

Comprehensive Long-Term Environmental Action Navy (CLEAN) II
Contract No. N62742-94-D-0048
Contract Task Order No. 0072



Final Health and Safety Plan
**Phase II Remedial
Investigation**

IRP Site 1, Explosive Ordnance Disposal Range
Marine Corps Air Station, El Toro, California

Prepared for:



Department of the Navy
Commander, Southwest Division
Naval Facilities Engineering Command
San Diego, California 92132-5190

Prepared by:



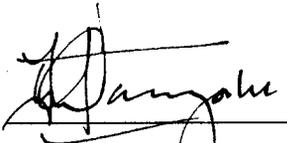
Earth Tech, Inc.
700 Bishop Street, Suite 900
Honolulu, Hawaii 96813

November 2001

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for
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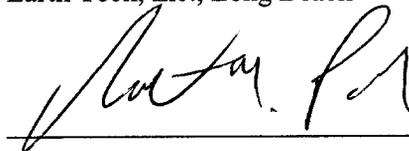
By signing below, I acknowledge that I have reviewed and hereby approve the Health and Safety Plan for the Phase II Remedial Investigation at MCAS El Toro IRP Site 1, EOD Range. This Health and Safety Plan has been written for the exclusive use of Earth Tech, Inc., its employees, and subcontractors. The plan is written for the specified site conditions, dates, and personnel, and must be amended if these conditions change.

Reviews and Approvals:



Crispin Wanyoike, P.E.
CTO Manager
Earth Tech, Inc., Long Beach

Date: 11/20/01



Robert M. Poll, CIH, CSP
CLEAN Health and Safety Manager
Earth Tech, Inc., Long Beach

Date: 11/20/2001

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ATTACHMENTS

- Attachment A: Health and Safety Forms
- Attachment B: General Safety Rules for Subcontractors
- Attachment C: Drill Rig Safety Guidelines
- Attachment D: Heavy Equipment Certifications
- Attachment E: Task Hazard Analyses

ACRONYMS AND ABBREVIATIONS

°F	degrees Fahrenheit
ACGIH	American Conference of Governmental Industrial Hygienists
ANSI	American National Standards Institute
bgs	Below ground surface
BTEX	benzene, toluene, ethylbenzene, and total xylenes
CCR	California Code of Regulations
CIH	Certified Industrial Hygienist
CLEAN	Comprehensive Long-Term Environmental Action Navy
CLP	Contract Laboratory Program
CNS	central nervous system
CSP	Certified Safety Professional
CTO	Contract Task Order
dBA	decibels, A-weighted scale
DoN	Department of the Navy
EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency, United States
FID	flame ionization detector
FM	field manager
FSP	field sampling plan
H&S	health and safety
H&SM	health and safety manager
H&SP	health and safety professional
HAZWOPER	Hazardous Waste Operations and Emergency Response
HSA	Hollow stem auger
HSP	health and safety plan
IDW	Investigation-derived waste
IRP	Installation Restoration Program
LEL	lower explosive limit
MCAS	Marine Corps Air Station
mg/m ³	milligram per cubic meter
OSHA	Occupational Safety and Health Administration
PACNAVFACENGCOM	Pacific Division, Naval Facilities Engineering Command
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PEL	permissible exposure limit
PID	photoionization detector
ppb	part per billion
PPE	personal protective equipment
ppm	part per million
SSO	site safety officer
STEL	short-term exposure limit
SWDIV	Southwest Division, Naval Facilities Engineering Command
THA	Task Hazard Analysis
TLV	threshold limit value
TPH	total petroleum hydrocarbons
U.S.	United States
UST	underground storage tank
VOC	volatile organic compound
WP	work plan

1. INTRODUCTION

The provisions of this Health and Safety Plan (HSP) are mandatory for all Earth Tech personnel involved in the performance of Phase II Remedial Investigation (RI) activities at the Installation Restoration Program (IRP) Site 1, Explosive Ordnance Disposal (EOD) Range, at Marine Corps Air Station (MCAS) El Toro, California. This HSP also provides the specification for the minimum acceptable requirements for all subcontractor organizations, and notification of the chemical and physical hazards known to be associated with the Earth Tech-managed activities addressed in this document.

Operational changes to this HSP that could affect the health or safety of personnel, the community, or the environment will not be made without prior approval of the Earth Tech Contract Task Order (CTO) Manager and the cognizant Earth Tech Health and Safety Professional (H&SP). In the event of a conflict between this HSP and federal, state, or local regulations, the most stringent will apply.

These work activities were authorized by the United States (U.S.) Department of the Navy (DoN), Southwest Division, Naval Facilities Engineering Command (SWDIV), as authorized by the U.S. Navy, Pacific Division, Naval Facilities Engineering Command (PACNAVFACENGCOM) under Contract Task Order (CTO) no. 0072 of the Comprehensive Long-Term Environmental Action Navy (CLEAN) II program, contract no. N62742-94-D-0048.

1.1 HEALTH AND SAFETY POLICY STATEMENT

It is the policy of Earth Tech to provide a safe and healthful work environment for all its employees. Earth Tech considers no phase of operations or administration to be of greater importance than injury and illness prevention. Safety takes precedence over expediency or shortcuts. At Earth Tech, we believe every accident and every injury is avoidable. We will take every reasonable step to reduce the possibility of injury, illness, or accident.

This HSP presents procedures to be employed during all on site work activities. The practices and procedures presented in this HSP are mandatory for all Earth Tech employees (and subcontractors) while engaged in work operations at the site. Earth Tech also requires that all visitors to areas under its control abide by these procedures.

1.2 CLASSIFICATION OF ACTIVITIES

The planned RI activities are considered to be Hazardous Waste Operations as defined in 8 CCR §5192 (a).

1.3 REGULATORY REQUIREMENTS

This HSP meets the requirements and follows the guidelines established by the U.S. Navy, Federal and State of California regulatory agencies in the following documents:

- U.S. Army Corps of Engineers, Safety and Health Requirements Manual, EM-385-1-1
- Title 8 of the California Code of Regulation (8 CCR), Chapter 4, Subchapter 4, *Construction Safety Orders*

- Title 8 of the California Code of Regulations (8 CCR), Chapter 4, Subchapter 7, *General Industry Safety Orders* (with specific attention to Section 5192, Hazardous Waste Operations and Emergency Response)
- Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, National Institute of Occupational Safety and Health NIOSH 85-115, 1985
- Standard Operating Safety Guides, U.S. EPA, November 1984
- Navy/Marine Corps Installation Restoration Manual, 2000 Update

The requirements specified in this HSP also conform to the CLEAN Health and Safety Program requirements set forth in the CLEAN Program Health and Safety Manual (Earth Tech 1996), as well as Earth Tech's Corporate Health and Safety Program requirements.

2. MANAGEMENT OF HEALTH AND SAFETY RESPONSIBILITIES

Project/field-level management of health and safety requires that a management organization be established for each project. The organizational structure will be standardized for each Earth Tech project, and will consist of the following positions/responsibilities.

2.1 CLEAN PROGRAM MANAGER (MR. KEN VINSON, P.E.)

Earth Tech's CLEAN Program Manager is responsible for ensuring that CTO Managers are provided with adequate programmatic guidance, resources and support to enable safe planning and performance of field operations. Programmatic management and technical aspects of this responsibility are delegated to the CLEAN Health and Safety Manager (H&SM), however the Program Manager will retain ultimate responsibility for ensuring that work activities are performed safely.

2.2 CLEAN HEALTH AND SAFETY MANAGER (MR. ROBERT POLL, CIH, CSP)

The CLEAN Health and Safety Manager (H&SM) oversees the technical and programmatic aspects of Earth Tech's Corporate and CLEAN Health and Safety Programs. In addition, the H&SM exercises CTO-specific duties, which include:

- Review and approval of this HSP
- Approval of the designated Site Safety Officer
- Review of all personal exposure monitoring results
- Investigation of any reported unsafe acts or conditions.

For this project the H&SM will also serve as the assigned Health and Safety Professional (H&SP), and will provide the CTO with all H&S-related technical services and support. The H&SM will be the first point-of-contact for all CTO H&S matters.

2.3 CTO MANAGER (MR. CRISPIN WANYOIKE, P.E.)

The CTO Manager is responsible for coordinating with local Navy representatives, discipline managers, and subcontractors to complete all projects in accordance with requirements set forth in this HSP and/or other project H&S documentation. The CTO Manager has final responsibility for managing all aspects of the work operations, and is responsible to Earth Tech management for the safe performance and completion of the work activities. Specific safety-related duties include:

- Ensuring that an approved HSP is prepared and address all aspects of the work to be performed.
- Ensuring that all personnel assigned to perform on-site activities meet the required qualifications.
- Providing adequate resources and supplies to fulfill all work safety requirements
- Assigning the Field Manager and Site Safety Officer, to provide on-site management of work activities

- Contacting the H&SP for guidance regarding any health and safety related matters.

2.4 FIELD MANAGER (MR. ROD LAZO)

At each field work site a Field Manager (FM) will be assigned who manages all Earth Tech and subcontractor activities at the site, and is responsible for field implementation of the specified H&S requirements. This includes communicating site requirements to all personnel, observing that field supervisors and subcontractors enforce all provisions of the HSP/other H&S documentation, working with the Site Safety Officer to implement all H&S performance elements, and consulting with the H&SP regarding any necessary changes to H&S requirements. Other responsibilities include:

- Reading and becoming familiar with the HSP
- Enforcing the HSP and other safety regulations
- Ensuring that no work is performed which is not properly addressed in this HSP (or approved supplemental guidance)
- Maintaining the presence of at least two qualified first aid providers on site at all times
- Contacting the H&SP for guidance regarding any health and safety related matters.

The Field Manager is required to have completed an 8-hour HAZWOPER Supervisor Training Course in accordance with 8 CCR §5192 (e)(4).

2.5 SITE SAFETY OFFICER (MR. ROD LAZO)

The FM or designated alternate will serve as the Site Safety Officer (SSO) for each field location, and will be responsible for the execution of the routine on-site duties for health and safety, with assistance and direction from the designated H&SP. The responsibilities of the SSO include:

- Conducting periodic safety reviews of the project site and project documentation
- Performing regular and frequent site inspections to identify hazards and observe employees at work
- Stopping work, as required, to maintain personal and environmental health and safety
- Determining emergency evacuation routes, establishing and posting local emergency telephone numbers, and arranging emergency transportation
- Ensuring that all site personnel and visitors have received the proper training and medical clearance prior to entering the site
- Establishing any necessary controlled work areas (as designated in this HSP or other H&S documentation)
- Presenting tailgate safety meetings and maintaining attendance logs and records
- Discussing potential health and safety hazards with the FM, H&SP and the CTO Manager

- Implementing air monitoring according to directives in this HSP or other H&S documentation and forwarding all employee exposure monitoring information to the H&SP to enable the exposure notification
- Implementing the field elements of the Earth Tech Respiratory Protection Program
- Maintaining decontamination procedures that meet established criteria.

The SSO is required to have completed an 8-hour HAZWOPER Supervisor Training Course in accordance with 8 CCR §5192 (e)(4).

2.6 SUBCONTRACTORS

Any Earth Tech subcontractor is responsible for assigning specific work tasks to their employees. Each subcontractor's management will provide qualified employees and allocate sufficient time, materials and equipment to safely complete assigned tasks. In particular, each subcontractor is responsible for equipping its personnel with any required personnel protective equipment.

Earth Tech considers each subcontractor to be an expert in all aspects of the work operations for which they are tasked to provide, and each subcontractor is responsible for compliance with those regulatory requirements that pertain to those services. Each subcontractor is expected to perform its operations in accordance with its own unique safety policies and procedures, to ensure that hazards associated with the performance of the work activities are properly controlled. Copies of any required safety documentation for a subcontractor's work activities will be provided to Earth Tech for review prior to the start of on-site activities, if required. Operators of heavy equipment will be required to supply copies of the Heavy Equipment Certification form as required in Section 6.3 and Attachment D. In the event that subcontractor procedures/requirements conflict with requirements specified in this HSP, the more stringent guidance will be adopted.

Hazards not listed in this HSP but known to any subcontractor, or known to be associated with a subcontractor's services, must be identified and addressed to the Earth Tech PM or Site Supervisor prior to beginning work operations. The Field Manager or authorized representative has the authority to halt any subcontractor operations, and to remove any subcontractor or subcontractor employee from the site for failure to comply with established health and safety procedures or for operating in an unsafe manner.

Attachment B provides Earth Tech's general subcontractor safety rules, which will be observed by all subcontractor organizations.

2.7 ONSITE PERSONNEL AND VISITORS

Each person (Earth Tech or subcontractor employee) is responsible for his/her own health and safety, for completing assigned tasks in a safe manner, and for reporting any unsafe acts or conditions to his/her supervisor and/or the FM/SSO. All personnel are responsible for continuous adherence to the specified health and safety procedures during the performance of their work. No person may work in a manner that conflicts with the letter or intent of safety and environmental precautions expressed in these procedures. After due warnings, Earth Tech will dismiss from the work site any person who violates safety procedures. Earth Tech employees are subject to progressive discipline and may be terminated for blatant or continued violations.

All personnel working for Earth Tech and its subcontractors are required to read and acknowledge their understanding of the HSP and any other applicable H&S documentation. All visitors to controlled work areas of any project site must likewise read and acknowledge their understanding of the applicable H&S requirements. All personnel are expected to abide by all written H&S requirements and any supplementary instructions communicated by the FM/SSO, and cooperate with supervisory personnel to ensure a safe and healthful work site. Site personnel are required to report immediately any of the following to the FM:

- Accidents and injuries, no matter how minor
- Unexpected or uncontrolled releases of any hazardous substances
- Any symptoms of exposure to a hazardous substance
- Any unsafe or malfunctioning equipment
- Any changes in site conditions that may affect the health or safety of project personnel.

3. SUMMARY OF SITE CONDITIONS AND PLANNED WORK ACTIVITIES

The following is information concerning conditions at MCAS El Toro IRP Site 1 and work activities to be performed for the Phase II RI. A more detailed accounting of this information can be found in Sections 2.0 and 3.0 of the Work plan.

3.1 SITE CONDITIONS

IRP Site 1 is located in the northeast portion of MCAS El Toro in the foothills of the Santa Ana Mountains. Site 1 is situated within a tributary canyon of Borrego Canyon Wash at elevations ranging from approximately 624 to 730 feet above mean sea level (MSL). Site 1 consists of the Northern EOD Range (approximately 737,250 square feet) and the Southern EOD Range (approximately 721,600 square feet).

Training for EOD and detonation of munitions had been conducted at Site 1 starting in 1952, but has been discontinued with the closure of MCAS El Toro on 2 July 1999. The majority of recent military EOD training took place at the Northern EOD Range, while the Southern EOD range had been used primarily by the Orange County Sheriff Department and federal law enforcement agencies. Several demolition pits, a range building, and a former observation bunker constructed from metal ammunition cans are reported to be present. Many of these metal cans were reported to be filled with the burned residue of disposed munitions, such as cartridge-actuated devices and 20-millimeter (mm) ammunition.

Military ordnance used at the site includes hand grenades, land mines, cluster bombs, smoke bombs, and rocket warheads. Civilian and commercial explosives, such as trinitrotoluene (TNT), dynamite, and plastic and gelatinous explosives have also been used at the EOD Range. Munitions were detonated in trenches and pits, which were continually filled with soil and then re-excavated. In 1982, approximately 2,000 gallons of sulfur trioxide chlorosulfonic acid (FS smoke) were reportedly burned in trenches located in the northern portion of the site. An estimated 300,000 gallons of petroleum fuels were used during disposal activities from 1952 through 1993. In addition, there are unconfirmed reports that low-level radioactive material was disposed at the site.

3.1.1 Geophysical Assessment

The geophysical survey conducted at Site 1 in 1991 involved ground-penetrating radar (GPR) and electromagnetic (EM) techniques. The EM survey provided useful information on the location of historic disposal operations (i.e., trenches, craters) and buried metallic objects (i.e., drums, vehicles). The GPR survey did not provide responses to indicate the presence of buried wastes. A large portion of the EOD Range was not investigated during this survey.

The second geophysical survey conducted during October and November 1999 revealed numerous anomalies throughout the northern half of the site including a large anomaly at the northeast portion of the site. At this location, surface accumulation of large metallic debris was relocated using a bulldozer in order to perform the subsurface survey. Various anomalies detected throughout Site 1 appear linear in alignment, suggesting locations of former trenches.

3.1.2 Surface Soil (0-1 feet bgs)

Phase I RI. Four surface soil samples were collected during the Phase I RI at depths of zero to 6 inches bgs. Three samples were collected within the EOD Range and one was collected upgradient of the site. All samples were analyzed for volatile organic compounds (VOCs), semivolatile organic

compounds (SVOCs), total recoverable petroleum hydrocarbons (TRPH), total fuel hydrocarbons (TFH), target analyte list (TAL) metals, general chemistry, and dioxins/furans. A summary of analytical results is provided below.

1. VOCs: toluene (<10 to 6 micrograms per kilogram [$\mu\text{g}/\text{kg}$]) and carbon tetrachloride (<10 to 2 $\mu\text{g}/\text{kg}$).
2. General chemistry: ammonia-N (5.94 to 9.75 milligrams per kilogram [mg/kg]); nitrate-N (0.65 to 1.53 mg/kg); and, total Kjeldahl nitrogen (359 to 874 mg/kg).
3. Fuel and petroleum hydrocarbons: TFH-gasoline (<0.05 to 0.22 mg/kg); TFH-diesel (19.4 to 61.6 mg/kg); and TRPH (<20 to 147 mg/kg).
4. Metals: 16 of 23 TAL metals were detected.

Perchlorate Verification Study. Three surface samples were collected at topographic depressions to evaluate the presence of contaminants due to deposition via surface runoff. Perchlorate was detected in one sample at a concentration of 320 $\mu\text{g}/\text{kg}$. The samples were also analyzed for total petroleum hydrocarbons (TPH) as motor oil, diesel, and gasoline. Detected concentrations of TPH as motor oil ranged from 15 to 59 mg/kg and detected concentrations of TPH as diesel ranged from 2 to 27 mg/kg .

3.1.3 Shallow Soil (1–10 feet bgs)

Perchlorate Verification Study. Soil samples were collected at anomalous locations identified by the geophysical survey. Twenty-eight samples were collected using a hand auger at 14 locations (2 per location) from depths of approximately 1.5 to 4.5 feet bgs. All samples were analyzed for perchlorate, TPH (motor oil, diesel, and gasoline ranges), and VOCs. Nine samples were analyzed for general chemistry (negative log of the hydrogen ion concentration [pH] and nitrate as nitrogen), metals, SVOCs, and explosives. Four samples were analyzed for dioxins/furans.

The summary of the analytical results for analytes that were detected above the respective reporting limits is provided below. The summary of the entire analytical results, along with the laboratory and data validation reports, can be found in *Site 1, Preliminary Soil Sampling Analytical Results* (Earth Tech 2000b).

1. Perchlorate: Detectable concentrations were found in 3 of the 28 samples (29 $\mu\text{g}/\text{kg}$ in HA07 at a depth of 4 feet; 110 $\mu\text{g}/\text{kg}$ in HA08 at a depth of 1.5 feet; and 210 $\mu\text{g}/\text{kg}$ in HA08 at a depth of 3.5 feet).
2. SVOCs: Di-N-butyl phthalate (971 $\mu\text{g}/\text{kg}$ in HA09 at a depth of 4 feet bgs).
3. General chemistry: nitrate-N (<220 to 2,700 mg/kg), maximum concentration at HA04 and HA09; and, pH (6.54 in HA14 at 4 feet bgs to 8.97 in HA06 at 4.5 feet bgs).
4. Dioxins/Furans: Toxicity equivalency quotient (TEQ) values were calculated from the toxicity equivalency factors (TEFs) for the individual compounds detected (3.9 and 27 mg/kg , respectively).
5. Metals: A summary of metals concentration in shallow soil is provided in Table 3-1.

Table 3-1: Shallow Soil Metals Concentration

Metal	Concentration	
	Range (mg/kg)	Location of Maximum Concentration(feet bgs)
Aluminum	3,580 to 7,290	HA08 at 3.5
Antimony	1.2	HA09 at 4
Arsenic	0.7 to 1.1	HA04 at 3.5
Barium	30.1 to 54.1	HA09 at 1.5
Beryllium	0.9 to 0.36	HA01 at 4
Cadmium	0.26 to 5.2	HA04 at 3.5
Calcium	2,090 to 12,890	HA06 at 4.5
Chromium	1.8 to 5.2	HA09 at 4
Cobalt	0.67 to 1.4	HA08 at 3.5
Copper	1.9 to 234	HA09 at 4
Iron	2,190 to 4,730	HA06 at 4.5
Lead	0.68 to 133	HA09-duplicate at 1.5
Magnesium	993 to 1,350	HA08 at 3.5
Manganese	25.6 to 84	HA04 at 3.5
Nickel	0.84 to 96	HA04 at 3.5
Potassium	430 to 769	HA04 at 3.5
Selenium	1.4 to 1.8	HA06 at 4.5
Silver	All samples below reporting limits	
Sodium	66.5 to 149	HA09 at 4
Thallium	All samples below reporting limits	
Vanadium	4.1 to 6.7	HA04 at 3.5
Zinc	5.7 to 772	HA04 at 3.5
Mercury	0.53 to 10.6	HA09-duplicate at 1.5

Notes:

mg/kg = milligrams per kilogram; bgs = below ground surface; HA = hand-auger sample identification

Soil samples were collected from the monitoring well boreholes. Six samples collected at depths of 5 and 10 feet bgs were analyzed for perchlorate: no detectable concentrations were present.

3.1.4 Subsurface Soil (deeper than 10 feet bgs)

Phase I RI. Soil samples were collected from monitoring well boreholes. Two samples from depths of 40 and 30 feet bgs were analyzed for VOCs, SVOCs, TRPH, TFH, TAL metals, general chemistry, dioxins, and furans. All analytes except metals were reported with concentrations below detection limits, with the exception of 2-butanone (2 and 4 mg/kg).

Perchlorate Verification Study. Selected monitoring well bore soil samples collected from depths of 15 to 35 feet bgs were analyzed for perchlorate. All samples were reported with concentrations below the reporting limit for perchlorate.

3.1.5 Groundwater

Phase I RI. Groundwater samples were analyzed for VOCs, SVOCs, TRPH, TFH, TAL metals, pesticides/polychlorinated biphenyls (PCBs), general chemistry, dioxins and furans, and gross alpha and beta. The summary of the analytical results is provided below.

1. VOCs: chloromethane (<2 to 0.7 µg/L).
2. SVOCs: bis (2-ethylhexyl) phthalate (<10 to 49 µg/L).
3. General chemistry: Nitrate/nitrite-N (1.66 to 7.66 milligrams per liter [mg/L]), and total dissolved solids (TDS) (429 to 808 mg/L).
4. Metals: Arsenic (<1.4 to 1.4 µg/L), nickel (12.6 to 110 µg/L), and manganese (2.4 to 74.7 µg/L).
5. Gross alpha and beta: gross alpha (5.8 to 7.5 picoCuries [pCi]/L), gross beta (6.6 to 12.2 pCi/L).

