from Motorized Equipment or Moving Parts	Personnel will be aware of location of motorized equipment, especially those with limited visibility. Back-up alarms will be required on equipment. All extremities will be kept clear of moving parts and machinery.	M

Add Items

	EQUIPMENT	TRAINING	INSPECTION
X	Hollow Stem Auger Drill Rig	Equipment manual, experienced subcontractors, applicable specific safety training and certification.	Before each use

Involved Personnel:

CDM and associated subcontractors.

Acceptance Authority (digital signature): _____

ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC)
(Use highest code)

L

Date: 7/28/10 Project: Raritan Bay Early RI Activities

Activity: Groundwater-Surface Water/Synoptic Water Level Data Collection

Activity Location: Raritan Bay Slag Superfund Site

Prepared By: Paul Opem, CSP

Risk Assessment Code Matrix

E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

		Probability				
		Frequent	Likely	Occasional	Seldom	Unlikely
Severity	Catastrophic	E	E	H	H	M
	Critical	E	H	H	M	L
	Marginal	H	M	M	L	L
	Negligible	M	L	L	L	L

Add Identified Hazards

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Deploy data recording pressure transducers	Slips, trips, falls; heat stress; drowning; heat stress; sun exposure	Be aware of grade changes, holes, trip hazards - assess area prior to deploying equipment; wear sunscreen. Wear PDF if over or near water.	L
X	Connect synoptic water level measurements	Slips, trips, falls; heat stress; drowning; heat stress; sun exposure	Be aware of grade changes, holes, trip hazards - assess area prior to deploying equipment; wear sunscreen. Wear PDF if over or near water.	L
X	Survey and mark elevation measurements at each monitoring well location	Slips, trips, falls; heat stress; drowning; heat stress; sun exposure	Be aware of grade changes, holes, trip hazards - assess area prior to deploying equipment; wear sunscreen. Wear PDF if over or near water.	L

Add Items

	EQUIPMENT	TRAINING	INSPECTION
X	GPS	Manufacturer's instructions	Daily
X	data recording pressure transducers	Manufacturer's instructions	Manufacturer's instructions

Involved Personnel:
CDM and associated subcontractors

Acceptance Authority (digital signature): _____

ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC)
(Use highest code)

L

Date: 7/28/10 Project: Raritan Bay Early RI Activities

Activity: Monitoring Well Development

Activity Location: Raritan Bay Slag Superfund Site

Prepared By: Paul Opem, CSP

Risk Assessment Code Matrix

E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

		Probability				
		Frequent	Likely	Occasional	Seldom	Unlikely
Severity	Catastrophic	E	E	H	H	M
	Critical	E	H	H	M	L
	Marginal	H	M	M	L	L
	Negligible	M	L	L	L	L

Add Identified Hazards

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Set up development equipment	Slips, trips, falls; heat stress; drowning; back injury; sun exposure	Be aware of grade changes, holes, trip hazards - assess area prior to setting up equipment; wear sunscreen; utilize proper lifting procedures. Wear PDF if over or near water.	L
X	Well sounding for sediment and depth	Slips, trips, falls; heat stress; drowning;; sun exposure	Be aware of grade changes, holes, trip hazards - assess area prior to setting up equipment; wear sunscreen. Wear PDF if over or near water.	L
X	Groundwater sampling	Slips, trips, falls; heat stress; drowning; back injury; sun exposure	Be aware of grade changes, holes, trip hazards - assess area prior to setting up equipment; wear sunscreen. Wear PDF if over or near water.	L
X	Demob of equipment	Slips, trips, falls; heat stress; drowning; back injury; sun exposure	Be aware of grade changes, holes, trip hazards - assess area prior to setting up equipment; wear sunscreen ;utilize proper lifting procedures. Wear PDF if over or near water.	L

Add Items

	EQUIPMENT	TRAINING	INSPECTION
X	Well sounding and groundwater sampling equipment	Manufacturer's instructions	Daily

Involved Personnel:
CDM and associated subcontractors

ACTIVITY HAZARDS ANALYSIS

Acceptance Authority (digital signature):

ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC)
(Use highest code)

L

Date: 7/28/10 Project: Raritan Bay Early RI Activities

Activity: Slag Surveys

Activity Location: Raritan Bay Slag Superfund Site

Prepared By: Paul Opem, CSP

Risk Assessment Code Matrix

E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

		Probability				
		Frequent	Likely	Occasional	Seldom	Unlikely
S e v e r i t y	Catastrophic	E	E	H	H	M
	Critical	E	H	H	M	L
	Marginal	H	M	M	L	L
	Negligible	M	L	L	L	L

Add Identified Hazards

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Walk along seawall and jetty to observe slag	Slips, trips, falls; heat stress; drowning; heat stress; sun exposure	Be aware of grade changes, holes, trip hazards - assess area prior to collecting data; wear sunscreen. Be aware of changing tides. Wear PDF if over or near water.	L
X	Prepare and launch boat (if observing slag from boat)	Slips, trips, falls; back injury; pinches; cuts; heavy lifting; drowning; heat stress	Follow established plan from captain of boat; wear PDFs at all times; utilize proper lifting procedures; be aware of grade changes, holes, trip hazards.	L
X	Collect photographs and GPS from boat	Drowning ; pinches; cuts; back injury; heat stress; sun exposure.	Proceed with devices according to manufacturer's instructions; remain in boat; wear PDF at all times; wear sunscreen; do not lift equipment when leaning or twisting body.	L
X	Boat docking and demob of equipment	Slips, trips, falls; back injury; pinches; cuts; heavy lifting; drowning; heat stress	Follow established plan from captain of boat; where PDFs at all times; utilize proper lifting procedures; be aware of grade changes, holes, trip hazards.	L
X	Collect photographs and GPS from shore	Slips, trips, falls; heat stress; drowning; heat stress; sun exposure	Be aware of grade changes, holes, trip hazards - assess area prior to collecting data; wear sunscreen. Be aware of changing tides. Wear PDF if over or near water.	L
X	Probe to identify buried slag	Slips, trips, falls; heat stress; drowning; heat stress; sun exposure; cuts; pinches	Be aware of grade changes, holes, trip hazards - assess area prior to collecting data; wear sunscreen. Wear PDF if over or near water. Wear protective cut-resistant gloves, safety glasses, hard hat, steel-toed shoes. Be aware of changing tides. Do not swing tools near other personnel.	L

Add Items

	EQUIPMENT	TRAINING	INSPECTION
X	GPS	Manufacturer's instructions	Daily

ACTIVITY HAZARDS ANALYSIS

	EQUIPMENT	TRAINING	INSPECTION
X	Camera	Manufacturer's instructions	
X	slambar, pick, shovel	Manufacturer's Instructions	Daily

Involved Personnel:

CDM and associated subcontractors

Acceptance Authority (digital signature):

ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC)
(Use highest code)

L

Date: 7/28/10 Project: Raritan Bay Early RI Activities

Activity: Topographic and Bathymetric Surveys

Activity Location: Raritan Bay Slag Superfund Site

Prepared By: Paul Opem, CSP

Risk Assessment Code Matrix

E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

		Probability				
		Frequent	Likely	Occasional	Seldom	Unlikely
S e v e r i t y	Catastrophic	E	E	H	H	M
	Critical	E	H	H	M	L
	Marginal	H	M	M	L	L
	Negligible	M	L	L	L	L

Add Identified Hazards

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Collect GPS data for each well casing	Slips, trips, falls; heat stress	Be aware of grade changes, holes, trip hazards - assess area prior to collecting data. Utilize proper lifting procedures. Proceed according to manufacturer's instructions. Wear PDF if over or near water..	L
X	Prepare and launch boat	Slips, trips, falls; back injury; pinches; cuts; heavy lifting; drowning; heat stress	Follow established plan from captain of boat; wear PDFs at all times; utilize proper lifting procedures; be aware of grade changes, holes, trip hazards.	L
X	Collect water depth measurements from boat	Drowning ; pinches; cuts; back injury; heat stress; sun exposure.	Proceed with depth measuring device according to manufacturer's instructions; remain in boat; wear PDF at all times; wear sunscreen; do not lift equipment when leaning or twisting body.	L
X	Boat docking and demob of equipment	Slips, trips, falls; back injury; pinches; cuts; heavy lifting; drowning; heat stress	Follow established plan from captain of boat; wear PDFs at all times; utilize proper lifting procedures; be aware of grade changes, holes, trip hazards.	L

Add Items

	EQUIPMENT	TRAINING	INSPECTION
X	GPS	Manufacturer's instructions	Daily
X	Depth Measuring Sonar Equipment	Manufacturer's instructions	Daily

ACTIVITY HAZARDS ANALYSIS

Involved Personnel:

CDM and associated subcontractors

Acceptance Authority (digital signature):

ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC)
(Use highest code)

L

Date: 3/15/ 2010 Project: Raritan Bay Slag Study

Activity: Air Monitoring

Activity Location: Raritan Bay Slag Superfund Site

Prepared By: Paul Opem, CSP

Risk Assessment Code Matrix

E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

		Probability				
		Frequent	Likely	Occasional	Seldom	Unlikely
Severity	Catastrophic	E	E	H	H	M
	Critical	E	H	H	M	L
	Marginal	H	M	M	L	L
	Negligible	M	L	L	L	L