Perchlorate Evaluation Study. Hydropunch groundwater samples that were collected at MCAS El Toro between January and March 1998 were reported with concentrations ranging from 4 to 23 µg/L.

Groundwater sampling and analysis for perchlorate was conducted during October 1998 and May 1999 at Site 1. Perchlorate concentrations as high as 280 and 380 µg/L were reported for the two events, respectively, however most wells sampled were reported with concentrations below reporting limits or below the California provisional action level (PAL) of 18 µg/L.

3.2 RI ACTIVITIES

Earth Tech and its subcontractors will conduct the following RI activities at IRP Site 1. Field activities are expected to take a total of 12-14 months to complete, with a projected finish time of March 2002.

3.2.1 Description of Investigation Phases

The RI activities will be divided into three phases, or Tiers.

Tier I

The principal objective of Tier I soil sampling is to collect adequate data to complete a screening level risk evaluation for each study area (Northern EOD Range and Southern EOD Range) at Site 1. Systematic sampling, using a central-aligned grid will be used at Site 1 to ensure uniform coverage of the site. Investigation techniques to be employed during this phase include:

- Investigation Area Evaluation
- Subsurface Soil Sampling (Direct Push and/or Hand Augering techniques)

Tier II

Tier I investigation results will be used to conduct localized investigations of hot spot areas (defined in the decision rules), as part of Tier II sampling. In addition, Tier II will also evaluate previously identified geophysical anomaly areas and may include the investigation of areas outside the EOD range, if indicated by the Tier I results.

Two perpendicular trenches, each approximately 25 feet long and 10 feet deep will be excavated at each area requiring localized investigation. Four soil samples will be collected per trench (eight per pair), at depths ranging from 1 to 10 feet bgs. The number of trenches will be determined based on the results of the Tier I sampling.

Tier III

Tier III sampling will be conducted at Tier II locations that indicate contamination greater than 10 feet bgs. Soil boreholes will be advanced to a depth of approximately 50 feet bgs using hollow-stem auger (HSA) techniques, and sampled at 5-foot intervals.

Groundwater monitoring will also be accomplished at locations where the Tier III data indicate potential groundwater impact. New groundwater monitoring wells will be installed unless existing groundwater wells are adequate to evaluate the impact to groundwater at a required location.

Other Activities

In addition to the investigation/sampling activities, Earth Tech will perform decontamination of personnel and equipment throughout on-site operations, and will be responsible for the collection and disposal of all investigation derived wastes (IDW) produced during onsite activities.

3.2.2 Description of Investigation Techniques

1. Investigation Area Evaluation – Earth Tech will perform surface and subsurface evaluation of the sample locations prior to initiating any sample collection activities. The evaluation will include a biological survey of the area (to identify any possible endangered species), a geophysics survey to identify any possible subsurface obstructions, and an evaluation for the presence of unexploded ordnance.
2. Direct Push Sampling – Direct push techniques will be employed to collect subsurface soil samples during Tier I, Tier II, and Tier III sampling.
3. Subsurface Trenching/Investigation – During Tier II, excavation techniques will be used to analyze possible subsurface soil impacts. A backhoe will be used to excavate. Samples will be collected manually from each trench using a sample sleeve and slide hammer assembly. Excavations will be backfilled after sampling using the excavated materials.
4. Drilling Operations (Hollow-Stem Auger) – During Tier III, HSA drilling techniques will be used to drill a series of boreholes at select locations to examine possible environmental impacts. Boreholes will be drilled to depths of approximately 50 feet. Soil samples will be collected at 5-foot intervals.
5. Groundwater Monitoring Well Installation and Development – Selected boreholes will be converted to groundwater monitoring wells, to be used for Tier III groundwater sampling

activities. Newly installed wells will be configured to allow "micro-purging" to be accomplished, which will minimize the volume of IDW.

6. Groundwater Sampling – During Tier III, groundwater samples may be collected from monitoring wells to provide data confirming the presence of any groundwater contamination. Sample collection will be performed using pumps. Existing wells have dedicated (permanently installed) pumps, while new wells will be sampled using portable "micro-purge" equipment.
7. Equipment Decontamination – Throughout RI activities, Earth Tech and subcontractor personnel will perform decontamination of vehicles and equipment used to perform RI activities within controlled work areas.
8. IDW Management – Earth Tech will be responsible for the collection and offsite disposal of all liquid and solid wastes (including soils [drilling spoils]) produced during investigation and decontamination activities.

4. GENERAL HEALTH AND SAFETY PROCEDURES

The following requirements apply to all work activities to be conducted during Phase II RI activities.

4.1 HAZWOPER REQUIREMENTS

All personnel performing work on site must be qualified as HAZWOPER workers, and must meet the following requirements.

4.1.1 Medical Screening And Health Surveillance

In accordance with Earth Tech Health and Safety Policy HS601, *Medical Surveillance*, personnel performing HAZWOPER activities (and visitors entering any HAZWOPER work area) will have completed a physical exam in accordance with the requirements of 8 CCR §5192 (f). Exam procedures and tests will be specified by the examining physician.

The results of medical examinations are to be evaluated by a physician specializing in occupational medicine. The medical evaluation must include a judgment of the employee's ability to use respiratory protective equipment and to participate in hazardous waste site activities. The examining physician must document his evaluation/recommendations in writing. Restrictions of onsite activities may be required for personnel with certain medical conditions which could be aggravated by chemical exposure or physical demands at the site. Each employee is responsible for notifying the Health and Safety Professional of physical or medical restrictions. The Health and Safety Professional will then ensure that project management observes and enforces the restrictions. A copy of each persons written medical evaluation will be made available for review following a request from the Health and Safety Professional. Employees who have not received a medical examination within 12 months (365 days) of their previous medical exam will be required to immediately obtain an appropriate medical exam and provide a copy of the medical evaluation to the H&SP for review prior to starting work on the project.

Personnel who are not routinely exposed to site hazards may be waived from the annual medical examination requirement by the H&SP, provided that they meet the following:

- Medical examinations are received on a frequency determined by the examining physician, but not to exceed every two (2) years.
- Site activities performed by the exempted personnel do not entail exposure to contaminants in excess of the permissible exposure limits or other exposure limitations as outlined in this HASP.

4.1.2 HAZWOPER Training Requirements

In compliance with Earth Tech Health and Safety Policy HS301, *HAZWOPER Training and Refresher*, all Earth Tech personnel involved with site activities (or site visitors) must successfully complete 40 hours of initial training covering the elements established in 8 CCR §5192 (e)(2). All personnel will also receive annual refresher training in accordance with 8 CCR §5192 (e)(8), and must have completed the most recent training course within the previous 365 days.

Work supervisors will also receive an additional required 8 hours of training addressing supervisor responsibilities and obligations in maintaining an effective health and safety program in accordance with 8 CCR §5192 (e)(4).

4.1.3 Visitor Clearances

Visitors to any HAZWOPER controlled-work area must comply with the health and safety requirements of this HASP, and demonstrate an acceptable need for entry into the work area. All visitors desiring to enter any controlled work area must observe the following procedures:

1. A written confirmation must be received by Earth Tech documenting that each of the visitors has received the proper training and medical monitoring required by this HASP. Verbal confirmation can be considered acceptable provided such confirmation is made by an officer or other authorized representative of the visitor's organization
2. Each visitor will be briefed on the hazards associated with the site activities being performed and acknowledge receipt of this briefing by signing the appropriate tailgate safety briefing form.

If the site visitor requires entry to any Exclusion Zone, but does not comply with the above requirements, all work activities within the Exclusion Zone must be suspended and monitoring using direct reading instruments must indicate that no airborne contaminant concentrations are present which exceed the established background levels. Until these requirements have been met entry will not be permitted.

4.2 ON-SITE TRAINING PROCEDURES

The following training procedures will be accomplished for all operational activities.

4.2.1 Initial Orientation Training

All on-site personnel will be trained about potential hazards at the site, and exposure prevention or control measures. Field personnel will be:

1. Instructed on the contents of applicable portions of this plan
2. Made aware of task-specific physical hazards and other hazards that may be encountered during site work (see Attachment E).
3. Informed about the potential routes of exposure, protective clothing, precautionary measures, and symptoms or signs of chemical exposure, and heat stress
4. Made aware of fire prevention measures, fire extinguishment methods, and evacuation procedures.

The PM shall ensure that this training is provided to each person prior to his/her entry into any controlled area. All site-specific training should be documented on the *Tailgate Safety Briefing Sign-in Log*, a copy of which is found in Attachment A.

4.2.2 Tailgate Safety Briefings

A tailgate safety briefing will be conducted at the start of each workday. The SSO will conduct the tailgate safety briefings, and will review and discuss the health and safety issues associated with the days planned work activities, problems encountered, and modifications to existing procedures. Documentation of the tailgate safety briefings will be accomplished by using the *Tailgate Safety Briefing Sign-in Log*, a copy which is found in Attachment A. The SSO will maintain copies of all

tailgate safety briefing sign-in logs in the project files. All field personnel associated with each days project activities are required to attend these meetings.

4.2.3 Hazard Communication Training

Section 5.2 provides information concerning the materials that may be encountered as environmental contaminants during the work activities. In addition, any organization wishing to bring any hazardous material onto any Earth Tech-controlled work site must first provide a copy of the item's (Material Safety Data Sheet (MSDS) to the SSO for approval and filing (the SSO will maintain copies of all MSDSs on site). For locally-obtained products, MSDSs may not be available, in which case some alternate form of product hazard documentation will be acceptable. In accordance with the requirements of Earth Tech Health and Safety Procedure HS401, *Hazard Communication*, all personnel shall be briefed on the hazards of any chemical product they use, and shall be aware of and have access to all MSDSs.

All containers onsite shall be properly labeled to indicate their contents. Labeling on any containers not intended for single-day, individual use shall contain additional information indicating potential health and safety hazards (flammability, reactivity, etc.).

4.3 GENERAL SITE SAFETY RULES

All personnel must abide by the following requirements regarding smoking, eating, drinking, contact with contaminated materials, site awareness, housekeeping, and communications.

4.3.1 Smoking, Eating, and Drinking

Except where exempted by the SSO, smoking, eating and drinking will not be permitted inside any controlled work area at any time. Field workers will first wash hands and face immediately after leaving controlled work areas (and always prior to eating or drinking). Consumption of alcoholic beverages is prohibited at any Earth Tech site.

4.3.2 Housekeeping and Personal Hygiene

During site activities, work areas will be continuously policed for identification of excess trash and unnecessary debris. Excess debris and trash will be collected and stored in an appropriate container (e.g., plastic trash bags, garbage can, roll-off bin) prior to disposal. At no time will debris or trash be intermingled with waste PPE or contaminated materials. Anyone observed throwing contaminated material or PPE away with municipal wastes will be removed from the site.

In accordance with EM 385-1-1 Section 2, the following requirements will also be observed:

Water Supply: A water supply meeting the following requirements will be utilized:

- **Potable Water** - An adequate supply of potable water will be available for field personnel consumption. Potable water can be provided in the form of water bottles, canteens, water coolers, or drinking fountains. Where drinking fountains are not available, individual use cups will be provided as well as adequate disposal containers. Potable water containers will be properly identified in order to distinguish them from non-potable water sources
- **Non-Potable Water** - Non-potable water may be used for hand washing and cleaning activities. Non-potable water will not be used for drinking purposes. All containers of non-Potable water will be marked with a label stating:

Non-Potable Water Not Intended for Drinking Water Consumption

Toilet Facilities: A minimum of one toilet facility will be provided for each sex in a group of 20 employees or more. Where there are less than 5 employees, a toilet facility for each sex need not be provided. Exceptions to this requirement will apply to mobile crews where work activities and locations permit transportation to nearby toilet facilities.

Washing Facilities: Employees will be provided washing facilities (e.g., buckets with water and Alconox) at each work location. The use of water and hand soap (or similar substance) will be used by each employee following exit from the Exclusion Zone, prior to breaks and at the end of daily work activities.

4.3.3 Contact with Contaminated Materials

Field personnel should avoid contact with potentially contaminated substances. They should not walk through puddles, pools, mud, etc., and should avoid, whenever possible, kneeling on the ground and leaning or sitting on equipment or the ground. Monitoring equipment should not be placed on a potentially contaminated surface, including the ground surface.

All field crewmembers should make use of their senses (all senses) to alert them to potentially dangerous situations, e.g., presence of strong, irritating, or nauseating odors.

4.3.4 Site Awareness

Field crew members shall be familiar with the physical characteristics and requirements of the work site, including:

- Entering Exclusion Zones upwind from contamination sources
- Accessibility to equipment and vehicles
- Communication
- Hot zones (areas of known or suspected contamination)
- Site access
- Emergency procedures and evacuation assembly points
- Location of protective and emergency equipment and relevant first-aid procedures

The number of personnel and equipment in the contaminated area should be minimized, consistent with site operations.

4.3.5 Buddy System

All field personnel shall use the buddy system when working within any controlled work area. Personnel belonging to another organization onsite can serve as “buddies” for Earth Tech personnel. Under no circumstances shall an Earth Tech employee be present alone in a controlled work area.

4.3.6 Lighting

At a minimum, all portions of each work location will be sufficiently lit so that all surfaces are illuminated at 10 foot-candles or greater. Since work activities are expected to be conducted

exclusively outdoors and during daylight hours, the use of supplemental lighting is not anticipated. However, should a need for supplemental lighting be identified (nighttime work activities are required, etc.), its use will conform to the following requirements.

Portable lighting may require the use of a portable generator to provide power. Care should be taken in the operation of this equipment. Only personnel trained in the operations and maintenance of generators will be permitted to operate the units. All electrical systems will include only Underwriters Laboratory (UL®)-approved components (or European Union equivalent), and all usage will conform to the following safety requirements:

Grounding. The non-current-carrying metal parts of fixed, portable, or plug-connected equipment shall be grounded. Electrical connections shall include a ground-fault interrupter system. Ground wires shall be tested with an electrical resistance meter to assure conductivity as often as necessary to assure safety. Portable tools and appliances protected by an approved system of double insulation need not be grounded.

Extension Cords. Extension Cords shall be the three-wire type for grounded tools (two-wire is permissible for double-insulated tools) and shall be protected from damage; do not fasten with staples or extend across an aisle way or walkway. Worn or frayed cords shall not be used. Cords shall not be run through doorways where the door could cut or damage them.

Light Bulbs. Exposed bulbs on temporary lights shall be guarded to prevent accidental contact, except where bulbs are deeply recessed in the reflector. Temporary lights shall not be suspended by their electric cords unless designed for this use. Explosion-proof bulb covers shall be used when contact with flammable vapors or gases is likely and shall meet Class I, Division I requirements.

Electrical Receptacles. Receptacles for attachment plugs shall be of the approved, dead-front, concealed contact type. Where different voltages, frequencies, or types of current are supplied, receptacles shall be of such design that attachment plugs are not interchangeable.

Wet Environments. Work done in wet environments shall require ground fault interrupters and water-tight connectors.

If maintenance of electrical systems is required, the equipment will be de-energized and locked-out using an approved lock-out device. The lock will be removed only by the person performing the maintenance work.

4.4 DRUM HANDLING

The handling of all containers used for storage of materials will be performed in accordance with the requirements of Earth Tech Health and Safety Procedure HS 724, *Handling of Drums and other Large Containers*, and the following:

- Where containers of capacity greater than 10 gallons are used for containerizing chemical products or waste materials, handling of the containers will be accomplished in accordance with the following:
 - When not in use, drums/containers will be covered with tight fitting lids

- At the conclusion of each work shift, all drums/containers will be placed in a designated waste storage area. This area will be properly marked and secured
- Mechanical or powered drum handling equipment will be used to move drums/containers. Manual handling of the drums leads to musculo-skeletal injuries and will be avoided to the maximum extent possible.

If sampling of drums for waste characterization purposes is required, it will be accomplished in a manner to minimize potential for skin contact. Handling of potentially contaminated soils and groundwater presents the risk of contact with hazardous substances. In order to provide protection against skin contact with contaminated materials, all sample collection activities will be performed using Modified Level D protective equipment ensembles. Specified personnel decontamination procedures will also be observed.

4.5 HEAT STRESS PREVENTION

Heat stress can be a significant field site hazard, especially for workers wearing protective clothing. Depending on the ambient conditions and the work being performed, heat stress can occur very rapidly, within as little as 15 minutes. Site personnel will be instructed in the identification of a heat stress victim, the first-aid treatment procedures for the victim and the prevention of heat stress casualties.

Workers should be encouraged to immediately report any difficulties or heat-related problems that they may experience or observe in fellow workers. Supervisors should use such information to alter the work-break schedule to accommodate such problems. During breaks, workers should be encouraged to drink plenty of water or other liquids to replace lost fluids and to help cool off. Should any worker exhibit signs of severe heat distress, such as profuse sweating, extreme confusion and irritability, or pale, clammy skin, that worker should be relieved of all duties at once and made to rest in a cool location and drink plenty of water. Anyone exhibiting symptoms of heat stroke (red, dry skin, or unconsciousness) should be taken immediately to the nearest medical facility, taking steps to cool the person during transportation (clothing removal, wet the skin, air conditioning, etc.). Severe heat stress (heat stroke) is a life threatening condition that must be treated by competent medical authority.

Heat Stress Monitoring

The prevention of heat stress-related accidents/illnesses is best performed through continuous observation of employees and routine heat stress awareness training activities. Heat stress monitoring can be accomplished using one of the techniques discussed below.

Any results obtained from monitoring techniques should be used as guidance only. To properly mitigate the effects of heat stress, it is necessary to establish a work routine that incorporates adequate rest periods to allow workers to remove protective clothing, drink fluids (vital when extreme sweating is occurring), rest, and recover. The frequency and length of such work breaks must be determined by the individual work location supervisor based upon factors such as the ambient temperature and sunshine, the amount of physical labor being performed, the physical condition of the workers, and protective clothing being used. While heat stress measurement techniques provide guidance in optimizing this routine, breaks must always be sufficient to prevent workers from manifesting symptoms of heat stress regardless of monitoring results.

Evaluation of heat stress, to determine appropriate work/rest cycles, will be performed whenever fieldwork activities are occurring at ambient temperatures greater than 70 degrees Fahrenheit (°F). The Basic Instrument Measurements Method shown below must be used for personnel using *Level D protective equipment only*. Where any type of chemically protective clothing (CPC) is in use, the Modified Instrument Measurements Method will be used together with the Direct Observation Method to provide guidance in appropriate work/rest cycles.

Basic Instrument Measurements Method: This method will only be used to monitor heat stress where workers are not using chemically protective clothing. The Wet Bulb Globe Temperature (WBGT) value will be determined using a WBGT meter (Reuter-Stokes 214 DL or equivalent), and compared with the values shown in Table 4-1 to determine appropriate work/rest cycles.

Modified Instrument Measurements Method: This method will be used whenever personnel use chemically protective clothing. The WBGT value will be determined as above. The measured value will then be compared with the values shown in Table 4-2 to determine the appropriate work/rest cycle.

Table 4-1: WBGT Values for Level D Work/Rest Cycles

Work-Rest Regimen	°F –WBGT		
	Light Work	Moderate Work	Heavy Work
Continuous Work	86	80	77
75% Work – 25% Rest	87	82	78
50% Work – 50% Rest	89	85	82
25% Work – 75% Rest	90	88	86

Notes:

Re-printed from ACGIH's 1999 Threshold Limit Values for Chemical Substances and Physical Agents

°F = degrees Fahrenheit

WBGT = Wet Bulb Globe Temperature

Table 4-2: WBGT Values for CPC Work/Rest Cycles

Work-Rest Regimen	°F –WBGT		
	Light Work	Moderate Work	Heavy Work
Continuous Work	75	69	66
75% Work – 25% Rest	76	71	67
50% Work – 50% Rest	78	74	71
25% Work – 75% Rest	79	77	75

Notes:

Re-printed from ACGIH's 1999 Threshold Limit Values for Chemical Substances and Physical Agents

°F = degrees Fahrenheit

WBGT = Wet Bulb Globe Temperature

Direct Observation: This method can be used as a substitute for the Modified Instrument Measurements Method, and can be used whenever personnel use chemically protective clothing. At the start of the workday each worker's baseline pulse rate will be determined in beats per

minute (bpm). Worker pulse rates will then be measured at the beginning and end of each break period. As recommended by the American Conference of Governmental Industrial Hygienists (ACGIH), each worker's maximum heart rate at the start of any break should be less than [180 minus workers age] bpm. If this value is exceeded for any worker, the duration of the following work period will be decreased by at least 10 minutes. At the end of each work period all workers heart rates must have returned to within +10% of the baseline pulse rate. If any worker's pulse rate exceeds this value, the break period will be extended for at least 5 minutes, at the end of which pulse rates will be re-measured and the end-of-break criteria again applied.

Heat-Related Illnesses

The following guidance can be used in the identification and treatment of heat related illness.

Mild Heat Strain. The mildest form of heat-related illness. Victims exhibit irritability, lethargy, and significant sweating. The victim may complain of headache or nausea. This is the initial stage of overheating, and prompt action at this point may prevent more severe heat-related illness from occurring.

First Aid: Provide the victim with a work break during which he/she may relax, remove any excess protective clothing, and drink cool fluids. If an air-conditioned spot is available this is an ideal break location. Once the victim shows improvement he/she may resume working, however the work pace should be moderated to prevent recurrence of the symptoms.

Heat Exhaustion. Usually begins with muscular weakness, dizziness, nausea, and a staggering gait. The victim exhibits an extremely high body temperature (> 102°F). The bowels may move involuntarily. The victim is very pale, with clammy skin, and he or she may perspire profusely. The pulse is weak and fast, and breathing is shallow. He or she may faint unless they lie down.

First Aid: Immediately remove the victim from the work area, to a shady or cool area with good air circulation (avoid drafts or sudden chilling). Remove all protective outerwear. Call a physician. Treat the victim for shock. (Make the victim lie down, raise his or her feet 6-12 inches, and keep him or her cool by loosening all clothing). If the victim is conscious, it may be helpful to give him or her sips of water. Transport victim to a medical facility as soon as possible.

Heat Stroke. This is the most serious of heat illness, and represents the collapse of the body's cooling mechanisms. As a result, body temperatures often rise to between 105°-110°F. As the victim progresses toward heat stroke, the following symptoms can be noted: headache, dizziness, nausea, and dry, red, and hot skin. Sudden collapse and loss of consciousness follows quickly and death is imminent if exposure continues. Heat stroke can occur suddenly.

First Aid: Immediately evacuate the victim to a cool and shady area. Remove all protective outerwear and all personal clothing. Lay the victim on his or her back with the head and shoulders slightly elevated. Apply cold wet towels, ice bags, etc. to the head, armpits, and thighs. Sponge off the bare skin with cool water or rubbing alcohol, if available, or even place the victim in a tub of cool water. The main objective is to cool without chilling the victim. Give no stimulants or hot drinks. Since heat stroke is a severe medical condition requiring professional medical attention, emergency medical help should be summoned immediately to provide on-site treatment of the victim and proper transport to a medical facility.