Add Identified Hazards

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Set up DataRAM	Slips, trips, falls; pinches; cuts; back injury; heavy equipment.	Survey for level location away from obstacles and equipment prior to set up. Utilize proper lifting procedures. Proceed deliberately according to manufacturer's instructions. Communicate with any operators in area.	L
X	Monitor Equipment	Slips, trips, falls; pinches; cuts; heavy equipment.	Communicate with personnel and operators in area; survey area for any new hazards such as tools laying on ground.	L
X	Remove DataRAM from location	Slips, trips, falls; pinches; cuts; back injury; heavy equipment.	Utilize proper lifting procedures. Proceed deliberately according to manufacturer's instructions. Communicate with any operators in area.	L

Add Items

	EQUIPMENT	TRAINING	INSPECTION
X	DataRAM	Manufacturer's instructions	Daily

Involved Personnel:
CDM and associated subcontractors

This AHA was reviewed and approved by Shawn Oliveira, CIH, CSP, Director of H&S Programs CDM Federal Services Group

ACTIVITY HAZARDS ANALYSIS

Acceptance Authority (digital signature):

ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC)
(Use highest code)

M

Date: 3/15/ 2010 Project: Raritan Bay Slag Study

Activity: Excavation/Trenching Safety

Activity Location: Raritan Bay Slag Superfund Site

Prepared By: Paul Opem, CSP

Risk Assessment Code Matrix

E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

		Probability				
		Frequent	Likely	Occasional	Seldom	Unlikely
Severity	Catastrophic	E	E	H	H	M
	Critical	E	H	H	M	L
	Marginal	H	M	M	L	L
	Negligible	M	L	L	L	L

Add Identified Hazards

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Locate Utilities	Explosions, burns (gas lines), electrocution or electrical fires (electrical lines), drowning (water & sewer lines)	Pre-arrange utility mark out with BPU personnel before digging. If needed, pot-hole for utilities to locate the exact location before beginning full excavation. Hand excavate when nearing the utility so that it is not damaged. Each operator on the job should be aware of the location of all underground utilities, structures, tanks, etc., identified by BPU base personnel. Utilities will be a topic of daily safety meetings.	M
X	Set up exclusion zone	Slips, trips, falls; moving equipment	Communicate with all operators in area. Survey area for holes, grade changes, trip hazards. Wear required PPE.	L
X	Excavation	Training, truck, excavator, front end loader, other heavy equipment failure	Only trained operators experienced with the type of equipment being used will be operating heavy equipment. Perform visual inspection to the vehicles and equipment before operating. Ensure brakes are working properly before operating. Have work vehicle/equipment maintenance documentation available. If the truck, trailer, front-end loader, or other heavy equipment is in need of repair, report to supervisor immediately. Place removed soil on poly sheeting.	L
X	Inspect soils and determine appropriate sloping, benching, or shoring necessary	Slips, trips, falls; moving equipment	Communicate with all operators in area. Do not enter unprotected excavations/trenches. Wear required PPE.	L
X	Slope or bench the excavation; or install trench box or shoring	Soil cave-ins; crushing; pinching; slips, trips, falls; moving equipment	Personnel not allowed in moving trench box; Equipment/storage not allowed on edge of excavation; communicate with operator; personnel should not be in unprotected excavation;	M

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Refuel equipment	Fuel spill, explosions, fire, possible chemical exposure	Use only approved metal safety cans to store and dispense fuel. Place oily or fuel soaked rags and other combustibles in approved containers. No smoking. For gasoline powered equipment, attach the grounding wire from the fuel tank to the equipment before fueling.	L
X	Collect Soil Samples	Slips, trips, falls; heavy equipment; exposure to possible hazardous material	Survey area for grade changes, holes, etc; do not enter unprotected excavations; maintain communication with operator; utilize latex/nitrile gloves when collecting soil.	M
X	Place removed soil back into excavated trench	Cave-ins, equipment contact with personnel	Remove all personnel from excavation; field personnel must maintain contact with operator.	M
X	Decon equipment (in particular excavator bucket)	Possible exposure to hazardous material; slips, trips, falls; moving equipment	Spray in controlled manner back into excavation; Do not stand near edge of trench or excavation; communicate with operators; wear required PPE, including Tyvek and face shield if necessary to keep spray off personnel	M

Add Items

	EQUIPMENT	TRAINING	INSPECTION
X	Excavator	Training on specific operations and maintenance per manufacturer. Trained operators on equipment used.	Daily
X	Haul Trucks	Training on proper loading and unloading techniques and procedures for notifying and avoiding site personnel that may be in the construction zone.	Daily
X	Re-fueling equipment	Training on proper fueling techniques for site equipment, and specific safety measures to be taken when fueling.	Daily

Involved Personnel:

CDM and associated subcontractors
Competent Persons: Robert Gainer, CEMCO

This AHA was reviewed and approved by Shawn Oliveira, CIH, CSP, Director of H&S Programs CDM Federal Services Group

Acceptance Authority (digital signature): _____

ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC)
(Use highest code)

L

Date: 3/15/ 2010 Project: Raritan Bay Slag Study

Activity: Fence Maintenance

Activity Location: Raritan Bay Slag Superfund Site

Prepared By: Paul Opem, CSP

Risk Assessment Code Matrix

E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

		Probability				
		Frequent	Likely	Occasional	Seldom	Unlikely
Severity	Catastrophic	E	E	H	H	M
	Critical	E	H	H	M	L
	Marginal	H	M	M	L	L
	Negligible	M	L	L	L	L

Add Identified Hazards

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Inspect fencing for damage and repairs needed	Slips, trips, falls; cuts; biological hazards such as flora/fauna and animals; weather	Survey area for holes and grade changes; survey area for sharp or poisonous plants and harmful animals; pay close attention to changing weather patterns and prepare for cold or rain.	L
X	Initiate repairs to fencing material (e.g., replace fence post)	Exposure to possible hazardous material in soil; cuts/pinches/strains from hand tools	Keep impacted soil areas wet during hand digging. Place all removed soil on poly sheeting and arrange for proper IDW disposal. Tools should only be used according to manufacturer's recommendation; wear required PPE; spray soil as digging proceeds to eliminate dust. If slag is encountered, move placement location of fence post to area free of debris.	M
X	Decon all equipment in contact with soil	Exposure to possible hazardous material in soil	Spray in controlled manner back into hole and away from personnel; wear required PPE, including Tyvek and face shield if necessary to keep spray off personnel.	L
X	Dispose of replaced fencing material and IDW	Cuts; slips;trips;falls; exposure to possible hazardous material.	Arrange for IDW subcontractor to dispose of all IDW, including fence posts. Arrange for prompt removal of material. Place soil on poly sheeting and other IDW in properly labeled bags awaiting disposal.	L

Add Items

	EQUIPMENT	TRAINING	INSPECTION
X	Hand tools (e.g., shovels, metal cutters, hudson-type sprayer, etc.)	Use in accordance with intended purpose; wear appropriate required PPE (e.g., leather work gloves; safety glasses with side shields, steel-toed shoes). Proper lifting; proper storage.	Daily

ACTIVITY HAZARDS ANALYSIS

Involved Personnel:

CDM and associated subcontractors

This AHA was reviewed and approved by Shawn Oliveira, CIH, CSP, Director of H&S Programs CDM Federal Services Group

Acceptance Authority (digital signature):

Appendix C

Corporate Health & Safety Plan

- Section 16.8 Excavations
- Section 16.13 Heat Stress
- Section 16.14 Cold Stress

16.8 Excavations

CDM employees who work in or around excavations are exposed to many of the same excavation hazards as construction personnel. CDM employees should learn to recognize these hazards and avoid situations that put themselves, other employees, and subcontractors at risk. Employees should be aware of the following safe excavation work practices.

16.8.1 Pre-Excavation Activities

- Before excavation, the location of any underground utilities such as gas, sewer, electricity, and telephone lines should be determined and marked. In public areas, this can be done using the state's one-call system for utility location. On private property, government facilities, etc., the owner must be asked to locate underground utilities. In some cases, it may be necessary to use nonintrusive subsurface investigation techniques to identify underground utilities and installations.
- Excavations should be conducted under the direction of a "competent person." OSHA defines "competent person" as an individual who, by way of training and/or experience, is knowledgeable of applicable standards, is capable of identifying workplace hazards relating to the specific operation, is designated by the employer, and has authority to take appropriate actions. For excavations, the competent person should be on site and is responsible for ensuring the following:
 - Performing inspections before the start of each shift and as needed throughout the shift to ensure a safe operation
 - Removing employees from the hazardous area when there is evidence of a possible cave-in
 - Identifying and correcting hazards associated with the excavation
- Sometimes the excavation is under control of CDM, and CDM should provide the competent person. Often the excavation is under the control of a contractor, and that contractor should provide the competent person.
- For many excavations an excavation permit must be completed before excavating. The permit is usually generated by the owner/operator of a facility or sometimes a prime contractor. The permit should be completed by the competent person for that excavation.
- Surface encumbrances (buildings, utility poles, pavement, or other structures that may be undermined by the excavation) that have a potential to create a hazard to employees or become subject to physical damage must be removed, supported, or neutralized, as necessary, before the start of any excavation work.
- The competent person must evaluate soil conditions and determine the shoring or sloping requirements for the trench or excavation, based on the soil evaluation. If no attempt is made to determine soil type, excavations shall be sloped at an angle not steeper than 1.5 (horizontal) to 1 (vertical) (34 degrees), or a trench box or other protective system shall be used. For excavations greater than 20 feet (6 meters) in depth, sloping and/or shoring systems must be designed by a professional engineer.