4.6 PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS

All use of personal protective equipment (PPE) will conform to the requirements of Earth Tech Health and Safety Procedure HS501, *Personal Protective Equipment*, as well as the specifications provided below. Requirements for PPE use are specified in the THAs found in Attachment E.

4.6.1 Head Protection

Employees will wear hard hats on work sites at all times unless otherwise specified in the HSP, other applicable H&S documentation, or directed by the SSO. Where necessary, ear protection and faceshields may be attached to hard hats.

All hardhats shall meet the requirements set forth in ANSI Z89.1. Additional requirements (e.g., electrical or heat resistance) may be specified in the HSP or other applicable H&S documentation.

4.6.2 Eye Protection

Eye protection will be worn on work sites at all times unless otherwise specified in the HSP, other applicable H&S documentation, or directed by the SSO. All selected eye protection will meet the following minimum requirements:

- Provide adequate protection against the particular hazards for which they are designed
- Be reasonably comfortable when worn under the designated conditions
- Fit snugly and not unduly interfere with the wearer's movements
- Be durable
- Be easily cleaned and disinfected

Where specified due to particular work conditions, eye protection must also meet the impact and durability standards set forth in ANSI Z87.1. However, where this is not specified the use of commercial sunglasses will be permitted at work sites (due to the limited potential for high velocity impact hazards associated with most Earth Tech work activities).

Persons whose vision requires correction and are required to wear eye protection may wear goggles or spectacles of one of the following types:

- Spectacles whose protective lenses provide optical correction (Rx)
- Goggles that can be worn over corrective (Rx) spectacles without disturbing the adjustment of the spectacles
- Goggles that incorporate corrective (Rx) lenses mounted behind the protective lenses.

4.6.3 Hearing Protection

Appropriate hearing protection (ear plugs, canal caps, or ear muffs) will be provided when noise may be a problem, such as around heavy machinery, power support equipment, and impact tools. Employees who may be exposed to hazardous noise must be participants in a hearing conservation program that meets the requirements of 8 CCR §5097.

4.6.4 Foot Protection

Employees will wear appropriate foot protection while working onsite, which will consist of leather or chemical-resistant boots (as appropriate) with safety toes. All footwear must meet the specifications of ANSI Z41.1.

4.6.5 Hand Protection

Employees will use appropriate hand protection when exposed to hazards that could cause injury to the hands. Gloves must resist puncturing and tearing as well as provide any necessary physical abrasion or chemical resistance.

4.6.6 Respiratory Protection

The use of respiratory protection by Earth Tech personnel will not be allowed without the concurrence of the H&SP. Any subcontractor employee's use of respiratory protection must be identified to the SSO.

All use of respiratory protection will conform to the requirements found in Earth Tech Health and Safety Procedure HS 503, *Respiratory Protection*. In addition, where respiratory protection is used at field sites the following requirements will be enforced:

- Only personnel who have been trained to wear and maintain respirators properly shall be allowed to use respiratory protection
- Only properly cleaned, maintained, NIOSH-approved respirators shall be used on site
- Only full-face respirators equipped with organic vapor cartridges will be used, where required, based on on-site monitoring results (see Section 6.9)
- Used air-purifying cartridges shall be replaced at the end of each shift, or where breakthrough is noted by the respirator wearer
- Positive and negative pressure tests shall be performed each time the respirator is donned
- Only personnel who have been fit tested within the last 12 months will be allowed to work in atmospheres where respirators are required. Subcontractors shall provide certificates of a respirator fit test completed within the last 12 months for each employee onsite
- Respirator users shall be instructed in the proper use and limitations of respirators
- If an employee has difficulty in breathing during the fit test or during use, he/she shall be evaluated medically to determine if he/she can wear a respirator safely while performing assigned tasks
- No employee shall be assigned to tasks requiring the use of respirators if, based upon the most recent examination, a physician determines that the health or safety of the employee will be impaired by respirator use
- Respirators shall be cleaned and sanitized daily after use

- Respirators shall be inspected during cleaning. Worn or deteriorated parts shall be replaced
- Facial hair that might interfere with a good facepiece seal or proper operation of the respirator is prohibited

When respiratory protection is in use, the SSO shall review the respiratory protection use daily to ensure employees are properly wearing and maintaining their respirators and that the respiratory protection is adequately protecting the employees.

4.7 ACCIDENT OR INCIDENT REPORTS

All accidents and incidents that occur on site during any field activity will be promptly reported to the SSO and the FM.

If any Earth Tech employee is injured and requires medical treatment, Earth Tech's Workers Compensation Insurer, Sedgwick CMS (877-261-8926) will be notified. The CTO Manager will initiate a written report, using the *Supervisor's Report of Incident* form (found in Attachment A). The CTO Manager will complete the first three sections of this form, and forward to the H&SP within 24 hours of the incident.

If any employee of a subcontractor is injured, documentation of the incident will be accomplished in accordance with the subcontractor's procedures, however copies of all documentation (which at a minimum must include the OSHA Form 101 or equivalent) must be provided to the SSO within 24 hours after the accident has occurred.

The H&SP will review the documentation, and will assist in the performance of any necessary accident investigation or other follow-up. The CTO Manager will ensure that the recommendations resulting from any investigation are implemented without delay. Additionally, mishap reports must be submitted to the CLEAN Contracting Officer according to the following schedule:

1. **Tier One:** Serious Contractor Mishap, any mishap involving a fatality or the hospitalization of three or more workers, or resulting in property damage exceeding \$200,000 in value, the Contractor Significant Incident Report CSIR-1 must be submitted to the Contracting Officer within 8 hours of the mishap
2. **Tier Two:** Significant Contractor Mishap, falls of 4 feet or more, electrical, confined space, diving, crane, trenching entrapment, hazardous material, hazardous waste, and equipment mishaps which involve a lost-time injury or property damage of \$10,000 or more in value, the *Contractor Significant Incident Report* CSIR-1 must be submitted to the Contracting Officer within 24 hours of the mishap
3. **Tier Three:** General Contractor Mishap, any OSHA recordable mishap not meeting the definitions of tier one-serious or tier two-significant contractor mishap, the *Contractor Significant Incident Report* CSIR-1 must be submitted to the Contracting Officer within 5 working days of the mishap

Following any on-site injury or accident the Health and Safety Professional will review the available documentation, and will assist in the performance of any necessary accident investigation or other follow-up. The CTO Manager will ensure that the recommendations resulting from any investigation are implemented without delay.

5. HAZARD ASSESSMENT

For this project, Earth Tech will perform a series of field investigation and sampling tasks. Performance of these tasks can expose Earth Tech and subcontractor personnel to a variety of hazards due to the operational activities, physical conditions of the work locations, and the potential presence of environmental contaminants. Significant hazards include:

- Exposure to site contaminants during RI activities
- Exposure to hazardous noise levels during operation of some equipment (e.g., drill rigs)
- Heat stress.

5.1 SPECIFICATION OF WORK TASKS

The following is a listing of the work tasks to be performed during the Phase II RI at Site 1. A task hazard analysis (THA) has been prepared for each task which specifies the major performance steps, identifies the related hazards and applicable safety procedures, and specifies any additional requirements (e.g., monitoring procedures). All THAs can be found in Attachment E.

1. Investigation Area Evaluation
2. Subsurface Soil Sampling (Direct Push)
3. Subsurface Soil Sampling (Hand Augering)
4. Subsurface Trenching/Potholing
5. Drilling Operations (Hollow-Stem Auger)
6. Groundwater Monitoring Well Installation and Development
7. Groundwater Sampling (Dedicated Pumps)
8. Groundwater Sampling (Micro-purge)

5.1.1 Unanticipated Work Activities

Where work activities are identified which are not addressed in this HSP, appropriate safety documentation and procedures will be implemented. Prior to initiation of work activities, any subcontractor organization tasked with performance of such work will submit a work procedure document which presents appropriate safety procedures applicable to the specific work activities to be undertaken. Submitted safety procedures will be reviewed by the H&SP for adequacy and compliance with applicable regulatory requirements and the requirements presented in this HSP. Work will not be initiated until this review is completed and any identified deficiencies corrected to the satisfaction of the H&SP.

The H&SP may issue an exemption to this requirement based on the nature of the work activities to be undertaken.

5.2 SUSPECTED ENVIRONMENTAL CONTAMINANTS

The information presented below is intended to inform site personnel about the expected hazards associated with known or suspected environmental contaminants. Hazards associated with the use of commercially-available hazardous materials are addressed as part of worker hazard communication requirements (see Section 4.2.3).

Based on previous sampling efforts, it is expected that environmental contaminants are located within the subsurface soil and groundwater matrices of the site, at relatively low concentrations (much less than 1%). Section 5.2.7 presents an analysis of the hazards represented by these materials during RI activities. Should other contaminants be detected, the H&SP will update the information on hazards accordingly.

5.2.1 Petroleum Hydrocarbon Compounds

Petroleum hydrocarbon fuels include gasoline (leaded and unleaded), diesel, and jet fuel. Each is produced by refining various crude oil fractions. Because refining is primarily a distillation process, all petroleum fuels contain a mixture of hydrocarbon compounds (primarily in the aliphatic and aromatic families), additives, and agents introduced in final blending to improve performance, clean and lubricate engine components, and reduce emissions. At Site 1 diesel fuel is the petroleum fuel encountered at the highest levels in previous environmental monitoring efforts, however gasoline was also noted.

Diesel Fuel. Diesel fuel is a complex mixture of hydrocarbons, manufactured through refining of middle distillate crude oil components. Exposure to diesel fuels can produce intoxication and other central nervous system (CNS) depression effects in cases of acute exposure, and can lead to defatting of skin and contact dermatitis in case of contact exposure.

Individual diesel fuel components and additives can present significant hazards. The aromatic compounds benzene, toluene, ethylbenzene, and total xylenes (BTEX) are the greatest concern for this site investigation (see below).

There are no established exposure standards from either OSHA or ACGIH for diesel fuel, however monitoring program action levels used by Earth Tech reflect the potential presence of BTEX (particularly benzene) when diesel fuels are present. Control of inhalation exposure to diesel fuel (and its various constituents) can be accomplished through the use of air purifying respirators equipped with organic vapor cartridges. The use of skin protection (chemically-protective gloves, etc.) is required when handling potential or confirmed diesel-contaminated materials.

Gasoline. Gasoline is a complex mixture of hydrocarbons and additives, used primarily as a motor fuel. Gasoline, which possesses a moderate to high vapor pressure and a lower explosive limit of 1.1% concentration in air, can present a significant and fire/explosion hazard in enclosed spaces (where airborne concentrations may accumulate).

Chronic exposures or exposures to a high concentration of gasoline vapor may cause unconsciousness, coma, and possible death from respiratory failure. Exposure to low concentrations of gasoline vapor may produce flushing of the face, slurred speech, and mental confusion. Gasoline is also irritating to the skin, and may cause drying and dermatitis as a result of prolonged contact.

Various components and additives of gasolines can themselves present significant additional hazards. The aromatic compounds benzene, toluene, ethylbenzene and xylene (BTEX) are of

greatest concern in relation to site investigation activities, and are addressed separately below. However some additives used for octane control (e.g., methyl tert-butyl ether – MTBE), oxygenation (e.g., alcohols and MTBE) and water scavenging (e.g., ethylene glycol methyl ether – EGME) can also present significant hazards as a result of prolonged inhalation or skin exposure. In the past, tetra-ethyl and tetra-methyl lead, both of which have been identified as carcinogens and present moderate skin contact hazards, were added to gasoline for anti-knock control.

Both the OSHA PEL and ACGIH TLV for gasoline are 300 ppm. Control of inhalation exposure to gasoline (and its various constituents and additives) can be accomplished through the use of air purifying respirators equipped with organic vapor cartridges. The use of skin protection (chemically-protective gloves, etc.) is required when handling gasoline-contaminated materials.

Waste Lubricating Oils. Oils are composed of higher molecular weight carbon chain molecules, and present properties (e.g., low vapor pressure) similar to hydraulic fluids. As with hydraulic fluids, waste oils present no significant vapor hazard, exposure hazards are limited to skin contact. Irritation of the skin can be prevented through the use of chemically-protective clothing and gloves. Waste oils, primarily waste motor oils, may also be contaminated by a variety of heavy metals as a result of use.

Aromatic Compounds (BTEX). The aromatic compounds of BTEX are generally found together as significant components of petroleum fuels (e.g., diesel fuel). Due to their high vapor pressure and the range and severity of their health effects, they are considered to present the greatest hazard during remedial and site investigation operations.

Benzene – Benzene is a known human carcinogen. Prolonged skin contact with benzene or excessive inhalation of its vapor may cause headache, weakness, loss of appetite, and lassitude. Continued exposure can cause collapse, bronchitis, and pneumonia. The most important health hazards are cancer (leukemia), bone marrow effects, and injuries to the blood-forming tissue from chronic low-level exposure. The OSHA PEL is 1 ppm, with an action level of 0.5 ppm and a short-term exposure limit of 5.0 ppm. The ACGIH exposure guideline is 0.5 ppm.

Toluene – Exposure to vapors of toluene may cause irritation of the eyes, nose, upper respiratory tract, and skin. Exposure to 200 ppm for 8 hours causes mild fatigue, weakness, confusion, tearing, and a sensation of prickling, tingling, or creeping on the skin that has no objective cause. Exposure to higher concentrations may cause headache, nausea, dizziness, dilated pupils, and euphoria, and in severe cases may cause unconsciousness and death. The liquid is irritating to the eyes and the skin. Contact with the eyes may cause transient corneal damage, conjunctival irritation, and burns if not promptly removed. Repeated or prolonged contact with the skin may cause drying and cracking. Toluene may be absorbed through the skin in toxic amounts. Ingestion causes irritation of the gastrointestinal tract and may cause effects resembling those from inhalation of the vapor. Chronic overexposure to toluene may cause irreversible liver and kidney injury. The OSHA PEL is 200 ppm; the ACGIH TLV is 50 ppm.

Ethylbenzene – Ethylbenzene vapors are severely irritating to the eyes and the mucous membranes of the respiratory system. Sustained inhalation of excessive levels can cause depression of the central nervous system (CNS) characterized by dizziness, headache, narcosis, and coma. Skin contact with liquid ethylbenzene causes irritation; dermatitis and defatting can also develop. The acute oral toxicity of ethylbenzene is low; however,

ingestion of it poses a serious aspiration hazard. Aspirating even a small amount into the lungs can result in extensive edema (lungs filled with fluid) and hemorrhaging of the lung tissue. No systemic effects are suspected at the levels that produce pronounced, disagreeable skin and eye irritation. The established PEL is set well below this intolerable level. The OSHA PEL and ACGIH TLV are all 100 ppm.

Xylene – Liquid xylene is a skin irritant and causes itching, dryness, and defatting; prolonged contact may cause blistering. Inhaling xylenes can depress the CNS, and ingesting it can result in gastrointestinal disturbance and possibly hematemesis (vomiting blood). Effects on the eyes, kidneys, liver, lungs, and the CNS are also reported. Both the OSHA PEL and ACGIH TLV are 100 ppm.

5.2.2 Dioxins

"Dioxins" is a general term applied to a family of 75 chlorinated dibenzo-p-dioxins. At the present time, little data is available concerning the hazards associated with many members of this group; however, at least one compound, 2,3,7,8-tetrachlorobenzo-p-dioxin (TCDD), has been identified as a potential carcinogen. Dioxins can be formed during the combustion of PCBs. Also, in early landfilling practices, circa 1950, it was not uncommon to burn wastes to reduce volume, and if PCBs were present during this combustion then dioxins may have been formed.

Dioxins exhibit a relatively low vapor pressure and present little potential for significant airborne exposure during site investigations; however, skin contact should be prevented through the use of chemically protective clothing when handling contaminated materials. At the present time, neither OSHA nor ACGIH has established exposure standards to any members of the dioxin group. Of the dioxins, TCDD is considered to be the most toxic due to its carcinogenic potential. Earth Tech has adopted an Occupational Exposure Limit (OEL) for dioxins of 65 picograms per cubic meter TCDD-equivalent airborne concentration.

Dioxins present exposure hazards via inhalation, skin contact, and ingestion. Since dioxins possess extremely low vapor pressures, inhalation exposure results from respiration of particulate matter to which dioxins are attached (e.g., contaminated soil particles); however, planned work activities will not generate significant dust. Skin contact/dermal absorption can be prevented through the use of chemically protective gloves. Ingestion results largely from hand-to-mouth contact, and can be prevented through the use of proper decontamination procedures when exiting from dioxin-contaminated areas.

5.2.3 Heavy Metals

As a group, the heavy metals (e.g., lead, mercury, copper, cadmium, chromium, nickel, and zinc) are toxic to a number of organs and organ systems in the body, including the liver, kidneys, blood-forming organs (primarily located in the bones), and the CNS (especially lead). Acute exposure to metals can produce symptoms, such as stomach distress and vomiting, mental confusion and sluggishness, heart palpitations, breathing difficulties, and renal (kidney) failure. Chronic exposure can be characterized by CNS degradation and deterioration of liver and kidney function. The suspected concentrations of the metals, although of environmental concern, are anticipated to be relatively low, presenting minimal occupational safety or health hazards.

5.2.4 Perchlorates

The term "perchlorates" applies to compounds formed by the ionic bonding of the cation ClO_4^- with anions sodium, potassium and ammonium (NH_4^+). The resulting salts are highly soluble in water. Perchlorate compounds are widely used in solid rocket propellants and some explosives (serving as the oxidizer material). Recently their widespread presence in the environment has been noted in areas where their use was prevalent.

The perchlorate compounds are odorless, possess no significant vapor pressure, and when not in solution, can typically be found as a white crystalline solid. Perchlorate compounds can be irritating to the eyes, skin, and mucous membranes upon contact or when inhaled. In significant airborne concentrations (as a dust) severe respiratory tract irritation can result. Ingestion of perchlorates at concentrations of 100 mg/day has resulted in severe side health effects, including death. Specific occupational exposure limits for perchlorates have not been established; however, reference doses for perchlorates in drinking water have been established between 4 and 18 parts per billion (ppb), which the EPA feels is an acceptable limit to prevent adverse health effects to members of the general populace.

In solution, perchlorate compounds present no inhalation hazard, however when dry, they can be found in dust released from contaminated sources (e.g., soil). Protection is provided by air purifying respirators equipped with particulate matter filters (P100 cartridges are recommended). The use of protective barrier clothing (chemically protective gloves, Tyvek coveralls, etc.) and employment of proper decontamination techniques will provide protection against the hazards of skin contact and ingestion.

5.2.5 Radionuclides

The presence of suspected various radiological materials (including uranium/uranium daughters, Strontium-90, Radium-226, Cesium-137, Thallium-232, and Cobalt-60) is suspected due to possible disposal of radiological sources. Collectively, this group of potential radionuclides present emissions of three types of ionizing radiation: alpha particles, beta particles and gamma/x-rays.

Protection against exposure will include on-site monitoring for potential external exposure threats (i.e., gamma/x-ray exposure), and prevention of internal deposition via inhalation and ingestion through the use of PPE and the employment of personal decontamination procedures.

5.2.6 Other Compounds

Past sampling activities noted the presence of several other chemical compounds, including the semi-volatile organic compounds bis-(2-ethylhexyl) phthalate and di-N-butyl phthalate. At high concentrations, these contaminants could present occupational exposure hazards during RI activities. However, the noted concentrations were all well below 1 ppb, therefore these materials are not expected to present a significant occupational exposure impact.

5.2.7 Assessment of Hazards

Phase II activities are intended to more clearly define the presence and extent of suspected environmental contaminants at each of the work sites (see Section 3.2 for a description of work activities). Based on previous sampling activities, the concentrations of all suspected environmental contaminants is known to be very low. However, there is the potential for occupational exposure to occur through two direct routes (inhalation and skin contact) and one indirect route (ingestion), there is also the potential for radiological exposure due to the suspected presence of radiological

materials. Exposures can involve volatile organic compounds (fuels and/or solvents), metals, dioxins/furans or radiological agents. Descriptions of exposure hazards and protective measures for each contaminant type can be found in Sections 5.2.1 – 5.2.4.

Inhalation

Protection against inhalation exposures are not expected to be needed, however if on-site monitoring indicates a need, exposure mitigation can be accomplished using full-face air purifying respirators equipped with combination organic vapor/P100 cartridges.

VOCs – VOC compounds possess relatively high vapor pressures, and intrusive activities may result in significant vapor-phase release of materials. Past experience has demonstrated that airborne concentrations are unlikely to approach occupationally significant levels, however on site monitoring will be conducted to ensure that unanticipated conditions are not encountered.

Dioxins – Dioxins possess an extremely low volatility, hence there will be no significant vapor-phase concentrations. Dioxins can attach themselves to soil particles and become airborne during intrusive activities, however, the expected in-soil concentrations are sufficiently low ($\ll 1$ ppb) that production of dust levels sufficient to present a dioxin exposure hazard is extremely unlikely.

Perchlorates – Perchlorates present no measurable vapor pressure, but they can become airborne as a component of dusts produced during intrusive activities. However, the anticipated concentrations of these materials are sufficiently low (< 1 ppm) that production of dust levels sufficient to present an exposure hazard is extremely unlikely.

Metals – Heavy metals present no measurable vapor pressure, but they can become airborne as a component of dusts produced during intrusive activities. However, the anticipated concentrations of occupationally significant metals (e.g., arsenic, lead, manganese, chromium) are sufficiently low (< 100 ppm) that production of dust levels sufficient to present an exposure hazard is extremely unlikely.

Radiological Agents – The potential radiological agents present no measurable vapor pressure, but they can become airborne as a component of dusts produced during intrusive activities. The anticipated physical condition and distribution of these materials are such that production of dust levels sufficient to present an exposure hazard is extremely unlikely, however, monitoring will be accomplished on site during intrusive activities to ensure that unanticipated conditions are not encountered.

Skin Contact

Contact with contaminated materials is likely during intrusive activities and collection/handling of environmental samples. However, protection against skin contact/absorption can be accomplished through the use of protective gloves/clothing (see Section 7.0). If on-site monitoring indicates a need, exposure mitigation can be accomplished.

Ingestion

Contact with contaminated materials is likely during intrusive activities and collection/handling of environmental samples. However, protection against exposure via ingestion can be accomplished by performance of proper decontamination procedures when exiting contaminated work areas (see Section 8.1).

Whole Body Radiological Exposure

Whole body exposure to gamma/x-ray radiation at levels exceeding occupationally significant thresholds (2 mrem/hour) is not considered to be a likely event. However, real-time on-site monitoring will be performed to ensure that no significant exposure occurs.

5.3 ADDITIONAL SITE HAZARDS**5.3.1 Hazardous Wildlife**

Hazardous wildlife may be encountered (e.g., insects, arthropods, and mammals). Field personnel should be cognizant of the presence of hazardous or annoying species of wildlife, such as snakes, and stinging insects. No hazardous plants are known to exist on or near the site.

Protection against hazards from animals and insects can include the following, as applicable:

- Personal protection (e.g., boots, hoods, netting, gloves, and masks),
- Repellents,
- On-site instruction in recognition of animals and insects.