16.8.2 During Excavation

- The competent person must inspect the trench or excavation daily before performing any work within the trench or excavation deeper than 5 feet.
- For trenches less than 5 feet deep, the competent person must inspect and evaluate the potential for a cave-in.
- All excavations that are 4 feet deep or deeper shall have a ladder for access into the excavation with no more than 25 feet of lateral travel in any direction.
- All excavations that are 5 feet deep or deeper and excavations shallower than 5 feet in unstable soil shall be sloped, braced, or shored to prevent cave-ins.
- No material, including trench spoil, may be stored within 2 feet of the edge of the excavation.
- All excavations shall be barricaded with the appropriate barrier tape and other protective devices to protect against falls or other inadvertent entry.
- If possible, excavations should not be left open. If an excavation must be kept open, proper covers, fencing, and security should be provided to prevent public access to the excavation during nonworking hours.
- Tools, equipment, or heavy machinery should not be placed near an excavation where they may affect the structural stability of the walls or fall into the excavation.
- When mobile equipment is operated adjacent to an excavation, or when such equipment is required to approach the edge of an excavation, and the operator does not have a clear and direct view of the edge of the excavation, a warning system such as barricades, hand or mechanical signals, or stop logs should be used. Where possible, the grade should slope away from the excavation.
- An emergency lighting system should be in place in the event of an electrical failure. This may consist of battery-operated flashlights.
- If employees or small equipment must cross over the excavation, provide walkways or bridges with a minimum clear width of 20 inches, equipped with standard rails, and extending a minimum of 24 inches past each surface edge of the trench.
- For excavation work adjacent to natural waterways, avoid polluting of the water by placing spoil piles away from the water and preventing any accumulation of spoils on slopes.
- Place any environmentally impacted soils on plastic liners and cover the spoil piles to prevent further spreading of the contamination. The liners and covers should be durable enough for the intended period of storage.

- For excavations that may contain a hazardous atmosphere, air monitoring should be conducted before entry and periodically during the work to ensure that a safe atmosphere is maintained during excavation work. Air monitoring shall be performed for explosive/flammable vapors, oxygen, and any hazardous gases that may be present such as hydrogen sulfide, carbon monoxide, or other hazardous gases that may be present as a result of activities conducted in the excavation or contaminants in the soil. Use forced ventilation if needed. Acceptable entry conditions are:
 - Oxygen content 20.5 percent to 23.5 percent
 - Flammable atmosphere <10 percent of the lower explosive limit (LEL)
 - Hydrogen sulfide <10 ppm
 - Carbon monoxide <25 ppm
 - Toxic vapor/gases < one half compound exposure limit

Note: If air monitoring results indicate levels outside of the conditions above, CDM employees and subcontractors should not enter the excavation and contact the safety coordinator or HSM for guidance.

- Heavy equipment, tools, or individuals shall not operate/work within 10 feet of any power line or exposed electrical distribution component unless it has been de-energized and visibly grounded or provided with an effective insulating barrier.
- Workers should wear PPE including a hard hat, safety glasses, and safety boots.
- Water accumulation is not permitted in any excavation that will be occupied. Remove standing water using pumps and continuously monitor the water level and pump operation.
- The competent person must evaluate soil conditions and stability as new soil layers are uncovered.
- Do not stand under any live load, including an excavator bucket.
- Stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials.
- Do not stand in the swing radius of excavation equipment.

16.14 Cold Stress

Persons working outdoors in low temperatures, especially below freezing, or in wet or snowy weather are potentially subject to cold stress disorders. Factors that contribute to cold stress exposure include temperature, humidity, wind, sunlight, rain, snow, fog, exposure duration, clothing, and work activity. Individual susceptibility to cold stress disorders can vary widely. Individual physical factors that can affect a person's response to cold work environments include a person's general fitness and age.

The following guidelines should be considered when working in ambient air temperatures below 40 ° F, especially when other contributing weather conditions such as snow, rain, or wind are present.

16.14.1 Hazards Associated with Cold Stress

Hypothermia – Hypothermia results from a cooling of the body's core temperature and if left unattended can become a serious condition. Hypothermia can result in the loss of physical skills and impair judgment thereby contributing to the potential for other accidents. Severe hypothermia can result in death. Hypothermia can occur at temperatures above freezing as well as below.

- Symptoms include shivering, teeth chattering, fumbling hands, slurred speech, and loss of coordination. Eventually the pulse and respiratory rate may slow. The victim may appear blue or lose color in the face.
- Treatment for hypothermia is to catch symptoms early and move the individual to a warm environment indoors or in a vehicle. If a warm location is not immediately available the victim should be sheltered from the wind and provided extra clothing such as coats or blankets, and observed to determine if their condition is improving or not. If the victim continues to deteriorate and becomes colder, they should be transported to a medical facility for assistance.

Frostbite – Frostbite is a condition in which the fluids around cells of body tissue freeze. The condition can lead to body tissue damage. The most vulnerable parts of the body are the nose, ears, cheeks, fingers, and toes.

- Symptoms of frostbite include, body parts becoming white, firm, cold to the touch and may feel waxy. The victim will not feel pain in the affected area.
- Treatment of frostbite requires that the victim be brought to a warm environment and the affected areas be allowed to thaw and warm. If frostbite has progressed beyond small patches of skin and affects whole body parts such as a hand, foot, or ear, the victim should be transported to a medical facility for treatment and observation.

16.14.2 Cold Stress Monitoring

Personnel should monitor themselves and each other for signs and symptoms of frostbite and/or hypothermia. If symptoms are observed in an employee or subcontractor, steps should be taken to treat the symptoms by having the individual go to a warm environment either in a nearby structure or vehicle.

16.14.3 Cold Stress Control and Prevention

Cold stress can easily be prevented with proper planning and prevention. Some basic controls and preventative measures are listed below:

- Forecasted conditions. Consider the effect of wind chill, (See Table 16-2 on next page).
- Dress in layers and stay dry. Avoid cotton clothing such as socks or T-shirts. Bring extra clothing.
- Wear hardhat liners and gloves. Wear rain gear in rain and snow.
- Curtail work if extreme weather conditions such as a blizzard, extreme wind chill, (e.g., less than 0° F), torrential cold rains or wind is expected.
- For long-term projects in cold environments, consider setting temporary structures with portable heaters.
- Take warming breaks as needed.
- Avoid beverages with caffeine, alcohol, or medications that restrict blood flow.
- Drink warm non-caffeine containing beverages such as hot chocolate or soups on breaks.

Table 16-2 Wind-chill Index

WINDCHILL INDEX Cooling Power of Wind on Exposed Flesh Expressed as an Equivalent Temperature (under calm conditions)												
Estimated Wind Speed (in mph)	Actual Temperature Reading (°F)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperature (°F)											
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
Wind speeds greater than 40 mph have little additional effect	LITTLE DANGER in < hr. with dry skin. Maximum danger of false sense of security.				INCREASING DANGER Danger from freezing of exposed flesh within one minute.				GREAT DANGER Flesh may freeze within 30 seconds.			
	From <i>Fundamentals of Industrial Hygiene</i> , Third Edition. Plog, B.A., Benjamin, G. S., Kerwin, M.A., National Safety Council, 1988.											

16.13 Heat Stress

Camp Dresser & McKee Inc. (CDM) employees may be exposed to hazards associated with hot work environments. Factors that contribute to heat exposure include temperature, humidity, personal protective equipment (PPE) radiant heat, sunlight, access to drinking water, exposure duration, and work activity. Individuals vary widely in their susceptibility to heat stress. Factors that may influence individual susceptibility to heat stress include the following:

- Lack of physical fitness
- Lack of acclimatization
- Age
- Dehydration
- Obesity
- Alcohol and drug use
- Infection
- Sunburn
- Diarrhea
- Chronic disease

The following guidelines should be considered when CDM employees or subcontractors perform work:

- In ambient air temperatures above 80 ° F
- That involves heavy physical labor in temperatures above 70 ° F
- In chemical-protective clothing above 70 ° F.

16.13.1 Hazards Associated With Heat Stress

Heat Stroke – Heat stroke is a serious medical emergency and can lead to death if left untreated. It is an acute and dangerous reaction caused by the failure of heat regulating mechanisms of the body. Persons who are elderly, obese, chronically ill, alcoholic, diabetic, or have circulatory system problems are at greater risk.

- Symptoms include red, hot, dry skin, nausea, headache, weakness, dizziness, elevated body temperature, rapid respiration and pulse, coma, or loss of consciousness.
- Treatment for heat stroke:

- Heat stroke is a serious medical emergency. Emergency medical services (911) should be contacted if heat stroke is suspected.
- Move the victim to a cool place, (shade, air conditioned building, vehicle).
- Remove heavy clothing.
- Cool the victim with ice packs, wet towels, or cloth.
- Keep head and shoulders elevated.
- Keep victim's airway open, check breathing and pulse.

Heat Exhaustion – A state of exhaustion or weakness caused by loss of fluids through perspiration and inadequate fluid replacement. Severe cases may result in loss of consciousness, (fainting). This condition can progress to heat stroke if left untreated.

- Symptoms include:
 - Pale, clammy, moist skin, heavy sweating, and extreme weakness.
 - Body temperature is normal, pulse is weak and rapid, breathing is shallow.
 - The person may have a headache, nausea, or feel dizzy.
- Treatment for heat exhaustion:
 - Remove the victim to a cool location. (e.g., shade, air conditioned building, or vehicle).
 - Allow the victim to lie down and prop their legs up.
 - Cool the victim with wet towels, cloth, or cold packs.
 - If the victim is not nauseous they should drink water slowly.
 - If the victim loses consciousness, transport to local medical facility.
 - Continue treatment until symptoms are gone. Consult with CDM medical consultant prior to returning to work.

Heat Cramps – Heat cramps are a condition that can progress to heat exhaustion or heat stroke. Symptoms include severe cramping of the arms, legs, and abdomen. Treatment includes:

- Removing the victim to a cool location. Loosen clothing.
- Having the victim slowly drink cool water.

- Resting the cramping muscles.

Heat Rash – Heat rash is a mild red skin rash, in areas where the body is in contact with clothing or protective gear. The area is likely to itch and can be a source of irritation. Treatment includes decreasing the amount of time in protective gear and applying talcum powder to absorb moisture. When possible, wear breathable clothing to prevent a buildup of moisture within the clothing.

16.13.2 Heat Stress Monitoring

Since the susceptibility to heat stress hazards can vary greatly from one individual to another, often the best way monitor for heat stress is through observing employees and individual physiological monitoring. When working in conditions that have the potential to create heat stress, either heart rate (HR) or body temperature (BT) should be monitored in accordance with the suggested frequency given in Table 16-1 below:

Table 16-1 Suggested Frequency of Physiological Monitoring for Fit and Acclimatized Workers^a

Adjusted Temperature ^b	Normal Work Ensemble ^c	Impermeable Ensemble
90°F (32.2°C) or above	After each 45 minutes of work	After each 15 minutes of work
87.5°-90°F (30.8°-32.2°C)	After each 60 minutes of work	After each 30 minutes of work
82.5°-87.5°F (28.1°-30.8°C)	After each 90 minutes of work	After each 60 minutes of work
77.5°-82.5°F (25.3°-28.1°C)	After each 120 minutes of work	After each 90 minutes of work
72.5°-77.5°F (22.5°-25.3°C)	After each 150 minutes of work	After each 120 minutes of work

^aFor work levels of 250 kilocalories/hour.

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

^cA normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.

- **Heart Rate (HR)** – Heart rate should be measured by the radial pulse for 30 seconds as early as possible in the initial rest period. On an individual basis, if the heart rate exceeds 110 beats per minute (BPM), that individual should not return to work until their heart rate drops below 110 BPM and they are fully recovered. If more than one worker has a heart rate that exceeds 110 BPM, a work rest regimen, or other control measures should be implemented to maintain heart rates below 110 BPM.
- **Body Temperature (BT)** – The body temperature may be measured using a clinical oral thermometer or a clinical ear thermometer. On an individual basis, if the body temperature exceeds 99.6 ° F, that individual should not return to work until their body temperature drops below 99.6 ° F and they are fully recovered. If more

than one worker has a body temperature in excess of 99.6 ° F, a work rest regimen, or other control measures should be implemented to maintain to maintain body temperatures below 99.6 ° F.

- Personnel should monitor themselves and each other for the development of symptoms such as sudden fatigue, nausea, dizziness, irritability, malaise, flu-like symptoms, and lightheadedness.

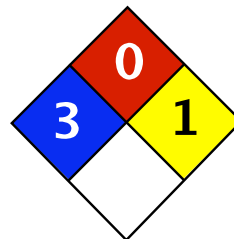
16.13.3 Heat Stress Controls and Prevention

- Develop work/rest regimen to maintain physiological parameters within limits described above and prevent development of initial symptoms of heat stress-related conditions. If the physiological limits are exceeded or symptoms develop, the work period should be reduced and rest period increased. Rest areas should be cool, in areas such as shade, air conditioned buildings, or vehicles, and away from heat exposure.
- In extreme heat conditions, employees may wear heat-control clothing such as ice vests or cool suits. Physiological monitoring should still be conducted and work/rest regimens implemented to keep physiological parameters within recommended limits.
- Mobile showers or hoses can be used to cool down workers in waterproof protective clothing.
- Shield sources of radiant heat.
- Provide shaded work areas.
- Conduct activities in early morning and late evening to avoid the hottest parts of the day.
- Allow employees to become acclimatized to the heat by performing less strenuous activities for the first few days. Schedule more physically demanding work later.
- Provide adequate, cool drinking water for consumption during break periods.
- Avoid consumption of beverages such as coffee, tea, or colas that act as diuretics and dehydrate the body.

Appendix D

Material Safety Data Sheets

- Hydrochloric Acid
- Sodium Hydroxide
- Nitric Acid



Health	3
Fire	0
Reactivity	2
Personal Protection	J

Material Safety Data Sheet

Sodium hydroxide MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sodium hydroxide

Catalog Codes: SLS3298, SLS1081, SLS2503, SLS3925, SLS1705

CAS#: 1310-73-2

RTECS: WB4900000

TSCA: TSCA 8(b) inventory: Sodium hydroxide

CI#: Not available.

Synonym: Caustic Soda

Chemical Name: Sodium Hydroxide

Chemical Formula: NaOH

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Sodium hydroxide	1310-73-2	100

Toxicological Data on Ingredients: Sodium hydroxide LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:

Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, of inhalation. The amount of tissue damage depends on length of contact. Eye contact can result in corneal damage or blindness. Skin contact can produce inflammation and blistering. Inhalation of dust will produce irritation to gastro-intestinal or respiratory tract, characterized by burning, sneezing and coughing. Severe over-exposure can produce lung damage, choking, unconsciousness or death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Not available.
MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.

The substance may be toxic to mucous membranes, upper respiratory tract, skin, eyes. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction, or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. **WARNING:** It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: metals

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available.

Risks of explosion of the product in presence of static discharge: Not available.

Slightly explosive in presence of heat.

Fire Fighting Media and Instructions: Not available

Special Remarks on Fire Hazards:

sodium hydroxide + zinc metal dust causes ignition of the latter.

Under proper conditions of temperature, pressure and state of division, it can ignite or react violently with acetaldehyde, ally alcohol, allyl chloride, benzene-1,4-diol, chlorine trifluoride, 1,2 dichloroethylene, nitroethane, nitromethane, nitroparaffins, nitropropane, cinnamaldehyde, 2,2-dichloro-3,3-dimethylbutane. Sodium hydroxide in contact with water may generate enough heat to ignite adjacent combustible materials. Phosphorous boiled with NaOH yields mixed phosphines which may ignite spontaneously in air. sodium hydroxide and cinnamaldehyde + heat may cause ignition. Reaction with certain metals releases flammable and explosive hydrogen gas.

Special Remarks on Explosion Hazards:

Sodium hydroxide reacts to form explosive products with ammonia + silver nitrate. Benzene extract of allyl benzenesulfonate prepared from allyl alcohol, and benzene sulfonyl chloride in presence of aqueous sodium hydroxide, under vacuum distillation, residue darkened and exploded. Sodium Hydroxide + impure tetrahydrofuran, which can contain peroxides, can cause serious explosions. Dry mixtures of sodium hydroxide and sodium tetrahydroborate liberate hydrogen explosively at 230-270 deg. C. Sodium Hydroxide reacts with sodium salt of trichlorophenol + methyl alcohol + trichlorobenzene + heat to cause an explosion.

Section 6: Accidental Release Measures

Small Spill:

Use appropriate tools to put the spilled solid in a convenient waste disposal container. If necessary: Neutralize the residue with a dilute solution of acetic acid.

Large Spill:

Corrosive solid. Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of acetic acid. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Keep container dry. Do not breathe dust. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If you feel unwell, seek medical attention and show the label when possible. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, reducing agents, metals, acids, alkalis, moisture.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Hygroscopic. Deliquescent.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:

Splash goggles. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor and dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

STEL: 2 (mg/m3) from ACGIH (TLV) [United States]

TWA: 2 CEIL: 2 (mg/m³) from OSHA (PEL) [United States]
CEIL: 2 (mg/m³) from NIOSH Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Deliquescent solid.)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 40 g/mole

Color: White.

pH (1% soln/water): 13.5 [Basic.]

Boiling Point: 1388°C (2530.4°F)

Melting Point: 323°C (613.4°F)

Critical Temperature: Not available.

Specific Gravity: 2.13 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility: Easily soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, moisture, moist air

Incompatibility with various substances:

Highly reactive with metals.

Reactive with oxidizing agents, reducing agents, acids, alkalis, moisture.

Corrosivity: Not available.