5.3.2 Unexploded Ordnance

Based on review of existing site documentation, the presence of unexploded ordnance (UXO) items is not anticipated, and a survey for UXO items will be conducted as part of Investigation Area Evaluation activities. However, working at Site 1 presents a limited potential to encounter unanticipated items during intrusive activities (trenching, drilling). Section 6.7 addresses response procedures in the event UXO items are encountered.

6. ACTIVITY-SPECIFIC HEALTH AND SAFETY PROCEDURES

The Task Hazard Analyses contained in Attachment E refer to the following safe work procedures.

6.1 SLIPS, TRIPS, FALLS, AND PROTRUDING OBJECTS

Hazards from protruding objects, careless movements, or placement of materials on paths or foot traffic areas present a problem with regard to slips, trips, falls, and puncture wounds. Personnel will use a reasonable amount of effort to ensure the prevention of such injuries.

6.2 HAZARDOUS NOISE ENVIRONMENTS

Working around large equipment often creates excessive noise. The effects of noise can include physical damage to the ear, pain, and temporary and/or permanent hearing loss. Workers can also be startled, annoyed, or distracted by noise during critical activities.

Earth Tech has compiled noise monitoring data which indicates that work locations within 25 feet of operating heavy equipment (drill rigs, earthworking equipment, etc.) can result in exposure to hazardous levels of noise (levels greater than 90 dBA). Accordingly, all personnel are required to use hearing protection (ear plugs or ear muffs) within 25 feet to any operating piece of heavy equipment.

The Health and Safety Professional may also monitor employee exposure to hazardous noise levels as part of Earth Tech's Hearing Conservation Program.

6.3 HEAVY MACHINERY

The use of heavy machinery (drilling, trenching and digging equipment, cranes, etc.) in areas where unprotected personnel are operating warrants special attention on the part of all personnel. Operators should ensure that equipment is working properly and is being run in a safe manner, and should be aware of the location of unprotected personnel at all times while operating this machinery to avoid serious accidents.

In order to assure that all equipment used on site presents no unwarranted safety hazards, the owner/operator of each piece of heavy equipment must perform a safety evaluation and certification in accordance with the procedures and requirements found in Attachment D.

6.4 EXCAVATION SAFETY

All trenching and excavation operation will be accomplished in accordance with this subsection and Earth Tech Health and Safety Procedure HS711, *Excavation*. The following safe operating guidelines will apply to trenches or excavations exceeding 4 feet in depth, in accordance with the requirements of 8 CCR §1541 and EM 385-1-1 Section 25.

6.4.1 Excavation Construction Guidelines

1. Excavated materials will be stored and retained at least 2 feet from the edge of the excavation (Note: this procedure should be observed even when excavation/trench entry will not occur)
2. Trees, boulders, and other surface encumbrances that create a hazard will be removed or made safe before excavation is begun.

3. Special precautions will be taken in sloping or shoring the sides of excavations adjacent to a previously backfilled excavation.
4. Except in hard rock, excavations below the level of the base of the footing of any foundation or retaining wall will not be permitted unless the wall is underpinned and all other precautions have been taken to ensure the stability of the adjacent walls.
5. All ladders used in excavation operations will be in accordance with the requirements of 8 CCR §1675.
6. Excavations will be inspected daily, or more often as conditions warrant, by a competent person to ensure that changes in temperature, precipitation, shallow groundwater, overburden, nearby building weight, vibrations, or nearby equipment operation has not caused weakening of sides, faces, and flows.
7. Diversion ditches, dikes, or other suitable means will be used to prevent water from entering an excavation and for drainage of the excavation.
8. When mobile equipment is used or allowed adjacent to excavations, stop logs or barricades will be installed. The grade will always be away from the excavation.
9. Dust conditions during excavation will be kept to a minimum. Wetting agents shall be used upon the direction of the Field Manager or SSO.
10. Field personnel shall not enter any excavation for any reason except to rescue injured individuals who have fallen into the excavated area.

6.4.2 Trench Entry Requirements

Earth Tech and/or subcontractor personnel may be required to enter on-site excavations as part of some work activities. The following requirements must be met before any personnel are permitted to enter any excavation.

1. Expected hazardous ground movement areas and banks more than 4 feet high shall be shored, laid back to a stable slope, shielded, or equivalent.
2. Sides of trenches in unstable or soft material 4 feet or more in depth shall be shored, sheeted, braced, sloped, or equivalent.
3. Sides of trenches in hard compact soil, including embankments, are shored or otherwise supported when the trench is 4 feet or more in depth and 8 feet or more in length.
4. Materials used for sheeting, sheet piling, bracing, shoring, and underpinning shall be in good, serviceable condition.
5. A means of egress (ladder, etc.) shall be accessible at any location inside the excavation without requiring more than 25 feet of lateral travel distance.
6. Additional precautions by way of shoring and bracing shall be taken to prevent slides or cave-ins when excavations are subjected to vibrations.

Also, before an employee enters an excavation greater than 4 feet in depth, the atmosphere must be tested to ensure that an oxygen deficient or hazardous atmosphere does not exist. If the concentration of any airborne contaminant exceeds one-half its permissible exposure limit (PEL) or other applicable occupational exposure limit (OEL), the airborne oxygen concentration is less than 19.5 percent, or explosivity exceeds ten percent of the lower explosive limit (LEL), then no personnel shall be permitted to enter the excavation.

6.5 EXPLOSIVE GAS HAZARDS

Intrusive activities increase the potential for the occurrence of elevated concentrations of volatile organic compounds that may be released. During excavation and well sampling activities, explosive concentrations of these constituents could develop in small and confined spaces. Explosivity will be monitored with a Combustible Gas Indicator (CGI) as specified in the Section 6.8. Monitoring will include all borings, well casings, potholes and other work areas where explosive concentrations may develop and locations that could potentially pose hazards as work activities progress. Flammable chemical compounds may not be identified and, therefore, any vapor or liquid must be treated as if it were flammable.

6.6 UNDERGROUND UTILITIES

Various forms of underground utility lines or pipes may be encountered during intrusive work activities. Prior to the start of intrusive operations, the following steps will be taken

1. Underground Service Alert (Dig Alert) will be contacted at least 48 hours prior to the work.
2. Geophysical clearance will be performed.
3. Authorization will be obtained from all concerned public utility department offices.

Should intrusive operations cause equipment to come into contact with utility lines, the SSO and the Health and Safety Professional will be notified immediately, and a Supervisor's Report of Incident (see Attachment A) will be completed. Work will be suspended until the appropriate actions for the particular situation can be taken.

6.7 UXO SAFETY

UXO items present hazards if encountered in subsurface areas while excavating, trenching, or drilling. The basic policy to be observed regarding UXO is

DO NOT TOUCH, HANDLE OR OTHERWISE DISTURB ANY UXO ITEM.

In addition, use the following information to minimize the hazards to personnel from UXO.

6.7.1 UXO in Surface Areas

All personnel must be briefed concerning the potential for UXO in surface areas and any known identifying characteristics of UXO items. When moving about the site, personnel should remain alert for any UXO items that might be present. Each work site should be thoroughly checked for the presence of UXO before any other work begins. In the event that any UXO item is observed or suspected, the following requirements will be observed:

1. Personnel should note the location of the UXO item and alert all other personnel in the area to its presence.
2. Any Earth Tech work occurring within 20 feet of the item will cease. All Earth Tech and subcontractor employees will evacuate this area.
3. Under no circumstances will any Earth Tech or subcontractor employee attempt to move or otherwise handle any UXO/suspected UXO item. **COLLECTION OF "SOUVENIRS" IS PROHIBITED.**
4. The UXO Evaluation Team will be alerted, and will implement the UXO item destruction procedure as specified in the UXO Evaluation Work Plan.

6.7.2 Excavating and Trenching

Excavation may disturb subsurface UXO items. Throughout the excavation a member of the site team will be posted as an observer, with the responsibility to monitor the trench conditions and observe if any suspected UXO items may be present. In the event that any UXO item is encountered during excavation, the following procedures will be observed:

UXO Item Encountered and Detonation Occurs

1. The work operation will cease *immediately*. Personnel will evacuate to a safe area/distance.
2. If injuries have occurred, the emergency action plan will be activated (see HSP Section 11).
3. Any equipment will be withdrawn from the site and the area will be delineated using yellow CAUTION tape.
4. The UXO Evaluation Team will be alerted, and will initiate an evaluation of the work area to identify any remaining UXO items. If a UXO item is found, the UXO Evaluation Team will implement the UXO item destruction procedure as specified in the UXO Evaluation Work Plan.
5. Equipment will be thoroughly inspected for damage before being put back into service.

UXO Item Observed in the Trench

1. The work operation will cease *immediately*. Personnel will evacuate to a safe area/distance.
2. The equipment will be withdrawn from the excavation and the area will be delineated using yellow CAUTION tape or bright paint.
3. The UXO Evaluation Team will be alerted, and will implement the UXO item destruction procedure as specified in the UXO Evaluation Work Plan.

UXO Item Observed in the Spoils

1. Work will cease immediately and all personnel will evacuate to a safe area/distance. The equipment will be left in place.
2. The area will be delineated UXO with yellow caution tape or bright paint.
3. Any Earth Tech work occurring within 20 feet of the item will cease. All Earth Tech and subcontractor employees will evacuate this area.

4. Under no circumstances will any Earth Tech or subcontractor employee attempt to move or otherwise handle any UXO/suspected UXO item. **COLLECTION OF "SOUVENIRS" IS PROHIBITED.**
5. The UXO Evaluation Team will be alerted, and will implement the UXO item destruction procedure as specified in the UXO Evaluation Work Plan.

6.7.3 Drilling

In the event that any UXO item is encountered during drilling the following procedures will be observed.

UXO Item Encountered Downhole and Detonation Occurs

1. The work operation will cease *immediately*.
2. If injuries have occurred the emergency action plan will be activated (see HSP Section 11).
3. Once any necessary immediate response actions have been completed, the drilling auger will be blocked in place and disconnected from the drill rig. The drill rig will then be withdrawn from the site, and the area will be delineated using yellow CAUTION tape.
4. The UXO Evaluation Team will be alerted, and will initiate an evaluation of the work area to identify any remaining UXO items. If a UXO item is found the UXO Evaluation Team will implement the UXO item destruction procedure as specified in the UXO Evaluation Work Plan.
5. The drill rig will be thoroughly inspected for damage before being put back into service (see Attachment C).

UXO Item Believed to be Encountered Downhole and No Detonation Occurs

1. The work operation will cease *immediately*.
2. If drilling, the drilling auger will be blocked in place and disconnected from the drill rig. The equipment (e.g., drill rig, backhoe) will be withdrawn from the site and the area will be delineated using yellow CAUTION tape.
3. The UXO Evaluation Team will be alerted, and will initiate an evaluation of the work area to identify any UXO items. If a UXO item is found the UXO Evaluation Team will implement the UXO item destruction procedure as specified in the UXO Evaluation Work Plan.

UXO Item Observed in the Spoils

1. The work will cease *immediately* and all personnel will evacuate the area. The equipment (e.g., drill rig, backhoe) will be left in place.
2. Any Earth Tech work occurring within 20 feet of the item will cease. All Earth Tech and subcontractor employees will evacuate this area.
3. Under no circumstances will any Earth Tech or subcontractor employee attempt to move or otherwise handle any UXO/suspected UXO item. **COLLECTION OF "SOUVENIRS" IS PROHIBITED.**
4. The UXO Evaluation Team will be alerted, and will implement the UXO item destruction procedure as specified in the UXO Evaluation Work Plan.

6.8 CHEMICAL EXPOSURE MONITORING PROCEDURES

This section presents monitoring procedures that will be employed during RI activities to assess employee exposure to chemical and physical hazards. Monitoring will consist primarily of onsite determination of various parameters (e.g., airborne contaminant concentrations and heat stress effects), but may be supplemented by more sophisticated monitoring techniques, if necessary.

6.8.1 Monitoring Instrumentation

To assess the exposure potential to environmental contaminants during sampling procedures, onsite monitoring will be performed using the following types of real-time instrumentation

Table 6-1: Air Monitoring Instrumentation

Instrument	Manufacturer/Model*	Substances Detected
Photoionization Detector (PID)	RAE Systems mini-RAE Photovac Microtip HNu Model HNu	Petroleum hydrocarbons
Colorimetric Detector Tubes	Sensidyne Draeger	Benzene 0.5–10 ppm
Aerosol Monitor	MIE Model PDM-3	Aerosols
Multigas Detector	MultiRAE Four Gas ISC TMX 412 Gas Tech GT 402 MSA Passport	Oxygen, percent LEL (combustible and flammable vapors and gases)

* Or similar unit, as approved by H&SP

All instruments will be calibrated on a daily basis in accordance with the manufacturer's written procedures for each device. Calibration information for each instrument will be recorded in the site log.

The following monitoring procedures and response action levels will be used for each of the site activities to be sampled.

6.8.2 Monitoring Procedures – Trenching Activities

Monitoring for volatile organic compounds (VOCs) will be conducted whenever drilling operations are in progress. Table 6-2 provides the necessary guidance, as well as the appropriate response procedures based on on-site readings.

6.8.3 Monitoring Procedures – Drilling Activities

Monitoring for volatile organic compounds (VOCs) will be conducted whenever drilling operations are in progress. Table 6-3 provides the necessary guidance, as well as the appropriate response procedures based on on-site readings.

6.8.4 Monitoring Procedures – Groundwater Monitoring Well Development

Monitoring for volatile organic compounds (VOCs) will be conducted during installation and development of groundwater monitoring wells. Assuming no significant benzene concentrations were noted during drilling, Table 6-4 provides the necessary guidance, as well as the appropriate response procedures based on on-site readings. Where significant benzene was detected during drilling, work will be conducted entirely in Level C PPE.

Table 6-2: Trenching Procedure Action Levels

Parameter	Zone Location and Monitoring Interval	Response Level (Above Background)	Response Activity
VOCs (total by PID)	Breathing Zone, every 30 minutes during drilling activities	< 25 units	Continue work in required PPE and continue monitoring.
		25–50 units (sustained for more than 5 minutes)	Continue work in required PPE, continue monitoring, and use benzene detector tubes.
		50-100 units (sustained for more than 5 minutes)	Contact the SSO, implement mitigation measures, upgrade PPE to Level C (organic vapor cartridge).
		> 100 units (sustained for more than 5 minutes)	Cease work, exit, and contact the H&SP and CTO Manager.
VOCs (total by PID)	Edge of Exclusion Zones, every 30 minutes during drilling activities	< 10 units	Continue work in required PPE, monitor air, and implement engineering controls.
		> 10 units (sustained for more than 5 minutes)	Continue mitigation measures and contact the SSO.
Benzene (by Colorimetric Tube)	Breathing zone, where indicated by VOC readings	No color change	Continue work activities.
		Any color change	Cease work, exit the area, and contact the SSO and CTO manager.
Aerosols (total by aerosol monitor)	Breathing zone and edge of exclusion zone every 30 minutes during identified activities	< 5 mg/m ³	Continue work in required PPE and continue monitoring.
		5-10 mg/m ³ (sustained for 5 minutes)	Implement dust suppression measures
		> 10 mg/m ³	Upgrade to Level C with P100 aerosol cartridges

Note: All VOC monitoring will be conducted using PID only.

Table 6-3: Drilling Procedure Action Levels

Parameter	Zone Location and Monitoring Interval	Response Level (Above Background)	Response Activity
VOCs (total by PID)	Breathing Zone, every 30 minutes during drilling activities	< 25 units	Continue work in required PPE and continue monitoring.
		25–50 units (sustained for more than 5 minutes)	Continue work in required PPE, continue monitoring, and use benzene detector tubes. Downgrade if benzene levels are less than 0.5 ppm.
		50-100 units (sustained for more than 5 minutes)	Contact the SSO, implement mitigation measures, upgrade PPE to Level C (organic vapor cartridge).
		> 100 units (sustained for more than 5 minutes)	Cease work, exit, and contact the H&SP and CTO Manager.
VOCs (total by PID)	Edge of Exclusion Zones, every 30 minutes during drilling activities	< 10 units	Continue work in required PPE, monitor air, and implement engineering controls.
		> 10 units (sustained for more than 5 minutes)	Continue mitigation measures and contact the SSO.
Benzene (by Colorimetric Tube)	Breathing zone, every 10 minutes where indicated by VOC monitoring FID readings	No color change	Continue work activities.
		Any color change	Cease work, exit the area, and contact the SSO and CTO manager.

Note: All VOC monitoring will be conducted using PID only.

Table 6-4: Groundwater Monitoring Well Development Action Levels

Parameter	Zone Location and Monitoring Interval	Response Level (Above Background)	Response Activity
VOCs (total by PID)	Breathing Zone, every 30 minutes during drilling activities	< 25 units	Continue work in required PPE and continue monitoring.
		25–50 units (sustained for more than 5 minutes)	Continue work in required PPE, continue monitoring, and use benzene detector tubes. Downgrade if benzene levels are less than 0.5 ppm.
		50-100 units (sustained for more than 5 minutes)	Contact the SSO, implement mitigation measures, upgrade PPE to Level C (organic vapor cartridge).
		> 100 units (sustained for more than 5 minutes)	Cease work, exit, and contact the H&SP and CTO Manager.
VOCs (total by PID)	Edge of Exclusion Zones, every 30 minutes during drilling activities	< 10 units	Continue work in required PPE, monitor air, and implement engineering controls.
		> 10 units (sustained for more than 5 minutes)	Continue mitigation measures and contact the SSO.

Note: All VOC monitoring will be conducted using PID only.

6.8.5 Monitoring Procedures – Groundwater Sampling Activities

VOCs have the potential to build up in any closed well. Accordingly, any well which has been sealed for longer than 6 hours will be allowed to ventilate for a minimum of 5 minutes upon opening, then monitored for explosivity using a CGI. A reading in excess of 10 percent of the lower explosive limit (LEL) will require additional ventilation, followed by re-monitoring. If an acceptable LEL concentration cannot be reached within 30 minutes of opening a well, reseal it and contact the H&SP for guidance.

6.9 RADIOLOGICAL MONITORING PROCEDURES

During trenching and drilling procedures, the use of direct reading instruments will be required to quantify the dose rate associated with radiological emissions. Two types of monitoring instruments will be employed:

- Gamma-scintillation detector – employs a sodium-iodide scintillator to quantify low gamma-x-ray exposure rates. Acceptable instruments must be capable of resolving exposure rates at levels less than 0.1 mrem/hour.
- G-M “pancake” detector – employs a thin-windowed halogen-quenched detector assembly to detect alpha and beta emissions from the surface areas of potentially contaminated materials. Such a detector assembly is commonly available as a hand-held instrument.

Specific instruments selected for field use must be approved by the H&SP.

During intrusive operations the SSO (or designated alternate) will perform radiation measurements for both general area whole-body exposure rates and a survey of the excavated soil. The following procedure will be used to accomplish this monitoring.

1. At the start of each workday, the performance of each meter will be established using a check source, following the manufacturer's standard procedures. Following this, a background radiation level will be established and recorded for each instrument as follows:
 - a. Scintillator – obtain an ambient dose rate reading in an outdoor area on site known to be free of any potential radiological contamination.
 - b. “Pancake” - using soil known to be free of radioactive contamination (contamination does not include any radioactive materials which occur naturally in the soil) perform dose rate measurement at the surface of the soil as well as at distances of 1 foot and 1 meter from the surface.

Background readings will be subtracted from all readings obtained during the day to determine the dose rate, if any, from radioactive contaminants at the site.

2. At 30-minute intervals, perform a walk-through of the work area to measure whole-body exposure rates using the scintillator detector.
3. As soils are excavated/accumulated as spoils, readings will be taken at intervals of not more than every 30 minutes. Readings will also be taken of soil samples that are collected. Readings will always be taken at the surface of the soil, and if necessary at a distance of 1 foot and 1 meter from the surface of the soil. The background readings established at the start of the work day will be subtracted from the dose rate readings obtained, and the results evaluated against the action levels specified in Table 6-5.

If a radiological hazard to workers is determined to exist, whole body dosimeters may be issued.

Table 6-5: Radiation Monitoring Action Levels

Measurement Location	Monitoring Interval	Measurement	Response Action
Whole-body Exposure (Gamma/x-rays)			
Work Area	Every 30 minutes during intrusive activity	< 0.5 mrem/hour	Continue work ns task-specified PPE.
		> 0.5 mrem/hour	Cease work and contact the H&SP for guidance.
Alpha/Beta Exposure			
Soil Surface	Every 30 minutes for spoils, all soil samples	< 5x background	No other monitoring required. Continue work ns task-specified PPE.
		> 5x background and	Begin monitoring rates at 1 foot from soil surface.
		< 15x background	Continue work in Modified Level D personal protective equipment.
		> 15x background	Cease work and contact the SSO and the H&SP.
1 foot from the soil surface	Every 15 minutes if surface rate exceeds 5 CPM but less than 15 CPM, continue every 15 minutes for spoils, and all soil samples	< 3x background	Continue work in Modified Level D personal protective equipment.
		> 3x background and	Contact the SSO and the H&SP.
		> 3x background and	Begin monitoring rates at 1 meter from soil surface.
		< 10x background	
1 meter from the soil surface	Every 15 minutes if 1 foot rate exceeds 3 CPM but less than 10 CPM, continue every 15 minutes for spoils, and all soil samples	> 10x background	Cease work and contact the SSO and the H&SP.
		< 5x background	Continue work in Modified Level D personal protective equipment.
		> 5x background	Cease work and contact the SSO and the H&SP.

Note: Comparison of readings should be made with the appropriate background reading obtained during function checks at the start of each work day.

6.10 DUST AND VAPOR SUPPRESSION

In the event that airborne concentrations of contaminants are found to exceed established action levels (specified in the HSP), the SSO will implement appropriate mitigation measures, such as:

Trenching

- Apply a water mist to the active digging area and open excavation.
- Cover inactive excavation areas with plastic.

Drilling

- Reduce the advance rate of the drilling action.
- Apply water obtained from the drill rig water supply tank using garden hose (or similar).

Groundwater Well Development/Sampling

- Partially cover the open well head to reduce the escape of contaminants.

- Place a cover on the container of collected spoils if this material is identified as the source of measurable emissions.

If mitigation measures are found to be inadequate, the SSO will halt on-site operations until effective control can be achieved.

7. PERSONAL PROTECTIVE EQUIPMENT

The harmful effects that chemical substances may have on the human body often necessitate the use of protective clothing. Proper selection of personal protective equipment (PPE) depends upon a number of factors. The protective equipment used must be suitable for the hazard(s) confronted. All PPE used on the work site will conform with the guidance specific in Earth Tech's Health and Safety Policy 500 Series, Protective Equipment.

Appropriate PPE ensembles are specified on a task-by-task basis in the THAs found in Attachment E, and upgrade criteria are based upon on-site monitoring results as presented in Tables 6-2 and 6-3. The designated levels of protection are, in increasing complexity: Level D, Modified Level D, Level C, Level B, and Level A. These ensembles provide progressively increasing protection against chemical hazards, and are defined primarily by the level of respiratory protection provided and secondarily by the level of skin protection. Specifications for each ensemble are listed below.