Special Remarks on Reactivity:

Hygroscopic. Much heat is evolved when solid material is dissolved in water. Therefore cold water and caution must be used for this process.

Sodium hydroxide solution and octanol + diborane during a work-up of a reaction mixture of oxime and diborane in tetrahydrofuran is very exothermic, a mild explosion being noted on one occasion.

Reactive with water, acids (mineral, non-oxidizing, e.g. hydrochloric, hydrofluoric acid, muriatic acid, phosphoric), acids (mineral, oxidizing e.g. chromic acid, hypochlorous acid, nitric acid, sulfuric acid), acids (organic e.g. acetic acid, benzoic acid, formic acid, methanoic acid, oxalic acid), aldehydes (e.g. acetaldehyde, acrolein, chloral hydrate, foraldehyde), carbamates (e.g. carbanolate, carbofuran), esters (e.g. butyl acetate, ethyl acetate, propyl formate), halogenated organics (dibromoethane, hexachlorobenzene, methyl chloride, trichloroethylene), isocyanates (e.g. methyl isocyanate), ketones (acetone, acetophenone, MEK, MIBK), acid chlorides, strong bases, strong oxidizing agents, strong reducing agents, flammable liquids, powdered metals and metals (i.e. aluminum, tin, zinc, hafnium, raney nickel), metals (alkali and alkaline e.g. cesium, potassium, sodium), metal compounds (toxic e.g. beryllium, lead acetate, nickel carbonyl, tetraethyl lead), nitrides (e.g. potassium nitride, sodium nitride), nitriles (e.g. acetonitrile, methyl cyanide), nitro compounds (organic e.g. nitrobenzene, nitromethane), acetic anhydride, chlorohydrin, chlorosulfonic acid, ethylene cyanohydrin, glyoxal, hydrosulfuric acid, oleum, propiolactone, acylonitrile, phorosous pentoxide, chloroethanol, chloroform-methanol, tetrahydroborate, cyanogen azide, 1,2,4,5 tetrachlorobenzene, cinnamaldehyde.
Reacts with formaldehyde hydroxide to yield formic acid, and hydrogen.

Special Remarks on Corrosivity: Very caustic to aluminum and other metals in presence of moisture.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:

LD50: Not available.

LC50: Not available.

Chronic Effects on Humans:

MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells.

May cause damage to the following organs: mucous membranes, upper respiratory tract, skin, eyes.

Other Toxic Effects on Humans:

Extremely hazardous in case of inhalation (lung corrosive).

Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (corrosive), of ingestion, .

Special Remarks on Toxicity to Animals:

Lowest Published Lethal Dose:

LDL [Rabbit] - Route: Oral; Dose: 500 mg/kg

Special Remarks on Chronic Effects on Humans: May affect genetic material. Investigation as a mutagen (cytogenetic analysis)

Special Remarks on other Toxic Effects on Humans:

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Sodium hydroxide, solid UNNA: 1823 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

Illinois toxic substances disclosure to employee act: Sodium hydroxide

Illinois chemical safety act: Sodium hydroxide

New York release reporting list: Sodium hydroxide

Rhode Island RTK hazardous substances: Sodium hydroxide

Pennsylvania RTK: Sodium hydroxide

Minnesota: Sodium hydroxide

Massachusetts RTK: Sodium hydroxide

New Jersey: Sodium hydroxide

Louisiana spill reporting: Sodium hydroxide

California Director's List of Hazardous Substances: Sodium hydroxide

TSCA 8(b) inventory: Sodium hydroxide

CERCLA: Hazardous substances.: Sodium hydroxide: 1000 lbs. (453.6 kg)

Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): CLASS E: Corrosive solid.

DSCL (EEC):

R35- Causes severe burns.

S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

S37/39- Wear suitable gloves and eye/face protection.

S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 2

Personal Protection: j

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 1

Specific hazard:

Protective Equipment:

Gloves.

Synthetic apron.

Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.

Splash goggles.

Section 16: Other Information

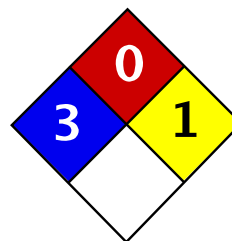
References: Not available.

Other Special Considerations: Not available.

Created: 10/09/2005 06:32 PM

Last Updated: 10/09/2005 06:32 PM

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Health	3
Fire	0
Reactivity	1
Personal Protection	

Material Safety Data Sheet Hydrochloric acid MSDS

Section 1: Chemical Product and Company Identification

Product Name: Hydrochloric acid

Catalog Codes: SLH1462, SLH3154

CAS#: Mixture.

RTECS: MW4025000

TSCA: TSCA 8(b) inventory: Hydrochloric acid

CI#: Not applicable.

Synonym: Hydrochloric Acid; Muriatic Acid

Chemical Name: Not applicable.

Chemical Formula: Not applicable.

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Hydrogen chloride	7647-01-0	20-38
Water	7732-18-5	62-80

Toxicological Data on Ingredients: Hydrogen chloride: GAS (LC50): Acute: 4701 ppm 0.5 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:

Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, . Slightly hazardous in case of inhalation (lung sensitizer). Non-corrosive for lungs. Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:

Slightly hazardous in case of skin contact (sensitizer).
CARCINOGENIC EFFECTS: Classified 3 (Not classifiable for human.) by IARC [Hydrochloric acid].
MUTAGENIC EFFECTS: Not available.

TERATOGENIC EFFECTS: Not available.

DEVELOPMENTAL TOXICITY: Not available.

The substance may be toxic to kidneys, liver, mucous membranes, upper respiratory tract, skin, eyes, Circulatory System, teeth.

Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. **WARNING:** It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:

If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: of metals

Explosion Hazards in Presence of Various Substances: Non-explosive in presence of open flames and sparks, of shocks.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:

Non combustible.

Calcium carbide reacts with hydrogen chloride gas with incandescence.

Uranium phosphide reacts with hydrochloric acid to release spontaneously flammable phosphine.

Rubidium acetylene carbides burns with slightly warm hydrochloric acid.

Lithium silicide in contact with hydrogen chloride becomes incandescent. When dilute hydrochloric acid is used, gas spontaneously flammable in air is evolved.

Magnesium boride treated with concentrated hydrochloric acid produces spontaneously flammable gas.

Cesium acetylene carbide burns hydrogen chloride gas.

Cesium carbide ignites in contact with hydrochloric acid unless acid is dilute.

Reacts with most metals to produce flammable Hydrogen gas.

Special Remarks on Explosion Hazards:

Hydrogen chloride in contact with the following can cause an explosion, ignition on contact, or other

violent/vigorous reaction: Acetic anhydride AgClO + CCl₄ Alcohols + hydrogen cyanide, Aluminum

Aluminum-titanium alloys (with HCl vapor), 2-Amino ethanol, Ammonium hydroxide, Calcium carbide Ca₃P₂

Chlorine + dinitroanilines (evolves gas), Chlorosulfonic acid Cesium carbide Cesium acetylene carbide,

1,1-Difluoroethylene Ethylene diamine Ethylene imine, Fluorine, HClO₄ Hexalithium disilicide H₂SO₄ Metal

acetylides or carbides, Magnesium boride, Mercuric sulfate, Oleum, Potassium permanganate,

beta-Propiolactone Propylene oxide Rubidium carbide, Rubidium, acetylene carbide Sodium (with aqueous HCl),

Sodium hydroxide Sodium tetraselenium, Sulfonic acid, Tetraselenium tetranitride, U₃P₄, Vinyl acetate.

Silver perchlorate with carbon tetrachloride in the presence of hydrochloric acid produces trichloromethyl perchlorate which detonates at 40 deg. C.

Section 6: Accidental Release Measures**Small Spill:**

Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:

Corrosive liquid. Poisonous liquid.

Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal.

Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage**Precautions:**

Keep locked up.. Keep container dry. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, organic materials, metals, alkalis, moisture.

May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection**Engineering Controls:**

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

CEIL: 5 (ppm) from OSHA (PEL) [United States]

CEIL: 7 (mg/m³) from OSHA (PEL) [United States]

CEIL: 5 from NIOSH

CEIL: 7 (mg/m³) from NIOSH

TWA: 1 STEL: 5 (ppm) [United Kingdom (UK)]

TWA: 2 STEL: 8 (mg/m³) [United Kingdom (UK)] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Pungent. Irritating (Strong.)

Taste: Not available.

Molecular Weight: Not applicable.

Color: Colorless to light yellow.

pH (1% soln/water): Acidic.

Boiling Point:

108.58 C @ 760 mm Hg (for 20.22% HCl in water)

83 C @ 760 mm Hg (for 31% HCl in water)

50.5 C (for 37% HCl in water)

Melting Point:

-62.25°C (-80°F) (20.69% HCl in water)

-46.2 C (31.24% HCl in water)

-25.4 C (39.17% HCl in water)

Critical Temperature: Not available.

Specific Gravity:

1.1- 1.19 (Water = 1)

1.10 (20% and 22% HCl solutions)

1.12 (24% HCl solution)

1.15 (29.57% HCl solution)

1.16 (32% HCl solution)

1.19 (37% and 38% HCl solutions)

Vapor Pressure: 16 kPa (@ 20°C) average

Vapor Density: 1.267 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.25 to 10 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether.

Solubility: Soluble in cold water, hot water, diethyl ether.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, water

Incompatibility with various substances:

Highly reactive with metals.

Reactive with oxidizing agents, organic materials, alkalis, water.

Corrosivity:

Extremely corrosive in presence of aluminum, of copper, of stainless steel(304), of stainless steel(316).

Non-corrosive in presence of glass.

Special Remarks on Reactivity:

Reacts with water especially when water is added to the product.

Absorption of gaseous hydrogen chloride on mercuric sulfate becomes violent @ 125 deg. C.

Sodium reacts very violently with gaseous hydrogen chloride.

Calcium phosphide and hydrochloric acid undergo very energetic reaction.

It reacts with oxidizers releasing chlorine gas.

Incompatible with, alkali metals, carbides, borides, metal oxides, vinyl acetate, acetylides, sulphides, phosphides, cyanides, carbonates.

Reacts with most metals to produce flammable Hydrogen gas.

Reacts violently (moderate reaction with heat of evolution) with water especially when water is added to the product. Isolate hydrogen chloride from heat, direct sunlight, alkalies (reacts vigorously), organic materials, and oxidizers (especially nitric acid and chlorates), amines, metals, copper and alloys (e.g. brass), hydroxides, zinc (galvanized materials), lithium silicide (incandescence), sulfuric acid(increase in temperature and pressure)

Hydrogen chloride gas is emitted when this product is in contact with sulfuric acid.

Adsorption of Hydrochloric Acid onto silicon dioxide results in exothermic reaction.

Hydrogen chloride causes aldehydes and epoxides to violently polymerize.

Hydrogen chloride or Hydrochloric Acid in contact with the following can cause explosion or ignition on contact or

Special Remarks on Corrosivity:

Highly corrosive. Incompatible with copper and copper alloys. It attacks nearly all metals (mercury, gold, platinum, tantalum, silver, and certain alloys are exceptions).

It is one of the most corrosive of the nonoxidizing acids in contact with copper alloys.

No corrosivity data on zinc, steel.

Severe Corrosive effect on brass and bronze

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation.

Toxicity to Animals:

Acute oral toxicity (LD50): 900 mg/kg [Rabbit].

Acute toxicity of the vapor (LC50): 1108 ppm, 1 hours [Mouse].

Acute toxicity of the vapor (LC50): 3124 ppm, 1 hours [Rat].

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: Classified 3 (Not classifiable for human.) by IARC [Hydrochloric acid].

May cause damage to the following organs: kidneys, liver, mucous membranes, upper respiratory tract, skin,

eyes, Circulatory System, teeth.

Other Toxic Effects on Humans:

Very hazardous in case of skin contact (corrosive, irritant, permeator), of ingestion, .
Hazardous in case of eye contact (corrosive), of inhalation (lung corrosive).

Special Remarks on Toxicity to Animals:

Lowest Published Lethal Doses (LDL/LCL)
LDL [Man] -Route: Oral; 2857 ug/kg
LCL [Human] - Route: Inhalation; Dose: 1300 ppm/30M
LCL [Rabbit] - Route: Inhalation; Dose: 4413 ppm/30M

Special Remarks on Chronic Effects on Humans:

May cause adverse reproductive effects (fetotoxicity).
May affect genetic material.

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects:
Skin: Corrosive. Causes severe skin irritation and burns.
Eyes: Corrosive. Causes severe eye irritation/conjunctivitis, burns, corneal necrosis.
Inhalation: May be fatal if inhaled. Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract. Inhalation of hydrochloric acid fumes produces nose, throat, and laryngeal burning, and irritation, pain and inflammation, coughing, sneezing, choking sensation, hoarseness, laryngeal spasms, upper respiratory tract edema, chest pains, as well as headache, and palpitations. Inhalation of high concentrations can result in corrosive burns, necrosis of bronchial epithelium, constriction of the larynx and bronchi, nasospetal perforation, glottal closure, occur, particularly if exposure is prolonged. May affect the liver.
Ingestion: May be fatal if swallowed. Causes irritation and burning, ulceration, or perforation of the gastrointestinal tract and resultant peritonitis, gastric hemorrhage and infection. Can also cause nausea, vomiting (with "coffee ground" emesis), diarrhea, thirst, difficulty swallowing, salivation, chills, fever, uneasiness, shock, strictures and stenosis (esophageal, gastric, pyloric). May affect behavior (excitement), the cardiovascular system (weak rapid pulse, tachycardia), respiration (shallow respiration), and urinary system (kidneys- renal failure, nephritis).
Acute exposure via inhalation or ingestion can also cause erosion of tooth enamel.
Chronic Potential Health Effects:
dyspnea, bronchitis. Chemical pneumonitis and pulmonary edema can also

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Hydrochloric acid, solution UNNA: 1789 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

Connecticut hazardous material survey.: Hydrochloric acid
Illinois toxic substances disclosure to employee act: Hydrochloric acid
Illinois chemical safety act: Hydrochloric acid
New York release reporting list: Hydrochloric acid
Rhode Island RTK hazardous substances: Hydrochloric acid
Pennsylvania RTK: Hydrochloric acid
Minnesota: Hydrochloric acid
Massachusetts RTK: Hydrochloric acid
Massachusetts spill list: Hydrochloric acid
New Jersey: Hydrochloric acid
New Jersey spill list: Hydrochloric acid
Louisiana RTK reporting list: Hydrochloric acid
Louisiana spill reporting: Hydrochloric acid
California Director's List of Hazardous Substances: Hydrochloric acid
TSCA 8(b) inventory: Hydrochloric acid
TSCA 4(a) proposed test rules: Hydrochloric acid
SARA 302/304/311/312 extremely hazardous substances: Hydrochloric acid
SARA 313 toxic chemical notification and release reporting: Hydrochloric acid
CERCLA: Hazardous substances.: Hydrochloric acid: 5000 lbs. (2268 kg)

Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).
EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):

CLASS D-2A: Material causing other toxic effects (VERY TOXIC).
CLASS E: Corrosive liquid.

DSCL (EEC):

R34- Causes burns.
R37- Irritating to respiratory system.
S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 1

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 1

Specific hazard:

Protective Equipment:

Gloves.

Full suit.

Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.

Face shield.

Section 16: Other Information

References:

-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987.

-SAX, N.I. Dangerous Properties of Industrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984.

-The Sigma-Aldrich Library of Chemical Safety Data, Edition II.

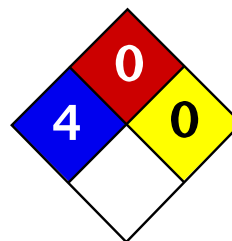
-Guide de la loi et du règlement sur le transport des marchandises dangereuses au Canada. Centre de conformité international Ltée. 1986.

Other Special Considerations: Not available.

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Last Updated: 09/14/2009 10:34 AM

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Health	3
Fire	0
Reactivity	0
Personal Protection	

Material Safety Data Sheet

Nitric acid, 65% MSDS

Section 1: Chemical Product and Company Identification

Product Name: Nitric acid, 65%

Catalog Codes: SLN2161

CAS#: Mixture.

RTECS: Not applicable.

TSCA: TSCA 8(b) inventory: Water; Nitric acid, fuming

CI#: Not applicable.

Synonym: Nitric Acid, 65%

Chemical Name: Not applicable.

Chemical Formula: Not applicable.

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Water	7732-18-5	35
Nitric acid, fuming	7697-37-2	65

Toxicological Data on Ingredients: Nitric acid, fuming: VAPOR (LC50): Acute: 244 ppm 0.5 hours [Rat]. 344 ppm 0.5 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:

Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, . Slightly hazardous in case of inhalation (lung sensitizer). Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Prolonged exposure may result in skin burns and ulcerations. Over-exposure by inhalation may cause respiratory irritation. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Not available.

MUTAGENIC EFFECTS: Not available.

TERATOGENIC EFFECTS: Not available.

DEVELOPMENTAL TOXICITY: Not available.

The substance may be toxic to lungs, mucous membranes, upper respiratory tract, skin, eyes, teeth.

Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:

If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: of combustible materials

Explosion Hazards in Presence of Various Substances:

Explosive in presence of reducing materials, of organic materials, of metals, of alkalis.

Non-explosive in presence of open flames and sparks, of shocks.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:

Flammable in presence of cellulose or other combustible materials.
Phosphine, hydrogen sulfide, selenide all ignite when fuming nitric acid is dripped into gas.
(Nitric Acid, fuming)

Special Remarks on Explosion Hazards:

Reacts explosively with metallic powders, carbides, cyanides, sulfides, alkalies and turpentine.
Can react explosively with many reducing agents.
Arsine, phosphine, tetraborane all oxidized explosively in presence of nitric acid.
Cesium and rubidium acetylides explode in contact with nitric acid.
Explosive reaction with Nitric Acid + Nitrobenzene + water.
Detonation with Nitric Acid + 4-Methylcyclohexane.
(Nitric acid, fuming)

Section 6: Accidental Release Measures**Small Spill:**

Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:

Corrosive liquid. Oxidizing material. Poisonous liquid.
Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Avoid contact with a combustible material (wood, paper, oil, clothing...). Keep substance damp using water spray. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage**Precautions:**

Keep locked up.. Keep container dry. Keep away from heat. Keep away from sources of ignition. Keep away from combustible material.. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as reducing agents, combustible materials, organic materials, metals, acids, alkalies, moisture. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage:

Keep container tightly closed. Keep container in a cool, well-ventilated area. Separate from acids, alkalies, reducing agents and combustibles. See NFPA 43A, Code for the Storage of Liquid and Solid Oxidizers. Do not store above 23°C (73.4°F).