Where the use of chemically protective gloves is specified the following items will be acceptable:

Inner Gloves

- Best Safety Model N-Dex gloves (nitrile rubber)
- Other models approved on a case-by-case basis by the H&SP

Outer gloves

- North Model Solvex gloves (nitrile rubber)
- Other models approved on a case-by-case basis by the H&SP

7.1 LEVEL D

Level D protection is the lowest level of personal protection allowed on HAZWOPER sites. Respiratory protection is not required, since concentrations of airborne contaminants are expected to be below applicable action levels.

During HAZWOPER activities, Level D protection will be the primary level of protection worn during all operations where contact with contaminated materials is unlikely (e.g., geophysical testing). The Level D ensemble provides minimal levels of skin protection. Upgrading to greater levels of protection will be executed as required in Tables 6-2 and 6-3.

Level D Equipment List

- Hard hat
- Short-sleeved shirt (tank tops are not acceptable)
- Long pants (shorts or cut-offs are not acceptable)
- Safety-toed work boots
- Safety glasses

7.2 MODIFIED LEVEL D

If the potential exists for contact with chemical contaminants (e.g., minor splashes, "dirty operations," etc.), however the respiratory hazard is low, the use of a Modified Level D ensemble is appropriate. Modified Level D consists of protective clothing to preclude hazards due to contact with contaminated materials, but does not provide increased respiratory protection. The use of protective clothing in a Modified Level D ensemble can also serve to aid in personal cleaning and decontamination efforts through the use of disposable outer protective garments.

The use of Modified Level D PPE will be required for on-site operations where contact with contaminated soils can be expected (i.e., sample collection, soil handling/containerization). The Modified Level D ensemble provides moderate skin protection against chemical contact, but no respiratory protection. Upgrading to greater levels of protection will be executed as required in Tables 6-2 and 6-3.

Modified Level D Equipment List

- Chemical-resistant disposable outer coveralls (e.g., Tyvek or poly-coated Tyvek coveralls)
- Chemical-resistant outer gloves (taped to outer coveralls)
- Chemical-resistant inner gloves
- Hard hat
- Short-sleeved shirt (tank tops are not acceptable)
- Long pants (shorts or cut-offs are not acceptable)
- Safety-toed work boots
- Safety glasses
- Hearing protection (as required)
- Full-face air purifying respirator w/organic vapor cartridges (available for emergency use).

7.3 LEVEL C

Level C protection is defined by the use of a full-face, air-purifying respirator. This level of protection can be used when low levels of contaminants of a known nature are present, sufficient oxygen is available, and contaminants are not considered immediately dangerous to life or health (IDLH). The Level C ensemble provides considerable skin protection against chemical contact, and moderate respiratory protection.

Level C Equipment List

- Full-face air purifying respirator w/organic vapor cartridges
- Chemical-resistant disposable outer coveralls (e.g., Tyvek or poly-coated Tyvek coveralls)
- Chemical-resistant outer gloves (taped to outer coveralls)
- Chemical-resistant inner gloves
- Hard hat
- Short-sleeved shirt (tank tops are not acceptable)
- Long pants (shorts or cut-offs are not acceptable)
- Chemical-resistant safety-toe boots (taped to outer coveralls)
- Safety glasses
- Hearing protection (as required)

7.4 LEVEL A AND B

The need for the use of Level A or Level B protective equipment during site activities is considered to be highly unlikely. Should conditions be encountered for which Level B is inadequate work operations will cease and the H&SP will be contacted for guidance. Work will not resume until the H&SP has approved supplemental mitigation procedures.

8. DECONTAMINATION

All personnel and equipment entering any controlled work area must be adequately decontaminated prior to exiting the area.

8.1 PERSONNEL DECONTAMINATION

Decontamination procedures must be carried out on all personnel who have been in contact with contaminated materials. Under no circumstances (except emergency evacuations) will personnel be allowed to leave a controlled work area where contaminants are exposed without performing decontamination.

A Personal Decontamination Station (PDS) will be established at the exit location of each controlled work area. The PDS will allow a soap and water washing and water rinse of exterior protective gear to remove contaminants, followed by doffing of the gear. To accomplish this, the specific PDS set-up/procedures will be established based on the level of protective equipment in use:

Level D Personnel Decontamination: Personnel exiting the Exclusion Zone while site activities require the use of Level D PPE will perform decontamination as follows

1. Place tools, instruments, samples and trash at the drop location. The equipment drop area should be clean and dry and at a minimum, plastic bags should be available for trash. Waste PPE will not be placed in the same containers as general trash.
2. Inspect equipment, samples, and if applicable, tools for signs of residual amounts of contamination or excessive soil buildup. If present, soils and contamination must be completely cleaned off of equipment, samples, and tools prior to removal from the Exclusion Zone areas.
3. Personnel will visually check themselves for signs of excessive soils and possible contamination. If observed, soils and contamination will be completely removed before further decontamination is performed.
4. Prior to exiting the Exclusion Zone areas, personnel will wash their hands with soap and water in order to minimize the potential for contaminant exposure.

Modified Level D Personnel Decontamination: Where activities are performed in Modified Level D PPE, personnel will perform decontamination as follows:

1. Place tools, instruments, samples and trash at the drop location. The equipment drop area should be clean and dry and at a minimum, plastic bags should be available for trash. Waste PPE will not be placed in the same containers as general trash.
2. Inspect equipment, samples, and if applicable, tools for signs of residual amounts of contamination or excessive soil buildup. If present, soils and contamination must be completely cleaned off of equipment, samples, and tools prior to removal from the exclusion zone areas.
3. Personnel will visually check themselves for signs of excessive soils and possible contamination. If observed, soils and contamination will be completely removed before further decontamination is performed.

4. Wash and rinse outer work gloves and boots (boot covers) with soap and water.
5. Wash/brush off outer protective coverall (Tyvek).
6. Untape wrists and ankles.
7. Remove outer work gloves and place them in an appropriate container specified for waste PPE.
8. Remove outer Tyvek coveralls and place them in an appropriate container specified for waste PPE.
9. Wash, rinse, and remove inner protective gloves and place them in an appropriate container specified for waste PPE.
10. Wash hands using soap and water (separate from other decontamination cleaners/solutions).

Level C Personnel Decontamination: Where activities are performed in Level C PPE, personnel will perform decontamination as follows:

1. Place tools, instruments, samples and trash at the drop location. The equipment drop area should be clean and dry and at a minimum, plastic bags should be available for trash. Waste PPE will not be placed in the same containers as general trash.
2. Inspect equipment, samples and if applicable, tools for signs of residual amounts of contamination or excessive soil buildup. If present, soils and contamination must be completely cleaned off of equipment, samples and tools prior removal from the exclusion zone areas. Personnel will visually check themselves for signs of excessive soils and possible contamination. If observed, soils and contamination will be completely removed before further decontamination is performed.
3. Wash and Rinse outer work gloves and boots (boot covers) with soap and water.
4. Wash/brush off outer protective coverall (Tyvek).
5. Untape wrists and ankles.
6. Remove outer work gloves and place them in an appropriate container specified for waste PPE.
7. Remove outer Tyvek coveralls and place them in an appropriate container specified for waste PPE.
8. Remove respirator mask (also goggles if worn).
9. Wash, rinse, and remove inner protective gloves and place them in an appropriate container specified for waste PPE.
10. Wash hands using soap and water (separate from other decontamination cleaners/solutions).

Respirator Decontamination: Respirators will be decontaminated each day. Taken from the drop area, the masks will be disassembled, the cartridges disposed of and the rest placed in a cleansing solution. Personnel will inspect their own masks to be sure of proper strap readjustment for correct fit. Certain parts of contaminated respirators, such as the harness assembly or cloth components, are difficult to decontaminate. If grossly contaminated, they may have to be discarded, and replaced.

In addition to being decontaminated, all respirators, protective clothing, and other personal articles must be sanitized before they can be used again. The insides of masks and clothing become soiled from exhalation, body oils, and perspiration. The manufacturer's instructions should be followed in sanitizing the respirator mask. If practical, protective clothing should be machine washed after a thorough decontamination. Otherwise, it should be cleaned by hand.

8.2 EQUIPMENT DECONTAMINATION

Equipment that might require decontamination includes heavy equipment, tools, monitoring equipment, sampling equipment, and sample containers; trucks and trailers; and the decontamination equipment itself when the decontamination is closed down. Before entering the site, all equipment will be cleaned to remove grease, oil, encrusted dirt, or other potential contaminants. The following is a general guidance for use in determining equipment decontamination procedures:

Hand Tools: Tools will be dropped into a plastic pail, tub or other container in the Exclusion Zone. They will be brushed off, rinsed, and transferred into a second pail to be carried to the decontamination station. Generally, tools will be washed with a detergent solution, and rinsed with clean water.

Avoid using wooden tools; they cannot be adequately decontaminated due to their absorptive properties. If used, wooden tools cannot be removed from the Exclusion Zone until the end of the project, and then only to be disposed of as hazardous waste.

Manual Sampling Equipment: Sampling equipment will be decontaminated before and between sampling to prevent cross contamination, and when the equipment leaves the Exclusion Zone. Sampling equipment may include trowels, shovels, bailers, submersible pumps, geotechnical samplers, sleeves, and backhoes buckets.

All sampling equipment will be decontaminated using an Alconox wash, or equivalent, followed by two clean water rinses. The sampling tool will then be rinsed with deionized or distilled water and air dried.

Drilling and Trenching Equipment: All direct push rods, augers, backhoe buckets/arms and other components contacting potentially contaminated soils will require decontamination. This decontamination can occur on site, or at an offsite location. If offsite decontamination is chosen, all procedures and waste disposal responsibility will be the sole responsibility of the contractor performing the work, however onsite decontamination will be required to meet the following requirements:

1. Decontamination will be performed using a steam cleaner or high-pressure washer system.
2. Decontamination will occur at a central location at which a temporary decontamination pad is constructed to collect all wastewater. This can be accomplished using plywood and polyethylene sheeting.

3. Equipment will be thoroughly clean so that no visible contamination of dirt is present after decontamination is completed.
4. All decontamination water will be containerized in 55-gallon drums.
5. Upon disassembly of the decontamination pad, the polyethylene sheeting will be placed in 55-gallon drums and disposed of as contaminated waste.

Monitoring Instruments: Monitoring equipment should be protected as much as possible from contamination. Instruments will be draped, masked, or otherwise covered as much as possible with plastic without hindering the operation of the unit. Many instruments can be placed in a clear plastic bag that allows reading of the scale and operation of the knobs.

Contaminated instruments will be taken from the drop area, and will have their protective coverings removed and disposed of in appropriate containers. Any remaining dirt or obvious contamination will be brushed or wiped with a damp disposable paper wipe. The units can then be placed in a clean plastic tub, taken inside, wiped with damp disposable wipes and dried.

8.3 DISPOSAL OF DECONTAMINATION WASTES

Solid and liquid decontamination waste should be containerized. Solids may be double bagged, or placed in a sealed drum or similar container. Liquids will be collected during decontamination and placed in sealed containers or pumped into holding tanks for future testing and disposal. Containers must be clearly labeled for content, the operation from which they were filled, and the dates. No waste containers will be permitted to remain on site longer than 90 days from the date the first waste is placed in the container.

8.4 DECONTAMINATION DURING EMERGENCIES

Often during emergencies the need to quickly respond to an accident or injury must be weighed against the risk to the injured party from chemical exposure. It may be that the time lost or the additional handling of an injured person during the decontamination process may cause greater harm to the individual than the exposure that would be received by undressing that person without proper decontamination.

An additional consideration to include when bypassing decontamination of injured personnel is the acceptance of contaminated personnel at emergency medical facilities. Many facilities will not accept contaminated personnel. Site response personnel should accompany contaminated victims to the medical facility to advise on matters involving decontamination.

9. SITE CONTROL AND WORK ZONES

During RI activities (but not environmental sampling activities), Earth Tech will ensure control of the areas immediately surrounding the location.

9.1 CONTROLLED WORK AREAS

The area surrounding each sampling location presents hazards related to both the potential for the release of environmental contaminants and from sample collection procedures (drilling, etc.). To minimize hazards to personnel not directly involved in sampling procedures, a controlled work area (Exclusion Zone) will be established. The extent of each Exclusion Zone will be sufficient to ensure that personnel located at/beyond its boundaries will not be affected in any substantial way by hazards associated with sample collection activities. To meet this requirement, the following minimum distances will be used:

- **Direct Push Operations.** A distance 10 feet in all directions from the drilling location will be controlled.
- **Hand Auger Operations.** A distance 10 feet in all directions from the drilling location will be controlled.
- **Trenching Operations.** A distance 30 feet in all directions from each excavation site (except where unfeasible due to existing structures) will be controlled.
- **Hollow-Stem Auger Drilling.** Determine the mast height of the drill rig. This height will be cleared, if practical, in all directions from the borehole location and designated as the exclusion zone. The cleared area will be sufficient to accommodate movement of necessary equipment and the stockpiling of spoils piles.
- **Groundwater Sampling.** The area around the sampling location (i.e., groundwater monitoring well) will be sufficiently cleared to accommodate the groundwater sampling activities and the movement of the portable equipment to perform the activities.
- **Decontamination.** Thirty feet will be cleared in all directions from the decontamination location, where practical, for large efforts (e.g., vehicle and drilling equipment) conducted at a decontamination pad. For personal and small parts decontamination conducted at the work location, keep decontamination activities within the applicable Exclusion or Contamination Reduction Zone established for that operation.

Access to each Exclusion Zone will be accomplished through a single entry point, which shall also serve as the location of the Contamination Reduction Zone (CRZ) where personal and equipment decontamination will occur. The CRZ, which must be large enough to encompass decontamination activities and prevent unauthorized personnel from approaching closer than is safe, shall be located inside the fence such that it allows direct and sole access in/out of the gated entry point.

Samples will not be brought directly into the support zone. A separate table near the decontamination station or near the sample location shall be set up to handle samples as they are collected. A temporary disposable table (e.g., constructed of wood) is acceptable or a folding table with plastic sheeting may be used.

All personnel should be alert to prevent unauthorized, accidental entrance into controlled-access areas (the Exclusion Zone and CRZ). If such an entry should occur, the trespasser should be immediately escorted outside the area, or all HAZWOPER-related work must cease. All personnel,

equipment and supplies which enter controlled-access areas must be decontaminated or containerized as waste prior to leaving (through the CRZ only).

At the conclusion of all hazardous work location tasks, controlled areas must be properly cleaned so as to be nonhazardous ("clean") prior to discontinuing entry control procedures and PPE requirements. Once this occurs, Exclusion Zone requirements and use of chemically protective PPE can be discontinued.

9.2 EXCLUSION ZONE CONTROL RECORDS

On daily basis, the SSO will record the identities of all personnel working within each Exclusion Zone. The identity of each visitor entering any Exclusion Zone, as well as the time of entry/exit, will also be recorded.

This information will be placed in the site log.

10. EMERGENCY CONTINGENCY PLAN

10.1 GENERAL

Three major categories of emergencies could occur during site operations:

1. Illnesses and physical injuries (including injury-causing chemical exposure)
2. Catastrophic events (fire, explosion, earthquake, or chemical)
3. Safety equipment problems

Although a catastrophic event or severe medical emergency is unlikely, an emergency contingency plan has been prepared for this project, should such critical situations arise.

10.2 RESPONSIBILITIES

10.2.1 Field Manager/Site Safety Officer

The FM/SSO will be the primary contact and coordinator of all emergency activities. The FM/SSO will be responsible for

1. Evaluating the severity of the emergency,
2. Implementing the appropriate response action,
3. Summoning appropriate emergency services (e.g., fire department, police, or ambulance), and
4. Notifying all site personnel, the H&SP, and concerned authorities of the emergency situation.

10.2.2 Other Onsite Personnel

Field personnel are required to inform the SSO of all emergency situations and to abide by their issued response actions. Special medical problems of field personnel, such as allergies to insects, plants, or prescription medication, will be reported to the SSO.

10.3 EMERGENCY EQUIPMENT

In accordance with EM 385-1-1 Section 3, the following emergency equipment specified in the following Sections will be available and in proper working condition.

10.3.1 First Aid Kits

Each work site will have a first aid kit that meets the following requirements:

- First aid kits will be in weatherproof containers, be approved by the Earth Tech Occupational Physician, meet all regulatory requirements, and be present at all locations where Earth Tech employees are working.
- Whenever a new first aid kit is assembled, a new Inventory List and Physician's Authorization Certificate will be placed in the first aid kit as part of its inventory.
- First aid kits will be available at the job site at all times.

- Use of any item from the first aid kit necessitates completion of a Supervisor's Employee Injury Report. The report will be submitted to the Health and Safety department within one working day.
- For local field services work, first aid kits will be returned to the storeroom at the end of each workday.
- First aid kits will be inspected and restocked weekly, and an inventory of first aid supplies sufficient to restock kits on a weekly basis will be maintained.
- For jobs outside the local area, the site supervisors will replenish the kit from the nearest pharmaceutical source, with equivalent supplies to those used (until proper restocking by the storeroom can be accomplished), unless such supplies can economically be made available to the job from the storeroom.
- Personnel permitted to use first aid kits will possess a current first aid card. A minimum of two trained first aid/CPR providers will be present on site at all times.

10.3.2 Eyewash Units

Eyewash units meeting the latest requirements of American National Standards Institute (ANSI) Standard Z358.1 will be kept at the site. All units will be capable of supplying hands-free irrigation for both eyes for at least 15 minutes at a flow rate of at least 0.4-gallon per minute.

10.3.3 Fire Extinguisher

A fire extinguisher with a minimum rating of 1A, 10B, C will be available for use at each work location at all times. Site personnel will be trained in the use of the available fire extinguisher type(s), and will be kept aware of all on-site extinguisher locations (for access in case of fire).

In addition, a fire extinguisher will be mounted on each piece of heavy equipment for use in an emergency. The minimum rating for each vehicle-mounted extinguisher will be 2A, 10B.

10.4 EXERCISE OF THE EMERGENCY RESPONSE SYSTEM

During the first two days of on-site field operations, the SSO will perform a test of the emergency response system. An exercise will be conducted which will involve all on-site personnel, and will involve a simulated catastrophic accident to include both injured personnel and release of a hazardous site contaminant. All applicable response procedures will be simulated. At the completion of the exercise, a review will be conducted to evaluate the effectiveness of the emergency response system/procedures, and identify any necessary corrective actions.

Additional on-site exercises can be conducted at the discretion of the SSO.

10.5 RESPONSE ACTIONS—SAFETY EQUIPMENT PROBLEMS

A malfunction or other problem with any health and safety equipment can potentially lead to a medical emergency. Examples include the following:

- Leaks or tears in protective clothing.
- Failure of respiratory protective devices (i.e., self-contained breathing apparatus or air-purifying respirators).
- Encountering contaminants for which prescribed protective equipment may not be suitable.

These equipment problems must be corrected before proceeding with field activities. Personnel affected by the equipment problem(s) must exit the work area until the problem has been corrected.

10.6 RESPONSE ACTIONS—MEDICAL EMERGENCIES

A medical emergency is a situation that presents a significant threat to the health of personnel onsite. Chemical exposure, heat stress, cold stress, and poisonous insect bites can cause medical emergencies. Proper care must be initiated immediately. Proper care may be in the form of first aid treatment or emergency hospitalization.

Response personnel will accompany victims to the medical facility, whenever possible, to advise on decontamination. Table 10-1 provides instructions to respond to general categories of medical emergencies.

Table 10-1: How to Respond to Medical Emergencies

Emergency	Response
Inhalation	<ol style="list-style-type: none"> 1. Call for medical assistance. 2. Workers wearing proper respiratory protective equipment should remove the victim from the contaminated atmosphere. 3. Voluntary basis only: If the victim is not breathing, administer mouth-to-mouth resuscitation or CPR immediately.
Eye Contact	<ol style="list-style-type: none"> 1. Do not rub eyes. 2. Flood eyes with emergency eyewash solution. Hold the eye open and flood so that all surfaces are thoroughly washed. 3. Continue washing for 15 minutes while calling for medical assistance.
Skin Exposure	<ol style="list-style-type: none"> 1. Wash skin with soap and water for a minimum of 15 minutes. All contaminated areas on the body, including hair, should be thoroughly decontaminated. 2. If clothing is contaminated, it should be removed in a way to minimize further contact with the substance. 3. Seek medical assistance.
Heat Stress	<ol style="list-style-type: none"> 1. Remove excess clothing. 2. Pour water on the victim. 3. If the victim is conscious, offer water or Gatorade. 4. Seek medical assistance.

10.6.1 Medical Assistance

The FM or SSO will keep on site the list of emergency telephone numbers and locations of the local fire department, hospitals, ambulance service, and other emergency services (see Table 10-2).

In the event of severe injury, transport personnel to the designated hospital (see Figure 10-1). The address and phone number of the designated hospital follows.

Irvine Medical Center
16200 Sand Canyon Road
Irvine, CA 92718
(671) 646-5801

Directions. From the site, travel north along Perimeter Road to the intersection with Trabuco Road. Turn left (west) on Trabuco (exit through Trabuco Gate), and travel to the intersection with Sand Canyon Avenue. Turn south left (south) on Sand Canyon, and follow for approximately 2 miles. Irvine Medical Center will be on the left immediately before the intersection of Sand Canyon Avenue and Alton Parkway.

The SSO will inform hospital personnel of non-emergency medical treatment administered to personnel for onsite injury, illness, or exposure to chemical contaminants.

10.6.2 Treatment in Case of Electrical Shock

Notify the nearest medical treatment facility in all cases involving injury from electrical shock. The employee may not resume work until cleared by the H&SP after consultation with Earth Tech's occupational physician.