Section 8: Exposure Controls/Personal Protection**Engineering Controls:**

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be

used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 2 STEL: 4 (ppm) from ACGIH (TLV) [United States]

TWA: 2 STEL: 4 from OSHA (PEL) [United States]

Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Acrid. Disagreeable and choking. (Strong.)

Taste: Not available.

Molecular Weight: Not applicable.

Color: Colorless to light yellow.

pH (1% soln/water): Acidic.

Boiling Point: 121°C (249.8°F)

Melting Point: -41.6°C (-42.9°F)

Critical Temperature: Not available.

Specific Gravity: 1.408 (Water = 1)

Vapor Pressure: 6 kPa (@ 20°C)

Vapor Density: 2.5 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.29 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether.

Solubility:

Easily soluble in cold water, hot water.

Soluble in diethyl ether.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances:

Highly reactive with alkalis.

Reactive with reducing agents, combustible materials, organic materials, metals, acids.

Corrosivity:

Extremely corrosive in presence of aluminum, of copper.

Non-corrosive in presence of glass, of stainless steel(304), of stainless steel(316), of brass.

Special Remarks on Reactivity:

A strong oxidizer.

Reacts violently with alcohol, organic material, turpene, charcoal.

Violent reaction with Nitric acid + Acetone and Sulfuric acid.

Nitric Acid will react with water or steam to produce heat and toxic, corrosive and flammable vapors.

(Nitric acid, fuming)

Special Remarks on Corrosivity:

In presence of traces of oxides, it attacks all base metals except aluminum and special chromium steels.

It will attack some forms of plastics, rubber, and coatings.

No corrosive effect on bronze.

No corrosivity data for zinc, and steel

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:

LD50: Not available.

LC50: Not available.

Chronic Effects on Humans:

Contains material which may cause damage to the following organs: lungs, mucous membranes, upper respiratory tract, skin, eyes, teeth.

Other Toxic Effects on Humans:

Extremely hazardous in case of inhalation (lung corrosive).

Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (corrosive), of ingestion, .

Special Remarks on Toxicity to Animals: LDL - Lowest Published Lethal Dose [Human] - Route: Oral; Dose: 430 mg/kg
(Nitric acid, fuming)

Special Remarks on Chronic Effects on Humans:

May cause adverse reproductive effects (effects on newborn and fetotoxicity) based on animal data. (Nitric acid, fuming)

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects:

Skin: Severely irritates skin. Causes skin burns and may cause deep and penetrating ulcers of the skin with a characteristic yellow to brownish discoloration. May be fatal if absorbed through skin.

Eyes: Severely irritates eyes. Causes eye burns. May cause irreversible eye injury.

Ingestion: May be fatal if swallowed. Causes serious gastrointestinal tract irritation or burns with nausea, vomiting, severe abdominal pain, and possible "coffee grounds" appearance of the vomitus . May cause perforation of the digestive tract.

Inhalation: May be fatal if inhaled. Vapor is extremely hazardous. Vapor may cause nitrous gas poisoning.

Effects may be delayed. May cause irritation of the mucous membranes and respiratory tract with burning pain in the nose and throat, coughing, sneezing, wheezing, shortness of breath and pulmonary edema. Other symptoms may include nausea, and vomiting.

Chronic Potential Health Effects:

Repeated inhalation may produce changes in pulmonary function and/or chronic bronchitis. It may also affect behavior (headache, dizziness, drowsiness, muscle contraction or spasticity, weakness, loss of coordination, mental confusion), and urinary system (kidney failure, decreased urinary output after several hours of

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Nitric acid UNNA: 2031 PG: II

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:

New York release reporting list: Nitric acid, fuming

Rhode Island RTK hazardous substances: Nitric acid, fuming

Pennsylvania RTK: Nitric acid, fuming

Florida: Nitric acid, fuming

Minnesota: Nitric acid, fuming

Massachusetts RTK: Nitric acid, fuming

New Jersey: Nitric acid, fuming

TSCA 8(b) inventory: Water; Nitric acid, fuming

SARA 302/304/311/312 extremely hazardous substances: Nitric acid, fuming

SARA 313 toxic chemical notification and release reporting: Nitric acid, fuming 65%

CERCLA: Hazardous substances.: Nitric acid, fuming: 1000 lbs. (453.6 kg);

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):

CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC).

CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

CLASS E: Corrosive liquid.

DSCL (EEC):

R8- Contact with combustible material may cause fire.

R35- Causes severe burns.

S23- Do not breathe gas/fumes/vapour/spray

[***]

S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

S36- Wear suitable protective clothing.

S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 0

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 4

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves.

Full suit.

Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.

Face shield.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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Last Updated: 11/06/2008 12:00 PM

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Appendix E
OSHA POSTER

Job Safety and Health

It's the law!



Occupational Safety and Health Administration
U.S. Department of Labor

EMPLOYEES:

- You have the right to notify your employer or OSHA about workplace hazards. You may ask OSHA to keep your name confidential.
- You have the right to request an OSHA inspection if you believe that there are unsafe and unhealthful conditions in your workplace. You or your representative may participate in that inspection.
- You can file a complaint with OSHA within 30 days of retaliation or discrimination by your employer for making safety and health complaints or for exercising your rights under the *OSH Act*.
- You have the right to see OSHA citations issued to your employer. Your employer must post the citations at or near the place of the alleged violations.
- Your employer must correct workplace hazards by the date indicated on the citation and must certify that these hazards have been reduced or eliminated.
- You have the right to copies of your medical records and records of your exposures to toxic and harmful substances or conditions.
- Your employer must post this notice in your workplace.
- You must comply with all occupational safety and health standards issued under the *OSH Act* that apply to your own actions and conduct on the job.

EMPLOYERS:

- You must furnish your employees a place of employment free from recognized hazards.
- You must comply with the occupational safety and health standards issued under the *OSH Act*.

**This free poster available from OSHA –
The Best Resource for Safety and Health**



Free assistance in identifying and correcting hazards or complying with standards is available to employers, without citation or penalty, through OSHA-supported consultation programs in each state.

1-800-321-OSHA
www.osha.gov

OSHA 3165-12-06R

Appendix F:
RESUME

Shawn T. Oliveira, C.I.H., C.S.P.

Director of H&S Programs

Education

M.S. – Environmental Engineering, University of Illinois, 2000

B.S. – Chemistry, University of Illinois, 1997

Certification

Certified Industrial Hygienist (9528 CP)

Certified Safety Professional (#18988)

OSHA 500/501 Certified Trainer

OSHA 30

OSHA 10

EM 385-1

AHERA Project Designer

ICS 100, 200, & 800

Experience Highlights

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Mr. Oliveira is a Certified Industrial Hygienist (CIH) and a Certified Safety Professional with 11 years of experience in environmental engineering, industrial hygiene and occupational safety, environmental chemistry, specializing in design, implementation, and assessment of Health and Safety (H&S) and Injury/Illness Prevention Programs. He has structured field operations for compliance with comprehensive H&S Plans, as well as Federal, State, and additional Appropriate and Applicable Rules and Regulations (ARARs).

Director of H&S, CDM Federal Services Group. Mr. Oliveira directs and implements Industrial Hygiene and Health and Safety programs for CDM Federal's general construction, engineering, design/build, remediation, and O&M projects. In this role, he oversees the following:

- Safety program implementation and compliance for DOE, USACE, USEPA totaling over a million man hours performed in 2008 for Federal and joint construction efforts
- Integration of safety concepts into CDM's Design-Build model
- Medical monitoring programs for Occupational, Drug and Alcohol, as well as other contractually specified requirements
- Continued integration of proactive safety metrics, innovative technology, and filed observations to generate over 900 documented project safety inspections resulting in over 18,000 individual safety observations of field activities by staff
- Companywide Online H&S training efforts providing training courses to over 400 personnel during 2009

Project H&S Manager, EPA Region VIII, Libby Asbestos Site, Libby, Montana. As the Libby Asbestos Project H&S Manager, Mr. Oliveira's current responsibilities include conducting safety training for CDM personnel, subcontractors, and government agencies, implementing behavior-based safety programs, overseeing asbestos remediation activities, and performing field audits. Mr.

Oliveira is also responsible for project compliance with applicable guidance documents, project planning and development, and technical report writing.

As part of H&S management duties, Mr. Oliveira directs the activities of a full time H&S staff of three. The H&S program is responsible for overall safety and regulatory compliance, pre-removal containment inspections, final removal inspections, and general inspections for compliance with project guidance documents to ensure that appropriate

work practices and engineering controls are being used by removal contractors.