10.6.3 Heat-Related Illnesses

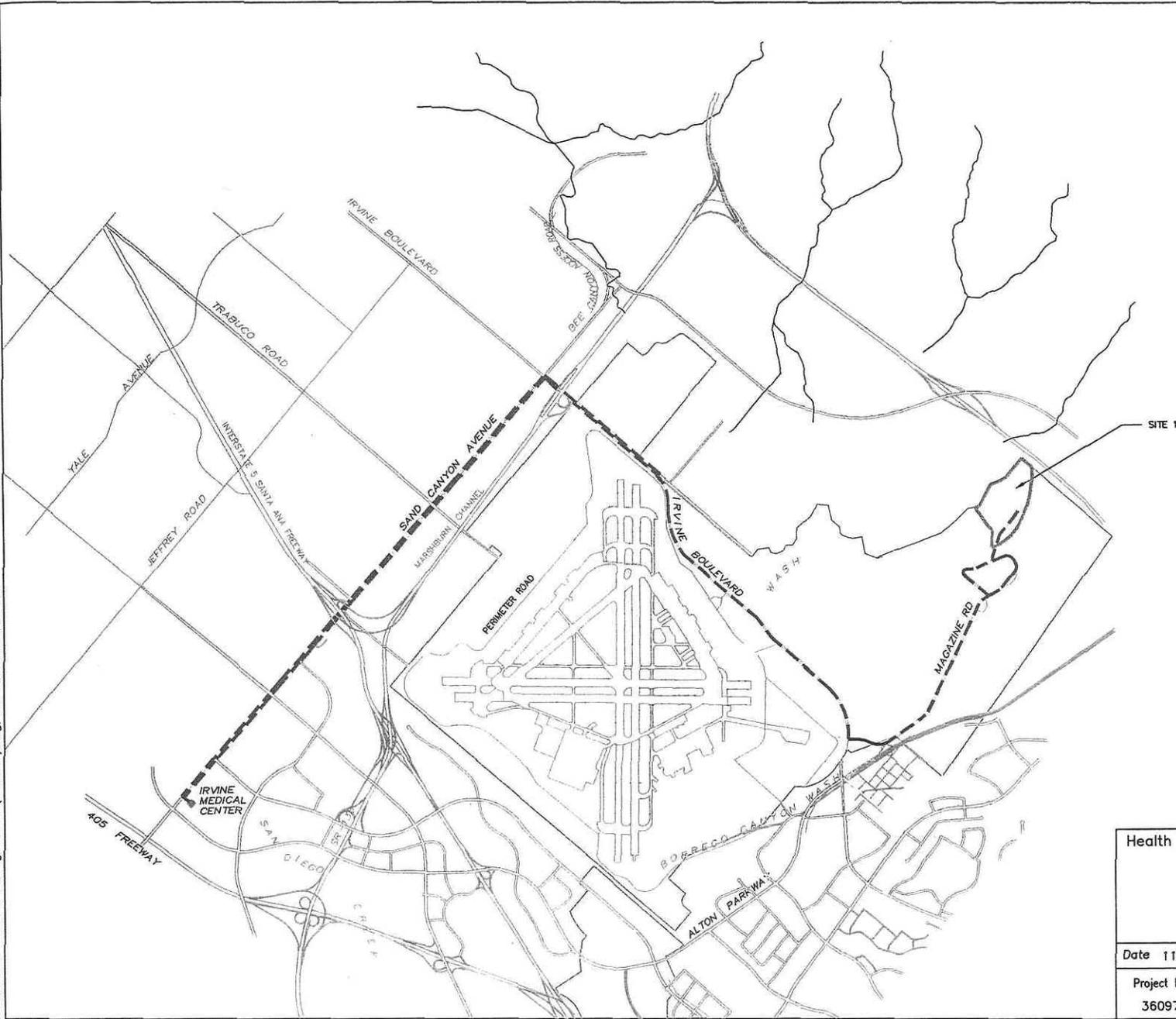
See Section 4.10 for guidance on how to identify and treat heat-related illness.

10.7 RESPONSE ACTIONS—CATASTROPHIC EVENTS

In the event of a catastrophic incident:

1. Stop all work activities and evacuate all project personnel from the work location. Evacuate personnel in a direction opposite the critically affected area. Have personnel assemble in a pre-designated location outside of the job site.
2. Take a head count of the assembled employees. Administer first aid to any injured individuals.
3. Contact the SSO immediately, if the SSO is not currently present at the work location.

At the start of each day's field operations the SSO will designate (1) a universal signal for emergency evacuation (e.g., use of a horn) and (2) the evacuation assembly location. The SSO will communicate these designations to all field personnel during the daily tailgate safety briefing.



N

LEGEND

- WASH OR STREAM
- MCAS EL TORO BOUNDARY
- ROUTE TO HOSPITAL

NOT TO SCALE

Health and Safety Plan		Final
<h3>Hospital Route Map</h3>		
Phase II Remedial Investigation, IRP Site 1		
Date 11-01	MCAS El Toro, California	Figure
Project No. 36097	 <small>A DUKACOR INTERNATIONAL LTD. COMPANY</small>	10-1

PAGE NO. 10-6

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Table 10-2: Emergency Telephone Numbers

Fire Department:	
Fire Department	911 or (949) 726-3333
Medical Care:	
Irvine Medical Center 16200 Sand Canyon Road Irvine, CA 92718	911/(949) 753-2250
Police:	
Local Police	911
Installation Emergency Service Desk	(949) 726-2172
Provost Marshal	911 or (949) 726-3525
Information and Response Organizations:	
National Response Center (if spill over RQ)	(800) 424-8802
Local Poison Control Center	(800) 484-5151
National Poison Control Center	(800) 458-5842
Navy Personnel:	
Resident Officer In Charge of Construction (ROICC), Scott Kehe	(949) 726-2506 or (949) 726-2254
Navy Technical Representative (NTR), David DeMars	(619) 532-4163
Earth Tech Personnel:	
CLEAN II Program Health and Safety Manager, Robert M. Poll, CIH, CSP	(562) 951-2242 Mobile: (562) 884-1414
CLEAN Technical Director, Ken Vinson, P.E.	(808) 471-9267 Mobile: (808) 371-7441
CTO Manager, Crispin Wanyoike, P.E.	(562) 951-2057 Pager: (310) 527-6339

Route to Irvine Medical Center: From the site, travel north along Perimeter Road to the intersection with Trabuco Road. Turn left (west) on Trabuco (exit through Trabuco Gate), and travel to the intersection with Sand Canyon Avenue. Turn south left (south) on Sand Canyon, and follow for approximately 2 miles. Irvine Medical Center will be on the left immediately before the intersection of Sand Canyon Avenue and Alton Parkway.

11. REFERENCES

Earth Tech, Inc. (Earth Tech) 1996. *CLEAN Health and Safety Program Manual*. Prepared for PACNAVFACENGCOM. Honolulu.

_____. 2001. *Final Work Plan, Phase II Remedial Investigation, IRP Site 1, Explosive Ordnance Disposal Range, Marine Corps Air Station, El Toro, California*. Honolulu. November.

Attachment A
Health and Safety Forms

Supervisor's Report of Incident

This is an official document to be initiated by the injured employee's Supervisor. Please answer all questions completely. Fax to your Region EHS Manager within 24 hours of the injury. See reverse side for instructions.

Section 1: Employee (Must complete each item or processing delays will occur) - Print Clearly

SCMS Claim#: _____ WC Location Code: _____ (877)261-8926			
Employee Data	S.S. No.	Sex	Birth Date
Injured's Name	Phone	Marital Status	Dependents
Home Address	City	State	Zip Code
Job Title	Dept No.	Office Location Address	
<input type="checkbox"/> Injury	<input type="checkbox"/> Illness	<input type="checkbox"/> Vehicle Injury	<input type="checkbox"/> Near Miss
Hire Date		Hourly Wage	

Section 2: Supervisor (Must complete each item or processing delays will occur) - Print Clearly

Date of Incident	Time	Date Reported	To Whom
Client Name	Job Assignment at Time of Incident		Time Shift Began
Exact Location & Address of Incident		Did injured leave work? When?	
Has injured returned to work? <input type="checkbox"/> Yes <input type="checkbox"/> No		Did employee miss a regularly scheduled shift? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Doctor/Hospital Name		Address of Hosp.	
Witness Name		Statements Attached <input type="checkbox"/> Yes <input type="checkbox"/> No	
Nature of Injury		Body Part	
Medical Attention			
Describe Incident			
What caused the incident?			
Corrective Action(s) to Prevent Future Occurrence:			
Supervisor/Foreman (Print Name)		Signature	Telephone Date

Section 3: Manager

Comments on incident and corrective action		
Manager (Print Name)	Signature	Telephone Date

Section 4: Environmental, Health and Safety

Concur with action taken? <input type="checkbox"/> Yes <input type="checkbox"/> No Remarks:		
OSHA Classification Pending <input type="checkbox"/> <input type="checkbox"/> Incident only <input type="checkbox"/> First aid <input type="checkbox"/> No lost work days OSHA Recordable <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Lost work days _____ <input type="checkbox"/> Days of restricted activity _____ <input type="checkbox"/> Fatality		
EHS Professional (Print Name)	Signature	Date Telephone

Supervisor's Report of Incident Instructions For Completion

The following types of incidents must be reported using this form:

1. Occupational Injury or Illness (includes first aid only, medical treatment, hospitalization, fatality)
2. Vehicle Accident Injuries
3. Near Miss (incident where employee(s) could have been injured)

INSTRUCTIONS

Immediate:

1. Employees must report such incidents to their Supervisor **immediately**.
2. The Supervisor must complete **Sections 1 and 2, Employee Data and the Supervisor Section** of the SRI. Incomplete items will delay timely processing. Any work-related injury or illness that requires medical treatment or care will require notifying SCMS at 877-261-8926.
3. The Supervisor must verbally notify his/her Manager, who in turn must sign **Section 3, Manager**, of the SRI. To avoid delaying SRI process, a separate copy of the SRI with the Manager's signature can be faxed within 3 days to the REHSM.
4. The Supervisor must verbally notify his/her REHSM with a follow-up SRI faxed within 24 hours (see below for fax numbers). The REHSM will review and complete **Section 4, Environmental Health and Safety**, and fax the SRI to the WCA at 804-515-8313.
5. For near-miss situations that could have resulted in an injury to an employee, the Supervisor must notify his/her Manager (see Item 3 above) and the REHSM with a follow-up SRI faxed within 24 hours.

PRIMARY CONTACTS

East REHSM: Dale Prokopchak, CIH, CSP
Telephone: 804-515-8556
Fax: 804-515-8313
Pager: 877-830-1981

WCA:
Telephone: 804-515-8557
Fax: 804-515-8313

Midwest REHSM: Jeff Grant, CIH
Telephone: 616-940-4426
Fax: 616-940-4396
Cell Phone: 734-516-5232

West REHSM: Bob Poll, CIH, CSP
Telephone: 562-951-2242
Fax: 562-495-9257
Cell Phone: 562-884-1414

Attachment B
General Safety Rules for Subcontractors

GENERAL SAFETY RULES FOR CONTRACTORS

Introduction

The rules and requirements contained in this attachment have been written for the guidance of Contractors who are performing work under contract with Earth Tech. This booklet prescribes general requirements. Additional specific rules may be necessary to ensure the safety of workers on a particular job. The Contractor, working in collaboration with the Earth Tech representative, will be expected to establish such additional rules and procedures as may be necessary to conduct a safe operation and comply with all Earth Tech, regulatory, and insurance requirements and those of our clients. Earth Tech health and safety professionals are available to assist.

The term Contractor, as used in this attachment, shall be understood to include any and all persons, sole proprietorships, partnerships, corporations, or other business ventures under contract, oral or written, to Earth Tech.

Contractor is responsible for informing its subcontractors of these requirements, for directing and supervising work of subcontractors, and for assuring that its subcontractors adhere to the requirements herein. Earth Tech may request Contractor to provide proof of its subcontractor's adherence to all rules and regulations and will prohibit access to Earth Tech property or job sites or our client's property for those Contractors not in compliance.

In order to assist Contractor in following these instructions, a Earth Tech Representative will be assigned to the Contractor to act as Earth Tech's agent in all matters relative to work activities at Earth Tech facilities or job sites. Under no circumstances shall any work be started until the Earth Tech Representative has been contacted, a job orientation has been conducted by the Earth Tech Representative, and all permits, insurance, Earth Tech, client, and regulatory pre-job requirements met.

The Earth Tech Representative and the Earth Tech Health and Safety professionals are authorized to stop any work which they may consider hazardous to Earth Tech personnel or equipment or Contractor personnel. This authority may be delegated to appropriate individuals.

General Safety Rules and Requirements

Accident Reporting

All accidents (personal and property damage) shall be reported orally to the Earth Tech Representative as soon as emergency conditions no longer exist. A written report shall follow within 7 days after emergency conditions are resolved.

Alcohol, Firearms, etc.

Alcoholic beverages, illegal drugs or narcotics, or guns and ammunition are not permitted on Earth Tech property or job sites. Personnel under the influence of alcohol or drugs shall not be allowed on Earth Tech property or job sites.

Approvals

The Contractor shall be required to obtain pertinent work permits or authorization and approval from the Earth Tech Representative before:

- Working on existing pipelines or equipment
- Entering tanks or closed vessels
- Entering any designated high-hazard areas
- Using torches, electrodes, electronic motors, forges, soldering irons, any open flames, or any device which could produce sparks or ignition source
- Closing walkways, roads, or restricting traffic
- Starting excavations
- Removing tanks from excavations
- Backfilling excavations
- Using utilities such as steam, water, compressed air, or electricity
- Sandblasting, spray painting, or guniting
- Storing flammable materials such as gasoline, oil, paints, oxygen cylinders, etc.
- Walking or working on roofs of buildings or equipment
- Drilling, boring, preparing test pits, or using geophysical equipment or any other exploratory equipment requiring penetration of surfaces
- Operating cranes or similar equipment near overhead power lines or pipelines
- Opening cutting through firewalls or berms
- Fueling or repairing Contractor operating equipment on Earth Tech property or job sites.

Security

For security reasons, entrance to and exit of Earth Tech facilities and job sites is restricted to those areas designated as the Contractor's work area.

Speed Limits

All vehicles on Earth Tech job sites and facilities must observe a maximum speed limit of 10 mph unless otherwise posted.

Vehicle Safety

- All vehicles must be parked in authorized areas only.
- There will be no passing of moving vehicles at job sites where there are narrow roads and short-sight distances.
- Vehicles will only be operated by personnel with valid licenses and good driving records.
- Vehicles shall have all required inspection and operating permits.
- Seat belts shall be used.

Safe Work Practices

Communication

Communication and coordination is vital to prevent accidents on construction sites. Every worker must be aware of equipment operating in his vicinity.

Confined Space Entry

Confined spaces include storage tanks, bins, sewers, in-ground vaults, degreasers, boilers, vessels, tunnels, manholes, pits, etc. These enclosures, because of inadequate ventilation and/or the introduction of hazardous gases and vapors, may present conditions that could produce asphyxiation or injury.

Before entering a confined space, Contractor must notify the Earth Tech Representative of intent to enter. The Earth Tech Representative will review with Contractor the safe entry requirements which include:

Removal of Contents. Before entering, confined spaces should be as clean and free of hazardous materials and chemicals as possible. Where appropriate, confined spaces may be purged by water or other suitable means. Purging with hazardous solvents should be avoided where possible.

Isolation. All input lines which discharged into the confined space shall be disconnected and capped or isolated. The use of a single in-line valve shut-off as the sole means of isolating the confined space from any input lines is prohibited.

However, the use of a double in-line valving arrangement with a vent or drain in between the two valves is acceptable provided that dangerous air contaminants are not introduced by such venting. Isolation valves shall be locked closed, vent or drain valves shall be locked open, and the key shall be kept by that person performing the job.

Electrical Lockout. Where electrical devices located within the confined space (motors, switches,

etc.) are to be repaired or worked on, the line-disconnect switches supplying the power must be tagged and locked in the "OFF" position. The lock key is to be kept by the person performing the job, and only this person is authorized to unlock the switch and remove the tag upon completion of the job. Where more than one person is working on the line, each must place a lock on the switch and retain his own key.

- Where there are multiple sources of power to an electrical device that supplies power to the device through an automatic or manual bus transfer switch, lockout devices must be placed on the breaker nearest to the electrical device that is to be isolated, and an electrician shall test the power supply lines to ensure that power has been secured.
- Line-disconnect switches supplying power to any mechanical apparatus in the confined space (mixers, conveyors, etc.) must also be tagged and locked in the "OFF" position. This must be done for any entry, even though work will not be performed on the apparatus itself.

Securing of Covers. All manhole and cleanout covers shall be removed and the openings maintained clear of any obstructions. When hinged doors or lids are provided, they shall be secured so they cannot close. See **Excavations and Trenches** for guarding requirements.

Testing Atmosphere. A qualified person (NIOSH Publication No. 80-106) using only equipment approved and tagged for Class 1, Division 1 locations shall make appropriate tests of the atmosphere in the confined space and place a record of the test results at the entrance to the confined space. Testing shall ensure the following:

- Combustible gas and vapor concentrations do not exceed 10 percent of the lower explosive limit
- Oxygen content is no less than 20 percent and no greater than 25 percent
- Appropriate respiratory protective equipment and other appropriate personal protective devices have been provided for all employees when concentrations of toxic materials exceed established threshold limit values (TLVs).

Continuous Monitoring. If the nature of the work to be performed introduces, or has the potential to introduce, harmful air contaminants, continuous monitoring of the atmosphere and/or the oxygen content drops below 20 percent, all personnel shall evacuate the confined space immediately.

Ventilation. All confined spaces found to be unsafe must be ventilated by means of mechanical exhaust systems arranged so as to avoid recirculating contaminated air. The Contractor must contact the Earth Tech Representative to obtain approval not to ventilate. Personnel shall be evacuated immediately in the event of failure of the mechanical ventilation system. The confined space shall be retested prior to reentry following ventilation system repair.

Buddy System. At least two workers shall remain outside the confined space. One standby worker shall be stationed just outside the access opening of the any confined space while such space is occupied. This person shall:

- Maintain continuous awareness of the activities and well-being of the occupant in the confined space
- Be able to maintain communication at all times
- Be alert and fully capable of quickly summoning help
- Be physically able and equipped to assist in the rescue of an occupant from a confined space under emergency conditions.

Safety Gear and Personal Protective Equipment. All Contractor employees must be instructed in accordance with OSHA regulations regarding safety gear and personal protective clothing, hard hats, respirators, lifelines, and harnesses. Such instructions shall be received and documented before entering any confined space.

Compressed Gas Cylinders

Valve protection caps. Valve protection caps shall be in place when compressed gas cylinders are transported, moved, or stored.

Cylinder valves. Cylinder valves shall be closed when work is finished and when cylinders are empty or are moved.

Compressed gas cylinders. Compressed gas cylinders shall be secured against rolling or tipping (roped or chained) at all times, except when cylinders are actually being hoisted or carried.

Gas regulators. Gas regulators shall be in proper working order while in use.

Leaks. If a leak develops in a gas cylinder, after donning appropriate safety equipment, immediately remove it to a safe location. If the leak cannot be corrected, report it to the Earth Tech Representative.

Identification of Contents. Cylinders should be permanently marked or stenciled to identify the type of gas in the cylinder.

Breathing Air. All compressed breathing air shall meet OSHA specifications for breathing air quality. All compressed breathing air cylinders shall have their contents checked at the job site for correct oxygen concentration and rejected for breathing air if the oxygen concentration is not 20.7% ±0.2%.

Oil and oily rags. Oil and oily rags shall be kept away from oxygen equipment.

Cranes, Hoists, and Other Heavy Equipment

Contractor personnel will not be permitted to use hoists and powered apparatus belonging to Earth Tech unless approval is obtained in each instance from the Earth Tech Representative.

ROPs. Roll over protection shall be used when conditions or regulations call for such use.

Cutting or Welding

Hot Work/Welding/Burning. "Hot Work" authorization must be obtained from the Earth Tech Representative before any welding, cutting, or other "hot work" is done. "Hot work" permits and results of tests are to be submitted to the Earth Tech Representative at the completion of the job or at the end of each workday.

Welding Flash. Noncombustible or flame-proof shields or screens must be provided to protect welder or others who might be harmed by direct rays or arc.

Personal Protective Equipment. Goggles, gloves, aprons, and other personal protective equipment appropriate to the job shall be used.

High Fire-Hazard Areas

- Contractor personnel are responsible to see that a fire watch is maintained and all adjacent combustible materials are protected or removed as designated by the Earth Tech Representative.
- Contractor shall provide his own calibrated combustible gas meter or other instruments for checking areas before hot work.
- Documentation of calibration shall be submitted to the Earth Tech Representative for review by the Earth Tech Health and Safety Section.
- Contractor is responsible for all testing and monitoring required by applicable regulations and to assure work place safety.
- Earth Tech shall have the right, not the responsibility, to perform additional testing. Earth Tech testing shall not be in lieu of Contractor's requirements.
- In the event of a bona fide emergency, such as emergency spill response work, and where the Contractor warrants that he cannot conduct the required testing, Earth Tech may upon written agreement then conduct all tests necessary to assure safety and regulatory compliance. The Contractor shall cosign the "hot work" permit form when tests are conducted by Earth Tech personnel.
- Contractor shall provide his own fire extinguisher(s) for welding and cutting, as designated by the Earth Tech Representative.

Electrical Safety

Grounding. The noncurrent-carrying metal parts of fixed, portable, or plug-connected equipment shall be grounded. Since ground wires can break, they shall be tested with an electrical resistance meter to assure conductivity as often as necessary to assure safety. Portable tools and appliances protected by an approved system of double insulation need not be grounded.

Extension Cords. Extension Cords shall be the three-wire type for grounded tools (two-wire is permissible for double-insulated tools) and shall be protected from damage; do not fasten with staples or extend across an aisleway or walkway. Worn or frayed cords shall not be used. Cords shall not be run through doorways where the door could cut or damage them.

Light Bulbs. Exposed bulbs on temporary lights shall be guarded to prevent accidental contact, except where bulbs are deeply recessed in the reflector. Temporary lights shall not be suspended by their electric cords unless designed for this use. Explosion-proof bulb covers shall be used when contact with flammable vapors or gases is likely and shall meet Class I, Division I requirements.

Electrical Receptacles. Receptacles for attachment plugs shall be of the approved, dead-front, concealed contact type. Where different voltages, frequencies, or types of current are supplied, receptacles shall be of such design that attachment plugs are not interchangeable.

Wet Environments. Work done in wet environments shall require ground fault interrupters and water-tight connectors.

Emergency Equipment

Earth Tech's fire equipment is not to be moved, relocated, or otherwise rendered inaccessible unless specific permission is granted in each case by the Earth Tech Representative.

Self-contained breathing apparatus, first aid equipment, fire blankets, stretchers, eyewash fountains, and deluge showers are not to be moved, relocated, or blocked without the express permission of the Earth Tech Representative.

Excavations and Trenches

Permits. Before any excavation work begins, all required permits shall be obtained.

"Dig-Alert". Before any excavation work begins, the existence and location of underground pipes, electrical conductors, etc., must be determined by Contractor who shall in turn notify the Earth Tech Representative.

Cave In Protection. The walls and spaces of all excavations and trenches (which will be entered by people) more than 4 feet deep shall be guarded by shoring, sloping of the ground, or some other equivalent means, in accordance with Cal/OSHA regulations.

Daily Inspections. Daily inspections of excavations shall be made by the Contractor. If there is evidence of possible cave-in or slide, all work in the excavation shall cease until the necessary safeguards have been taken.

Egress. Trenches more than 4 feet deep shall have ladders or steps located so as to require 10 feet or less of lateral travel between means of access.

Backfill. All trenches shall be backfilled as soon as practical after work is completed and all associated equipment removed.

Housekeeping. All Contractor equipment, such as pipe, rebar, etc., shall be kept out of traffic lanes and access ways. Equipment shall be stored in a manner which ensures the safety of Earth Tech and Contractor employees at all times.

Fall In Protection. All trenches shall be completely guarded on all sides. Standard guardrails are preferred. However, when wooden or metal barricades are used for trench guarding, they shall be spaced no further apart than 20 feet, and at least two feet from the edge of the trench. Such barricades shall be at least 36 inches high when erected.

- Battery-lighted barricades shall be used as follows:

(1) A minimum of two battery-lighted barricades shall be used at corners, one on each side of the barricade.

(2) At least one battery-lighted barricade shall be used where vehicular traffic approaches the trench at right angles.

(3) Where trenches parallel roadway, distance between battery-lighted barricades shall not exceed 40 feet unless this requirement conflicts with Item (1), above, and additional units are required.