H&S Manager, Southern Region Tertiary Treatment Plant, Marine Corps Base Camp Pendleton, California. Mr. Oliveira has provided H&S oversight for CDM and subcontractor design and construction efforts with a total contract value of \$257 million. This project was a design /build construction management “at risk” project which treats an average of 5 mgd of sewage generated at the southern region of the USMC Base. The sludge solids are converted into a dry material that is disposed of on base in landfills and the treated water which meets the California Title 22 standards will eventually be redistributed throughout the base for irrigation purposes under a separate sister project known as the P-110 Conveyance Systems Project. The P110 Conveyance Systems which has a value of \$48,770,248 that includes approximately 15 miles of HDPE pipelines, three sewage lift stations, five reclaimed water pump stations that is an integrated concert of conveyance systems for both the raw sewage and the Title 22 reclaimed treated water.

H&S Manager, Environmental Remediation, U.S. Department of Energy Portsmouth Gaseous Diffusion Plant, Kentucky. The site is a former nuclear enrichment facility and CDM is performing the following tasks involved in environmental remediation for DOE.

- Sampling and maintenance of five contaminated groundwater plumes, inspection and sampling of over 400 groundwater monitoring wells, seven landfills, operation of four groundwater treatment facilities that are in operation 24/7.
- Inspection and maintenance on several RCRA Landfills and RCRA/RAD areas, sampling of many surface water areas, sediment sampling, NPDES sampling, numerous on and off site sampling activities with DPT rigs and Drill rigs.
- CDM also performed oxidant injections at two separate groundwater plumes. This process was a four phase project that includes injecting hydrogen peroxide and Fenton's Reagent into hundreds of points via direct push technology.
- The CDM team performed D&D on over 10 facilities transforming these locations into green areas. CDM also provided oversight for handling and shipping of waste containers for treatment and disposal. These wastes were often downblended to reduce contaminated levels in order to meet DOT and treatment disposal facility's waste acceptance criteria. These wastes could be opened for inspection and size reduction and possibly placed into large overpacks.

Team Leader, Capitol Hill Anthrax Cleanup, Washington, D.C. Mr. Oliveira served as Botanical Gardens (BG) Team Leader, where post-fumigation processing of Anthrax contaminated critical items was performed. He designed and implemented a Health and Safety Plan in response to potential employee exposures to Ethylene Oxide (ETO), the primary fumigant used on Critical Items to kill Anthrax spores. Mr.

Oliveira prepared an ETO sampling plan and schedule for monitoring the de-fumigation/re-aeration of critical items prior to final clearance sampling. He also designed an EPA and FDA-approved ETO sampling and analysis plan for the safe return of fumigated Critical Items. The plan incorporated QA requirements stipulated by the EPA and FDA, such as multiple methods of analysis, and was designed to address a worst-case exposure scenario.

Professional Activities

Member, American Society of Safety Engineers, American Board of Industrial Hygiene

Professional Development

Introduction to the Incident Command System IS-00100

ICS for Single Resources and Initial Action Incidents IS-00200

Accident Investigation

Compressed Gases

Cranes and Slings 29 CFR 1910.179 and 184

HAZWOPER Awareness Level 29 CFR 1910.120

Job Hazard Analysis

Machine Guarding 29 CFR 1910.211-219

Process Safety Management of Highly Hazardous Chemicals

Revised OSHA Bloodborne Pathogens Compliance Directive (CPL2-2.69)

Safe Chemical Handling

ASSE: Environmental Law for Safety Professionals

ASSE: Managing Contractor Safety

Edward T. Kulkusky

Field Technician

Mr. Kulkusky specializes in remedial investigations and feasibility studies (RI/FS). He has performed groundwater, surface water, sediment, soil, building material, and test excavation sampling. He is also a field team leader supervising low-level gamma and alpha radiation investigation and verification surveys.

As a field technician, Mr. Kulkusky has performed groundwater investigation and sampling of multiple Superfund sites for USEPA Region 2 and Regions 2 and 3, USACE Kansas City District, and private clients. He is currently supervising low level radiation investigation surveys and groundwater sampling for the USACE, Kansas City District.

Remedial Investigations/Feasibility Studies

USACE - Kansas City District - Sylvania Corning FUSRAP Site RI/FS

Mr. Kulkusky is a field technician responsible for well development, groundwater sampling, radiation and air monitoring. His regular duties include calibration and operation of radiological monitoring and air monitoring equipment, collection of groundwater samples, sample management, monitoring well development, installation of monitoring well pumps, and maintenance of field equipment.

Experience Highlights

- 40-hour OSHA HAZWOPER
- 8-hour HAZWOPER refresher
- 10-hour OSHA Construction Safety Course

NJDEP, Field Technician, Prices Pit Landfill Site

Remedial Design, Egg Harbor and Pleasantville, New Jersey.

Mr. Kulkusky provided field support for the pre-design investigation including collection of groundwater samples, collection of subsurface soil samples, and test excavation soil sampling. He was responsible for calibrating and operating air monitoring equipment.

USEPA Region 2 - Field Technician, Monitor Devices Superfund Site, Groundwater and Soil Sampling, Wall Township, New Jersey.

Mr. Kulkusky was responsible for the groundwater sample collection using low-flow sampling techniques. He was responsible for the preparation of CLP paperwork and the maintenance and decontamination of all sampling equipment. Other responsibilities included oversight of subsurface soil sampling, collected via hollow stem auger drilling and geoprobe sampling methods.

Field Technician, Groundwater Sampling, NJ Turnpike Authority,

New Jersey. Mr. Kulkusky, using low-flow sampling techniques, was responsible for groundwater samples collected from several monitoring wells at several rest areas along the NJ Turnpike.

USACE Kansas City District, Field Technician, Federal Creosote Superfund Site, Manville, New Jersey. Mr. Kulkusky logged and collected soil samples from boreholes and using low-flow sampling techniques, was responsible for groundwater samples collection from several monitoring wells. He also collected soil and surface water samples for the environmental impact study. He supported the maintenance and decontamination of all sampling equipment.

USEPA Region 2 - Field Technician, Emmell's Septic Landfill Superfund Site, Galloway Township, New Jersey. Mr. Kulkusky, using low-flow sampling techniques, was responsible for groundwater samples collection from monitoring wells.

USEPA Region 2, Field Technician, Montclair/Glen Ridge Radium Superfund Sites, Montclair/Glen Ridge, New Jersey. Mr. Kulkusky's field activities include supervising gamma and alpha radiological surveys in both interior and exterior portions of buildings, the daily maintenance and calibration of field instruments, log book entry, data entry into a pen-based field computer, and site mapping. Also, Mr. Kulkusky, using low-flow sampling techniques, was responsible for groundwater samples collection from several monitoring wells.

USEPA Region 2, Field Technician, Puchack Well Field Superfund Site RI/FS, Pennsauken, New Jersey. Mr. Kulkusky, using low-flow sampling techniques, was responsible for groundwater samples collection from several monitoring wells.

Field Technician, RI/FS, Vega Baja Waste Disposal Site, EPA Region II, Vega Baja, Puerto Rico. Mr. Kulkusky, using low-flow sampling techniques, was responsible for groundwater samples collection from several monitoring wells. Also he performed down hole geophysical logging of bedrock monitoring wells using a Delta Epsilon Model 1000 AM logger with a caliper to measure the borehole diameter and combination probe to measure natural gamma, spontaneous potential, single point resistance and resistivity.

USEPA Region 2 - Field Technician, Horseshoe Road Complex Superfund Site RI/FS, Sayreville, New Jersey. Mobilized for the project as well as log and collect soil samples from boreholes. Also helped capture fish and wildlife for the environmental impact study.

Remedial Design

USEPA Region 2 - Environmental Technician, U.S. Radium Superfund Site Remedial Design, Orange, New Jersey. Mr. Kulkusky serves as a field technician and field team leader for the remedial design investigations at the U.S. Radium Superfund site. His responsibilities include the coordination of daily work assignments for the field investigation team. Mr. Kulkusky's field activities include supervising gamma and alpha radiological surveys in both interior and exterior portions of buildings, the daily maintenance and calibration of field

instruments, log book entry, data entry into a pen-based field computer, and site mapping. Mr. Kulkusky had NJDEP certification as a Radon Measurement Technician. He also updates and maintains the Alpha Track Database for radon investigation, and manages soil and building material sampling. Mr. Kulkusky coordinates property access with local residents and owners as directed by the U.S. EPA.

USEPA Region 2 - Field Technician, Tutu Wells Site Superfund Site, St. Thomas, U.S. Virgin Islands. Mr. Kulkusky coordinated and managed sample collection, sample custody and sample shipment to laboratories. Collected groundwater samples using low flow purge and sample techniques.

Site Assessments/Preliminary Assessment/Site Inspections

USEPA Region 2, Field Technician, Targeted Brownfields Assessments for Selected Region 2 Brownfield Initiative Sites. Mr. Kulkusky has taken soil vapor samples and soil samples for the site assessment of a number of Brownfield properties.

Remedial Action

Environmental Technician, U.S. Radium Superfund Site, Phases 1, 2, 3 and 4, Orange, New Jersey. Mr. Kulkusky serves as a field technician and field team leader for the remedial action activities at the U.S. Radium Superfund site. His responsibilities include the supervision of gamma verification scanning and gridding of areas, pressurized ion chamber measurements, log book data entry, soil sampling, packaging and completion of chain of custodies.