(4) All battery-lighted units shall be serviced as necessary to ensure equipment is operating.

- Caution tape shall be stretched securely between barricades. The caution tape shall be at least 3/4-inch-wide and shall be yellow or yellow and black and may have the words "CAUTION - DO NOT ENTER."

- Barricaded sections immediately adjacent to where pedestrians cross trenches shall be arranged to direct pedestrians to the walkway or bridge.

Encroachment. Use of other trench excavating equipment, or storage of equipment or supplies within a distance equal to the depth of the trench, will not be permitted without approval by the Earth Tech Representative.

Bridges. All pedestrian bridges shall be of sufficient strength to prevent no greater vertical deflection than one-half inch when a 250-pound weight is applied to the center of the bridge.

- Handrails shall consist of intermediate and top rails on both sides of the bridge. The top rail shall be between 42 and 45 inches above the walking surface and be capable of withstanding a lateral force of 200 pounds against the center of the top rail.

- All surfaces which a person could reasonably contact should be sufficiently

free of splinters, nails, or protrusions which may cause injury.

- All bridges intended for vehicular traffic shall be constructed to withstand twice the load of the heaviest vehicle anticipated.

Earth Grading Activity

Vest. All persons within an area where earthmoving are operating shall wear a safety vest or jacket at all times. Vests may be red, orange, or day-glo green in color, but bright or fluorescent orange is preferred. Significantly faded or damaged vest must be replaced.

Communication. Anytime a test pit is to be excavated, the technician shall notify the grading contractor's **authorized** representative for that area. That individual may be acting in the capacity as a dump man, operator, or supervisor from an independent vehicle. Advise that representative of the test pit location and request their cooperation to promote safety during the test period. This should include their advising those under their supervision of your existence in the grading area. Make a notation on your records of the name of the individual with whom you spoke so that the communication is documented.

- Provide notice to the grading contractor
- Identify location of test pit
- Request the cooperation through the completion of the tests and document accordingly.
- A flag must be affixed to any vehicle driving in an earth grading activity area and hazard warning lights shall be operated.

Flags. Every over-the-road vehicle operating in the area of earthmoving equipment activity must carry a flag. The flag must be at least 300 square inches in area with no dimension less than 12 inches. Flags must be high visibility red, orange, day-glo green and mounted approximately 12 feet above grade level.

Hazard Warning Lights. Every over-the-road vehicle operating in the area of earthmoving equipment activity must operate the hazard warning flashers at all times.

Rotating or Flashing Beacon. All vehicles stationary in the grading area shall use a rotating or flashing amber beacon or strobe light on the top of the cab of the vehicle during all field testing.

Orientation of Test Pits. The technician is responsible for selecting a test pit location. Of paramount concern is the technician's safety. The test pit should be located behind the established pattern of grading equipment and outside any existing patterns. The orientation of the pit should include the use of the technician's vehicle as a barrier to potential oncoming traffic. The waste pile created from the excavation of the test pit should be opposite the vehicle so that the test pit is positioned between the vehicle and the waste pile. A flag shall be placed immediately on top of the waste (spoil) pile, satisfying the same requirements as the vehicle flag.

Zone of Non-Encroachment. The location of the test pit must be selected so that no earthmoving equipment will approach closer than 50 feet from the center of the test pit. This is not only for the technician's safety, but to ensure the integrity of the test. Excessive vibration from the operation of earthmoving equipment operating too closely may impair the accuracy or spoil the test results.

Completion of Tests. Immediately upon completion of tests, record the data and withdraw flags and vehicles outside the grading area to record notes and do calculations.

Fire Prevention

Earth Tech Representative, or his designee, is authorized to correct any condition which he may consider a fire hazard. In any emergency, the site personnel are authorized to act directly with Contractor's Foreman in regard to fire hazards without waiting for the Earth Tech Representative.

Floor Openings

Floor openings shall be guarded by substantial barriers, railings, and/or covering materials strong enough to sustain twice the load of pedestrians or vehicular traffic. Barriers will be supplied by the Contractor.

Where a danger of falling exists for personnel, elevated floor areas must be provided with guardrails. In addition, toeboards shall be provided when the possibility of falling objects striking personnel below exists.

High-Hazard Areas

Although this list may not be all inclusive, there are certain areas and operations at Earth Tech facilities and job sites where extra precautions must be taken because of the nature of the hazards. When starting up any operation, the Contractor is required to check with the Earth Tech Representative for a review of the safety and health rules which apply before entering any of the following areas:

- Confined spaces (tanks, manholes, vaults, pits, etc.)
- Laboratories
- Chemical storage and disposal areas.

The contractor is also required to check with the Earth Tech Representative before any work is done on a flammable gas or solvent line; a tank or vessel that presently contains, or has contained, a flammable material; and before making an excavation anyplace on the site.

Housekeeping

Material should be carefully stacked and located so that it does not block aisles, doors, self-contained breathing apparatus, fire extinguishers, fire blankets, stretchers, emergency eyewash fountains, emergency

General Safety Rules for Contractors

safety showers, fixed ladders, stairways, or electrical breaker panels.

- Nails protruding from boards must be removed or bent over.
- All work areas shall be kept clear of form and scrap lumber and all other debris.
- Combustible scrap, waste materials, and debris shall be removed at regular and frequent intervals.
- Containers shall be provided for the collection and separation of refuse by type. Covers shall be provided on containers used for flammable, combustible, or harmful substances.
- Overhead storage of debris, tools, equipment, pipes, etc., is prohibited.
- At the end of each work day, Contractor shall provide for pick up of all debris such as paper, rags, empty cans and bottles, etc.

Ladders

The use of ladders with broken or missing rungs or steps, broken or split handrails, or with other faulty or defective construction is prohibited.

- Ladders must not be placed adjacent to a door unless the door is locked or guarded.
- Metal ladders shall not be used for electrical work.
- Tie off top of ladder to structure.

Medical Service and First Aid

Emergency Medical Service. Preplanned emergency medical service shall be provided as designated by Contractor and approved by the Earth Tech Representative.

First Aid Kit. Each Contractor shall provide a first aid kit for his employees which meets minimum OSHA requirements.

Mobile Cranes

Mobile cranes, including portable crane derricks, power shovels, or similar equipment, shall not be operated within ten feet of overhead electrical power lines.

Overhead Work

No overhead work shall be performed when, as a result of that work, the possibility of a falling object striking any person exists. Do not work above any person at any time.

Personal Protective Clothing and Equipment

In certain construction and maintenance operations, personal protective equipment such as safety glasses, chemical goggles, respirators, hard hats, and

protective clothing is required. The type of protective equipment to be worn will be determined by the degree of exposure to the potential hazard. There will be very few occasions when hard hats and eye protection will not be required at Earth Tech job sites. When in doubt of the safety measures to be observed, Contractor shall contact the Earth Tech Health and Safety Section. This shall not, however, relieve Contractor of his responsibilities to determine appropriate protection.

Eye protection is required when engaging in such operations as the following:

- Drilling, chipping, grinding, wire brushing
- Handling caustics and acids
- Breaking bricks or concrete
- Hammering chisels, drift pins, etc.
- Burning or welding
- Other situations which create a possible eye hazard, e.g., chemical environments.

Photographs

Only Earth Tech photographers, with permission from DIPEF, are permitted to carry cameras or take pictures. If progress or finished construction photographs are desired, request for same should be made through the Earth Tech Representative.

Power Tools

Power and Air-Actuated Tools. Gasoline-powered, electric, or air-actuated tools are not to be used on Earth Tech property or job sites without prior approval of the Earth Tech Health and Safety Department. To obtain approval, Contractor must contact the Earth Tech Representative.

Explosive-Actuated Tools. Explosive-actuated (powder-actuated) fastening tools shall meet the design requirements in "American National Standard Safety Requirements for Explosive-Actuated Fastening Tools" (ANSI A10.3-1970). A tool which does not meet these design standards cannot be used.

- Power tools shall never be left unattended in a place where they would be available to unauthorized persons.
- Power tools shall not be used in explosive or flammable atmospheres.

Fall Protection

Appropriate fall protection, such as safety harness and lanyard, must be worn when worker is exposed to falling more than 6 feet. Lanyard or lifeline must be tied off to appropriate structure capable of supporting five times the weight of the person (nominal 1000 pounds).

- Appropriate fall protection, such as safety harness and lanyard, must be worn when working above eight feet on straight or extension ladders when the work involves

General Safety Rules for Contractors

pushing, pulling, or action which may dislodge the person from the ladder.

- Safety harnesses are also required on swinging or portable scaffolds when handrails and toeboards are not provided (eight feet or more above ground or floor level).
- Safety harnesses and lifelines (including extraction devices for top entry spaces) are required on all work performed in confined spaces where an oxygen deficiency or toxic vapors may exist.
- All lifelines shall be safety secured to stable and adequate supports.
- Safety harnesses and lifelines must be worn on rooftops where there are no guardrails and where the work is within ten feet of the edge.

Salamanders

- "Hot work" authorization must be obtained from the Earth Tech Representative before using a salamander.
- Salamanders must be a Factory Mutual or Underwriters Laboratories-approved type.
- Position salamanders away from all combustible material to reduce the possibility of uncontrolled fire.
- Guard salamanders from traffic to prevent them from being overturned.

Scaffolds

All scaffolds, whether fabricated on site, purchased, or rented, shall conform to the specifications found in ANSI A10.8, Safety Requirements for Scaffolding. Rolling scaffolds shall maintain a three-to-one height-to-base ratio.

- The footing or anchorage for a scaffold shall be sound, rigid, and capable of carrying the maximum intended load without settling or displacement.
- Unstable objects, such as barrels, boxes, loose bricks, or concrete blocks, shall not be used to support scaffolds or planks.
- No scaffold shall be erected, moved, dismantled, or altered except under the supervision of competent persons.
- Scaffolds and their components shall be capable of supporting at least four times the maximum intended load without failure.
- Guardrails and toeboards shall be installed on all open sides and ends of platforms more than 10 feet above the ground or floor.
- Scaffolds measuring four to ten feet in height, and having a horizontal dimension of less than 45 inches, shall have standard

guardrails installed on all open sides and ends of the platform.

- Wire, synthetic, or fiber rope used for suspended scaffolds shall be capable of supporting at least six times the rated load.
- No riveting, welding, burning, or open flame work shall be performed on any staging suspended by means of fiber or synthetic rope.
- Tested fiber or approved synthetic ropes shall be used for or near any work involving the use of corrosive substances.
- All scaffolds, boatswain's (bosun's) chairs, and other work access platforms shall conform to the requirements set forth in the federal OSHA Regulations for Construction (29 CFR 1926.451) except where the specifications in ANSI A10.8 7 or state or local regulations are more rigorous.

Smoking and Open Flames

Smoking and the use of open flames are strictly prohibited in areas where flammable liquids, gases, or highly combustible materials are stored, handled, or processed. Obey "No Smoking" signs. Smoke only in designated areas.

Solvents and Paints

- Adequate ventilation must be maintained at all times when paints or solvents are used.
- Personnel should use proper respiratory protection and protective clothing when toxicity of the material requires such protection.
- Flammable solvents and materials must be used with extreme caution when possible sources of ignition exist.
- Flammable paints and solvents must be stored in an approved (Factory Mutual or Underwriters Laboratories) flammable liquids storage cabinet when storage is required inside the buildings. If an approved cabinet is not available, paints and solvents must be removed from the building when not in use.
- Flammable liquids must be dispensed in safety cans with flash arresters bearing a Factory Mutual or Underwriters Laboratories approval. These containers must be clearly identified as to their contents.
- Material Safety Data sheets, for materials used by the Contractor, shall be maintained by the Contractor, and a copy provided to the Earth Tech Representative.

Tarpaulins

When tarpaulins are required for the detection of hot slag, dust, paint drippings, etc., or as security

barriers, they shall be flame-resistant and in good condition.

Tools

Hand and power tools shall be kept in safe operating condition. Mushroomed heads on cold chisels, star drills, etc., are unsafe and should not be used. Hammers should have handles which are not cracked, split, or broken.

Nonsparking tools may be necessary in certain areas where flammable materials are handled or where sparks could create an explosion.

Transporting Material and Equipment

Extreme care must be taken while carrying sections of pipe, conduit, and other materials to assure safety to Earth Tech, Contractor, and client personnel and property. This includes, but is not limited to, flagging and use of two people to carry pipe of lengths greater than 10 feet.

- Tools, materials, and equipment must not be left unattended in access ways.
- Tools, material, and equipment shall not be removed from the job site without permission of the Earth Tech Representative.

Walking and Work Surfaces

- Workroom floors shall be clean and, to the extent possible, dry.
- Drainage mats, platforms, or false floors should be used where wet processes are performed.
- Floors shall be free from protruding nails, splinters, holes, and loose boards or tiles.
- Permanent aisles or passageways shall be marked.
- Floor holes shall be protected by covers that leave no openings of more than one inch wide.
- Floor openings into which persons can accidentally walk shall be guarded by standard railing and toeboards.
- Open-sided floors, platforms, and runways higher than four feet shall be guarded by standard railings.
- Toeboards shall be used wherever people can pass below, or where hazardous equipment or materials are located below.

Warning Signs

All posted warning, safety, and security signs and barriers shall be observed. Additionally, Contractor shall provide warning signs, barriers, barricades, etc. wherever such protection is needed. Where signs and barricades do not provide adequate protection, particularly along a road, flagmen shall be used.

Contractors are expected to brief their employees on these requirements and enforce these rules with their employees. Earth Tech management may stop or suspend work at any time the Contractor fails to comply with Earth Tech rules and regulations.

Regulatory References

- (a) *Standard Operating Safety Guides*, USEPA, November 1984
- (b) *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, NIOSH 85-115, 1985
- © Title 29 of the Code of Federal Regulations, Part 1910 (29 CFR 1910), Occupational Safety and Health Standards (USDOL/OSHA), with special attention to Section .120, Hazardous Waste Operations and Emergency Response
- (d) Title 29 of the Code of Federal Regulations, Part 1926 (29 CFR 1926), Safety and Health Regulations for Construction (USDOL/OSHA), with special attention to Section 1926.65, Hazardous Waste Operations and Emergency Response
- (e) Title 8 of the California Code of Regulations, Chapter 4, Subchapter 7, (commencing with Section 3200) General Industry Safety Orders (Cal/OSHA), with special attention to Section 5192, Hazardous Waste Operations and Emergency Response
- (f) Title 8 of the California Code of Regulations, Chapter 4, Subchapter 4, (commencing with Section 1500) Construction Safety Orders (Cal/OSHA)
- (g) Title 22 of the California Code of Regulations, Division 4, Chapter 30 (commencing with Section 66000) Environmental Health Standards for the Management of Hazardous Waste (California Environmental Protection Agency, Department of Toxic Substances Control)
- (h) Title 22 of the California Code of Regulations, Division 2, Chapter 3, (commencing with Section 12000) Safe Drinking Water and Toxic Enforcement Act Regulations (California Health and Welfare Agency)
- (i) National Oil and Hazardous Substances Contingency Plan

Attachment C
Drill Rig Safety Guidelines

Drill Rig Safety Guidelines

A. General Drilling Practices

Prior to the start of site work, the drilling subcontractor will inspect all drilling equipment. The inspection will be documented in the field records. If field operations last longer than 1 week, the drilling equipment inspection must be repeated on a weekly basis.

EARTH TECH will conduct geophysical clearance and determine the location of all underground utilities before the start of drilling operations. In addition to obtaining the utility locations from the client, EARTH TECH will make a utility survey of each drilling point. The utility survey shall include both magnetometer and ground-penetrating radar survey. Documentation that nearby utilities have been marked on the ground and that the drill site has been cleared shall be kept in the EARTH TECH project trailer and confirmed to the drilling subcontractor.

Drill rig maintenance and safety is the responsibility of the drilling subcontractor. The following information is provided as general guidelines for safe practices during drilling activities, and installation of monitoring/extraction wells.

1. No food or beverage will be consumed or stored in the work area.
2. EARTH TECH will contact appropriate utilities agency to survey, mark, and flag locations of buried utility lines.
3. Maintain orderly housekeeping on and around the drill rig.
4. Store tools, materials, and supplies to allow safe handling by drill crew members. Proper storage on racks or sills will prevent spreading, rolling, or sliding.
5. Avoid storage or transportation of tools, materials, or supplies within or on the drill rig derrick.
6. Maintain working surfaces free of obstructions or potentially hazardous substances.
7. Store gasoline only in containers specifically designed or approved for such use.
8. Wear eye protection when chipping, chiseling or breaking material that presents risk of flying objects.
9. The departing driller should inform the oncoming driller of any special hazards or ongoing work that may affect the safety of the crew.
10. Fire fighting equipment should not be tampered with and should not be removed for other than the intended fire fighting purposes or for servicing.
11. If lubrication fittings are not accessible with guards in place, machinery should be stopped for oil and greasing.
12. Rigging material equipment for material handling should be checked prior to use on each shift and as often as necessary to ensure it is safe. Defective rigging should be removed from service.
13. The area around the derrick ladder should be kept clear to provide unimpeded access to the ladder.
14. Work areas and walkways should not be obstructed.
15. The rotary table of the rig floor shall be kept free of obstructions and free of undue accumulation of oil, water, ice, or circulating fluids.

B. Moving Rig to Drilling Location

1. Inspect the route of travel before moving drill rig off-road. Note rocks, trees, erosion, and uneven surfaces.
2. Remove all passengers from the cab before moving drill rig onto rough or sloped terrain.
3. Engage multiple drive power trains (when available) on rig vehicle when mobilizing off-road.
4. Travel directly up or down grade on slopes when feasible. Avoid off-camber traverse approaches to drill sites.

Drill Rig Safety Guidelines

5. Approach changes in grade squarely to avoid shifting loads or unexpected unweighting.
6. Use a spotter (person at grade) to provide guidance when vertical and lateral clearance is questionable.
7. Use hand brakes and block rigwheels when grades are steep.
8. Lower rig mast before moving rig.
9. Secure all loads to rig prior to off-road mobilization.
10. EARTH TECH will use geophysical techniques, or equivalent, to locate buried utility lines.

C. Raising Mast

1. Locate visually overhead and buried utilities prior to drilling operations.
2. Treat overhead electrical lines as if they were energized and maintain at least a 40-foot clearance.
3. EARTH TECH will contact appropriate utilities agency to manipulate and deactivate overhead service in areas that interfere with drilling operations. Do not attempt to handle utilities.
4. Stabilize and level each work site prior to drill rig setup.
5. The derrick must not be raised until the rig has been blocked, leveled, and chocked.
6. Note wind speed and direction to prevent overhead utility lines from contacting rig derrick. Allow at least a 20-foot clearance between rig mast and utility lines.

D. Hoisting Operations

1. Drillers should never engage the rotary clutch without watching the rotary table and ensuring it is clear of personnel and equipment.
2. Unless the draw works is equipped with an automatic feed control, the brake should not

be left unattended without first being tied down.

3. Drill pipe or casing should not be picked up suddenly.
4. Drill pipe should not be hoisted until the driller is sure that the pipe is latched in the elevator, or the derrick man has signaled that he may safely hoist the pipe.
5. During instances of unusual loading of the derrick or mast, such as when making an unusually hard pull, only the driller should be on the rig floor and no one should be on the rig or derrick.
6. The brakes on the draw works of every drilling rig should be tested by each driller, when he comes on shift, to determine whether they are in good order. The brakes should be thoroughly inspected by a competent individual each week.
7. A hoisting line with a load imposed should not be permitted to be in direct contact with any derrick member or stationary equipment, unless it has been specifically designed for line contact.
8. Workers should never stand near the well bore whenever any wire line device is being run.
9. Hoisting control stations should be kept clean and controls labeled as to their functions.
10. Inspect wire, rope, hoisting hardware, swivels, hooks, bearings, sheaves, guides, rollers, clutches, brakes for the following:
 - abrasions
 - breaks
 - wear
 - fatigue
 - corrosion
 - jamming
 - kinking.
11. Avoid the suspension of loads when hoist is unattended.
12. Prevent hoisting loads directly over field personnel.

13. Restrict hoisting operations during unfavorable environmental conditions such as rain or high winds.
14. Maintain safe hand distance from hoisting equipment (e.g., wire rope, hooks, pinch points) when slack is reduced.

E. Riding Hoisting Equipment

Under no circumstances will personnel be permitted to ride the traveling block or elevators, nor will the cat line be used as a personnel carrier.

F. Cat Line Operations

1. Only experienced workers will be allowed to operate the cat head controls. The kill switch must be clearly labeled and operational prior to operation of the cat line.
2. The cat head area must be kept free of obstructions and entanglements.
3. The operator should not use more wraps than necessary to pick up the load. More than one layer of wrapping is not permitted.
4. Personnel should not stand near, step over, or go under a cable or cat line that is under tension.
5. Employees rigging loads on cat lines should:
 - Keep out from under the load
 - Keep fingers and feet where they will not be crushed
 - Be sure to signal clearly when the load is being picked up
 - Use standard visual signals only and not depend on shouting to coworkers
 - Make sure the load is properly rigged, since a sudden jerk in the cat line will shift or drop the load.

G. Pipe Handling

1. Pipe should be loaded and unloaded, layer by layer, with the bottom layer pinned or blocked securely on all four corners. Each successive layer should be effectively blocked or chocked.
2. Workers should not be permitted on top of the load during loading, unloading, or transferring of pipe or rolling stock.

3. Employees should be instructed never to try to stop rolling pipe or casing; they should be instructed to stand clear of rolling pipe.
4. Slip handles should be used to lift and move slips. Employees should not be permitted to kick slips into position.
5. When pipe is being hoisted, personnel should not stand where the bottom end of the pipe could whip and strike them.
6. Pipe stored in racks, catwalks, or on flatbed trucks should be chocked to prevent rolling.

H. Derrick Operations

1. The derrick climber should be used whenever climbing the derrick. Personnel on the derrick should be tied off, or otherwise protected from falling when working in an unguarded elevated position.
2. All stands of pipe and drill collars racked in a derrick should be secured with rope or otherwise adequately secured.
3. Tools, derrick parts, or materials of any kind should not be thrown from the derrick.
4. The elevators must be properly clamped onto all pipe joints prior to the driller engaging the load.

I. Making and Breaking Joints

1. Tongs should be used for the initial making up and breaking of the joint. The rotary table should not be used for the initial breaking of a joint.
2. Employees making or breaking joints should not be permitted to stand within the arc of the tong handles when the tong pull line is under tension. Employees should handle the tongs only by the appropriate handles.
3. Employees should be trained in the safe use of spinning chains. Spinning chains should not be handled near the rotary table while it is in motion.

J. Drilling Operations

1. Begin auger borings slowly with the drive engine operating at low speed.
2. Establish a communication system between driller, helper, and geologist for responsibilities during drilling operations.
3. Engage auger to power coupling as recommended by manufacturer.
4. Restrict contact with power coupling or auger during rotation.
5. Prevent placing hands or feet under auger during rotation.
6. Prevent placing hands or feet under auger sections during hoisting over hard surfaces.
7. Avoid the removal of spoil cuttings with hands or feet.
8. Assure drill rig is in neutral and the augers are not rotating before cleaning augers.

Attachment D
Heavy Equipment Certifications

PURPOSE

The purpose of this procedure is to present the minimum safety performance requirements for the operation of heavy equipment on Earth Tech CLEAN projects. CTO Managers are responsible for ensuring all equipment is certified and that the attached Machinery and Mechanized Equipment form has been submitted to the Navy.

GENERAL REQUIREMENTS

Subcontractor equipment shall comply with all applicable requirements for motor vehicles and material handling heavy equipment contained in 29 CFR 1926 Subpart O, and the latest *U.S. Army Corps of Engineers Safety and Health Requirements Manual, EM 385-1-1, Section 16 - Machinery and Mechanized Equipment* (attached). Heavy equipment includes, but is not limited to, drill rigs, front end loaders, backhoes, trackhoes, bulldozers, forklifts, and similar equipment used for the implementation of the project Statement of Work.

EQUIPMENT SAFETY INSPECTIONS

The following presents general guidelines for certifying equipment is in safe operating condition before activities commence at the site and during site operations. The following guidelines are not meant to be all inclusive. Equipment on-site are subject to the requirements found in Section 16 of *U.S. Army Corps of Engineers Safety and Health Requirements Manual, EM 385-1-1*.

1. All machinery and mechanized equipment will be certified to be in safe operating condition by a competent individual seven days prior to onsite operation. The certification form (provided hereinafter) is valid for a period of one year, for the project specified. Submit the completed form through the Program Management Office.
2. Equipment will be inspected on a daily basis by the owner/operator and daily logs will be maintained. All discrepancies shall be corrected prior to placing the equipment in service.
3. Inspections shall include, but are not limited to: all hydraulic lines and fittings for wear and damage, all cable systems and pull ropes for damage and proper installation, exhaust systems, brake systems, and drill controls, etc.
4. Drill rigs and related support equipment and vehicles shall be inspected by the driller in charge on a daily basis. These inspections shall be recorded on the Daily Drill Rig Checklist (included within the Drill Rig Safety Guidelines in Appendix C); or on equivalent subcontractor forms. Appendix C contains Earth Tech's Drill Rig Safety Guidelines and shall be used when the subcontractor does not have inspection procedures in place.
5. The Daily Drill Rig Inspection will be enforced by the on-site health and safety representative, Field Manager, or designee.
6. Exhaustive preventive maintenance shall be conducted for all equipment according to manufacturer recommendations and/or the Subcontractor's internal policies, schedules, and equipment SOPs.
7. Machinery and mechanized equipment shall be operated only by designated qualified persons.
8. Records of tests and inspections shall be maintained at the site by the contractor, and shall be made available upon request of the designated authority, and shall become part of the official project file.
9. Equipment not found to be in safe operating condition, or when a deficiency which affects the safe operation of the equipment, shall immediately be taken out of service and its use prohibited until safe conditions have been corrected.

HEAVY EQUIPMENT CERTIFICATION REQUIREMENTS

10. All equipment shall be kept in the exclusion zone until work or the shift has been completed. Equipment will be decontaminated within designated decontamination areas.
11. Equipment with an obstructed rear view must have an audible alarm that sounds when equipment is moving in reverse.

MACHINERY AND MECHANIZED EQUIPMENT CERTIFICATION FORM

TO: Contracting Officer

DATE:

FROM: Earth Tech, Inc.

CONTRACT NO.: N62742-94-D-0048

CTO No.:

CTO Title:

1. This form provides certification of machinery and mechanized equipment to be used on the referenced contract task order (CTO) for the following work:

Description of equipment work:	
Project Site:	
Subcontractor providing equipment: Address:	
Dates (duration) of equipment work:	

2. Inspection and certification of machinery and mechanized equipment, as required by *U.S. Army Corps of Engineers, EM 385-1-1, "Safety and Health Requirements Manual," Section 16 - Machinery and Mechanized Equipment*, has been made prior to, but within seven calendar days advance of, use on the project site. Re-certification will be required for equipment that is used on the project site for more than one year.

	Identification of equipment (make, model, serial no.)	Date of Certification
1		
2		
3		

3. The above listed equipment has been inspected and tested as indicated above, and is **CERTIFIED TO BE IN SAFE OPERATING CONDITION BY THE FOLLOWING COMPETENT INDIVIDUAL:**

Name		Title	
Company			
Signature		Date	

4. If there are any questions regarding this certification, please contact the following Earth Tech representative: _____.

Copy to: PACNAVFACENGCOM Code 00K
COTR (LRPM)
NTR (RPM)
CTO Files

Attachment E
Task Hazard Analyses

Evaluated by: Robert M. Poll, CIH, CSP

Date: October 2000

TASK NAME

INVESTIGATION AREA EVALUATION

TASK DESCRIPTION	CHEMICAL EXPOSURE HAZARDS
Personnel will walk all areas of the site to identify sample locations. Geophysics and UXO inspections will be conducted at each sample location.	None

PPE	OTHER SAFETY EQUIPMENT	PHYSICAL HAZARDS
Level D Ensemble (Section 7.1) <ul style="list-style-type: none"> • Hard Hat • Short Sleeve Shirt • Full-length Pants • Safety-toe Boots • Safety Glasses 	<ul style="list-style-type: none"> • First aid kit (located in vehicle) • Fire extinguisher (located in vehicle) 	<ul style="list-style-type: none"> • Slips, trips, and falls • Heat Stress

APPLICABLE OPERATIONAL SAFETY PROCEDURES	ADDITIONAL SAFETY CONSIDERATIONS
<ul style="list-style-type: none"> • Slips, Trips, Falls, and Protruding Objects (Section 6.1) • UXO Safety (Section 6.7) 	None

MONITORING PROCEDURES

No monitoring required.

Evaluated by: Robert M. Poll, CIH, CSP

Date: October 2000

TASK NAME

SUBSURFACE SOIL SAMPLING (DIRECT PUSH)

TASK DESCRIPTION

CHEMICAL EXPOSURE HAZARDS

Personnel will collect subsurface soil samples using direct push methods.

Steps

1. Position direct push rig.
2. Erect controlled work area barriers/markings.
3. Begin boring using direct push system.
4. Collect subsurface soil samples.
5. Remove direct push rods.
6. Decontaminate direct push rods.

- Petroleum compounds (skin contact)
- Dioxins (skin contact)
- Heavy metals (skin contact)
- Perchlorates (skin contact)
- Radionuclides (skin contact)

PPE

OTHER SAFETY EQUIPMENT

PHYSICAL HAZARDS

Level D Ensemble (Section 7.1)

- Hard Hat
- Short Sleeve Shirt
- Full-length Pants
- Safety-toe Boots
- Safety Glasses

Note: Personnel will wear chemically protective gloves when removing push rods or handling soil samples.

- Hand/face washing supplies (One 5-gallon bucket, soap, paper towels).
- Sample equipment decontamination supplies.
- First aid kit (located in vehicle)
- Fire extinguisher (located in vehicle)

- Slips, trips, and falls
- Heat Stress

APPLICABLE OPERATIONAL SAFETY PROCEDURES

ADDITIONAL SAFETY CONSIDERATIONS

- Slips, Trips, Falls, and Protruding Objects (Section 6.1)
- Underground Utilities (Section 6.3)
- UXO Safety (Section 6.7)

None.

MONITORING PROCEDURES

No monitoring required.

Evaluated by: Robert M. Poll, CIH, CSP

Date: October 2000

TASK NAME

SUBSURFACE SOIL SAMPLING (HAND AUGERING)

TASK DESCRIPTION

CHEMICAL EXPOSURE HAZARDS

Personnel will collect subsurface soil samples using hand auger methods.

Steps

1. Erect controlled work area barriers/markings.
2. Begin boring using hand auger system.
3. Collect subsurface soil samples.
4. Decontaminate hand auger equipment.

- Petroleum compounds (skin contact)
- Dioxins (skin contact)
- Heavy metals (skin contact)
- Perchlorates (skin contact)
- Radionuclides (skin contact)

PPE

OTHER SAFETY EQUIPMENT

PHYSICAL HAZARDS

Modified Level D Ensemble (Section 7.2)

- Hard Hat
- Tyvek coveralls
- Short Sleeve Shirt
- Full-length Pants
- Chemically-protective inner & outer gloves
- Safety-toe Boots
- Safety Glasses

- Hand/face washing supplies (One 5-gallon bucket, soap, paper towels).
- Sample equipment decontamination supplies.
- First aid kit (located in vehicle)
- Fire extinguisher (located in vehicle)

- Slips, trips, and falls
- Heat Stress

APPLICABLE OPERATIONAL SAFETY PROCEDURES

ADDITIONAL SAFETY CONSIDERATIONS

- Slips, Trips, Falls, and Protruding Objects (Section 6.1)
- Underground Utilities (Section 6.3)
- UXO Safety (Section 6.7)

None.

MONITORING PROCEDURES

No monitoring required.

Evaluated by: Robert M. Poll, CIH, CSP

Date: October 2000

TASK NAME

SUBSURFACE TRENCHING/POTHOLING

TASK DESCRIPTION

Personnel will perform excavation activities to obtain visual observations of subsurface areas, and to collect subsurface soil samples.

Steps

1. Identify excavation location and arrange site support vehicles and equipment upwind from boring location.
2. Begin excavating using backhoe. Stockpile excavated soils onto plastic sheeting.
3. Monitor breathing zone near excavation in accordance with monitoring requirements outlined below.
4. Perform visual observation for generation of dust. Apply appropriate dust control measures as necessary.
5. Collect subsurface soil samples using remote methods (slide hammer).
6. Backfill and compact the excavation.
7. Remove PPE as necessary and discard in separate containers from other trash.

CHEMICAL EXPOSURE HAZARDS

- Petroleum compounds (inhalation, skin contact)
- Dioxins (skin contact)
- Heavy metals (skin contact)
- Perchlorates (skin contact)
- Radionuclides (skin contact)

PPE

Modified Level D Ensemble (Section 7.2)

- Hard Hat
- Tyvek coveralls
- Short Sleeve Shirt
- Full-length Pants
- Chemically-protective inner & outer gloves
- Safety-toe Boots
- Safety Glasses
- Hearing protection (muffs/plugs)

OTHER SAFETY EQUIPMENT

- VOC monitor
- Benzene colorimetric tubes
- Aerosol monitor
- Hand/face washing supplies (One 5-gallon bucket, soap, paper towels).
- Sample equipment decontamination supplies.
- First aid kit (located in vehicle)
- Portable eyewash (filled, setup and located in vehicle, ready for use)
- Fire extinguisher (located in vehicle)

PHYSICAL HAZARDS

- Heavy equipment safety
- Hazardous noise
- Heat stress

APPLICABLE OPERATIONAL SAFETY PROCEDURES

- Slips, Trips, Falls, and Protruding Objects (Section 6.1)
- Hazardous Noise Environments (Section 6.2)
- Heavy Machinery (Section 6.3)
- Excavation Safety (Section 6.4)
- Underground Utilities (Section 6.6)
- UXO Safety (Section 6.7)
- Dust and Vapor Suppression (Section 6.9)

ADDITIONAL SAFETY CONSIDERATIONS

- Evaluate surrounding work area for additional hazards that may be present.
- Establish responsibilities and roles of all personnel involved. Document roles/responsibilities in log book.

MONITORING PROCEDURES

NEXT PAGE

Evaluated by: Robert M. Poll, CIH, CSP

Date: October 2000

SUBSURFACE TRENCHING/POTHOLING (CONTINUED)

MONITORING PROCEDURES

Parameter (Incl. location and monitoring interval)	Concentration (Two consecutive readings)	Response Action(s)
VOCs in worker breathing zones at 30 minute intervals.	< 25 ppm	Continue work in Level D and continue monitoring.
	25-50 ppm	Continue work in Level D. Continue monitoring and implement benzene monitoring.
	50-100 ppm	Upgrade to Level C (Section 7.3). Implement mitigation measures and contact the SSO.
	> 100 ppm	Cease Work. Contact H&SP and CTO manager.
VOCs at the Exclusion Zone boundary at 30 minute intervals.	< 10 ppm	Continue work. Continue monitoring. Implement mitigation measures (Section 7.3).
	10 - 25 ppm	Increase monitoring frequency to every 15 minutes. Contact SSO.
	> 25 ppm	Cease Work. Contact H&SP and CTO manager.
Benzene as indicated by VOC monitoring.	No color change	Continue work. Continue monitoring.
	Any color change	Cease work. Contact H&SP and CTO manager.
Aerosols in worker breathing zone at 30 minute intervals	< 5 mg/m ³	Continue work in Modified Level D and continue monitoring.
	5- 10 mg/m ³	Continue work in Modified Level D. Implement dust suppression measures.
	> 10 mg/m ³	Upgrade to Level C (Section 7.3) and contact the H&SP.

Instrumentation (see Section 6.8.1 for details): VOCs – Photoionization detector (w/10.2 eV bulb)
 Benzene – Colorimetric Tubes
 Aerosols – Aerosol monitor

Evaluated by: Robert M. Poll, CIH, CSP

Date: October 2000

TASK NAME

DRILLING OPERATIONS

TASK DESCRIPTION

Personnel will perform excavation activities to obtain visual observations of subsurface areas, and to collect subsurface soil samples.

Steps

1. Identify sampling location and arrange site support vehicles and equipment upwind from boring location.
2. Begin boring using HSA system.
3. Monitor breathing zone adjacent to borehole in accordance with monitoring requirements outlined below.
4. Perform visual observation for generation of dust. Apply appropriate dust control measures as necessary.
5. Collect subsurface soil samples.
6. Remove and decontaminate pipe/augers.
7. Remove PPE as necessary and discard in separate containers from other trash.

CHEMICAL EXPOSURE HAZARDS

- Petroleum compounds (inhalation, skin contact)
- Dioxins (skin contact)
- Heavy metals (skin contact)
- Perchlorates (skin contact)
- Radionuclides (skin contact)

PPE

Level D Ensemble (Section 7.1)

- Hard Hat
- Short Sleeve Shirt
- Full-length Pants
- Safety-toe Boots
- Safety Glasses
- Hearing protection (muffs/plugs)

Note 1: Drilling personnel may need to upgrade to Modified Level D (Section 7.2).

Note 2: Personnel will wear chemically protective gloves when handling augers or soil samples.

OTHER SAFETY EQUIPMENT

- VOC monitor
- Benzene colorimetric tubes
- Hand/face washing supplies (One 5-gallon bucket, soap, paper towels).
- Sample equipment decontamination supplies.
- First aid kit (located in vehicle)
- Portable eyewash (filled, setup and located in vehicle, ready for use)
- Fire extinguisher (located in vehicle)

PHYSICAL HAZARDS

- Drill Rig safety
- Hazardous Noise
- Heat Stress

APPLICABLE OPERATIONAL SAFETY PROCEDURES

- Slips, Trips, Falls, and Protruding Objects (Section 6.1)
- Hazardous Noise Environments (Section 6.2)
- Excavation Safety (Section 6.4)
- Underground Utilities (Section 6.6)
- UXO Safety (Section 6.7)
- Dust and Vapor Suppression (Section 6.9)
- Drill Rig Safety Guidelines (Attachment C)

ADDITIONAL SAFETY CONSIDERATIONS

- Evaluate surrounding work area for additional hazards that may be present.
- Establish responsibilities and roles of all personnel involved. Document roles/responsibilities in log book.

MONITORING PROCEDURES

NEXT PAGE

Evaluated by: Robert M. Poll, CIH, CSP

Date: October 2000

DRILLING OPERATIONS (CONTINUED)

MONITORING PROCEDURES

Parameter (Incl. location and monitoring interval)	Concentration (Two consecutive readings)	Response Action(s)
VOCs in worker breathing zones at 30 minute intervals.	< 25 ppm	Continue work in Level D and continue monitoring.
	25-50 ppm	Continue work in Level D. Continue monitoring and implement benzene monitoring.
	50-100 ppm	Upgrade to Level C (Section 7.3). Implement mitigation measures and contact the SSO.
	> 100 ppm	Cease Work. Contact H&SP and CTO manager.
VOCs at the Exclusion Zone boundary at 30 minute intervals.	< 10 ppm	Continue work. Continue monitoring. Implement mitigation measures (Section 7.3).
	10 - 25 ppm	Increase monitoring frequency to every 15 minutes. Contact SSO.
	> 25 ppm	Cease Work. Contact H&SP and CTO manager.
Benzene as indicated by VOC monitoring.	No color change	Continue work. Continue monitoring.
	Any color change	Cease work. Contact H&SP and CTO manager.

Instrumentation (see Section 6.8.1 for details): VOCs – Photoionization detector (w/10.2 eV bulb)
 Benzene – Colorimetric Tubes

Evaluated by: Robert M. Poll, CIH, CSP

Date: October 2006

TASK NAME

GROUNDWATER MONITORING WELL INSTALLATION AND DEVELOPMENT

TASK DESCRIPTION

CHEMICAL EXPOSURE HAZARDS

Personnel will construct and develop groundwater monitoring wells.

Steps

1. Insert well packing, casing and sealants.
2. Perform well surging.
3. Perform initial well purge using manual (bailer) methods.
4. Collect waste water in separate containers for off-site disposal.
5. Remove PPE as necessary and discard in separate containers from other trash.

- Petroleum compounds (inhalation, skin contact)
- Dioxins (skin contact)
- Heavy metals (skin contact)
- Perchlorates (skin contact)
- Radionuclides (skin contact)

PPE

OTHER SAFETY EQUIPMENT

PHYSICAL HAZARDS

Level D Ensemble (Section 7.1)

- Hard Hat
- Short Sleeve Shirt
- Full-length Pants
- Safety-toe Boots
- Safety Glasses
- Hearing protection (muffs/plugs)

Note: Personnel will wear chemically protective outer gloves when handling bailer or purge waters.

- VOC monitor
- Benzene colorimetric tubes
- Portable eyewash (filled, setup and located in vehicle, ready for use)
- Fire extinguisher (inspected and located in vehicle ready for use)

- Drill Rig safety
- Hazardous Noise
- Heat Stress

APPLICABLE OPERATIONAL SAFETY PROCEDURES

ADDITIONAL SAFETY CONSIDERATIONS

- Slips, Trips, Falls, and Protruding Objects (Section 6.1)
- Hazardous Noise Exposure (Section 6.2)
- Drill Rig Safety Guidelines (Attachment C)

- Evaluate surrounding work area for additional hazards that may be present.
- Establish responsibilities and roles of all personnel involved. Document roles/responsibilities in log book.

MONITORING PROCEDURES

Parameter (Incl. location and monitoring interval)	Concentration (Two consecutive readings)	Response Action(s)
VOCs in worker breathing zones at 30 minute intervals.	< 25 ppm	Continue work in Level D.
	25-50 ppm	Continue work in Level D. Continue monitoring. Implement benzene monitoring.
	50-100 ppm	Upgrade PPE to Level C. Implement mitigation measures (Section 7.3) and Contact SSO.
	> 100 ppm	Cease work. Contact H&SP and CTO manager.
VOCs at the Exclusion Zone boundary at 30 minute intervals.	< 10 ppm	Continue work In Level D. Continue monitoring.
	10 – 25 ppm	Implement mitigation measures (Section 7.3). Increase monitoring frequency to every 15 minutes. Contact SSO.
	> 25 ppm	Cease work. Contact H&SP and CTO manager.

Instrumentation (see Section 6.8.1 for details): VOCs – Photoionization detector (w/10.2 eV bulb)

Evaluated by: Robert M. Poll, CIH, CSP

Date: October 2000

TASK NAME

GROUNDWATER SAMPLING (DEDICATED PUMPS)

TASK DESCRIPTION

CHEMICAL EXPOSURE HAZARDS

Personnel will collect groundwater samples using dedicated downhole pumps.

Steps

1. Open well.
2. Perform well monitoring as directed below.
3. Connect pump power source (compressed gas).
4. Perform well purging using the pump mechanism. (collect water in separate containers for disposal). Collect IDW in separate containers for off site disposal.
5. Collect groundwater sample(s).
6. Re-seal well.

- Petroleum compounds (inhalation, skin contact)
- Dioxins (skin contact)
- Heavy metals (skin contact)
- Perchlorates (skin contact)
- Radionuclides (skin contact)

PPE

OTHER SAFETY EQUIPMENT

PHYSICAL HAZARDS

Level D Ensemble (Section 7.1)

- Hard Hat
- Short Sleeve Shirt
- Full-length Pants
- Safety-toe Boots
- Safety Glasses

Note: Personnel will wear chemically protective outer gloves when handling samples or purge waters.

- Explosive gas monitor
- Portable eyewash (filled, setup and located in vehicle, ready for use)
- Fire extinguisher (inspected and located in vehicle ready for use)

- Heat Stress

APPLICABLE OPERATIONAL SAFETY PROCEDURES

ADDITIONAL SAFETY CONSIDERATIONS

- Slips, Trips, Falls, and Protruding Objects (Section 6.1)

None

MONITORING PROCEDURES

Any well which has been sealed for longer than 6 hours will be allowed to ventilate for a minimum of 5 minutes upon opening, then monitored for explosivity using a CGI. A reading in excess of 10 percent of the lower explosive limit (LEL) will require additional ventilation, followed by re-monitoring. If an acceptable LEL concentration cannot be reached within 30 minutes of opening a well, reseal it and contact the H&SP for guidance.

Evaluated by: Robert M. Poll, CIH, CSP

Date: October 2000

TASK NAME

GROUNDWATER SAMPLING (MICROPURGE PUMPS)

TASK DESCRIPTION

CHEMICAL EXPOSURE HAZARDS

Personnel will collect groundwater samples using dedicated downhole pumps.

Steps

1. Open well.
2. Perform well monitoring as directed below.
3. Connect pump power source (compressed gas).
4. Perform well purging using the pump mechanism. (collect water in separate containers for disposal). Collect IDW in separate containers for off site disposal.
5. Collect groundwater sample(s).
6. Re-seal well.

- Petroleum compounds (inhalation, skin contact)
- Dioxins (skin contact)
- Heavy metals (skin contact)
- Perchlorates (skin contact)
- Radionuclides (skin contact)

PPE

OTHER SAFETY EQUIPMENT

PHYSICAL HAZARDS

Level D Ensemble (Section 7.1)

- Hard Hat
- Short Sleeve Shirt
- Full-length Pants
- Safety-toe Boots
- Safety Glasses

Note: Personnel will wear chemically protective outer gloves when handling samples or purge waters.

- Explosive gas monitor
- Portable eyewash (filled, setup and located in vehicle, ready for use)
- Fire extinguisher (inspected and located in vehicle ready for use)

- Heat Stress

APPLICABLE OPERATIONAL SAFETY PROCEDURES

ADDITIONAL SAFETY CONSIDERATIONS

- Slips, Trips, Falls, and Protruding Objects (Section 6.1)

None

MONITORING PROCEDURES

Any well which has been sealed for longer than 6 hours will be allowed to ventilate for a minimum of 5 minutes upon opening, then monitored for explosivity using a CGI. A reading in excess of 10 percent of the lower explosive limit (LEL) will require additional ventilation, followed by re-monitoring. If an acceptable LEL concentration cannot be reached within 30 minutes of opening a well, reseal it and contact the H&SP for guidance.