

**Site Safety and Health Plan
for the Engineering Evaluation/Cost
Analysis and Risk Assessment at the
Ross-Adams Site, Tongass National
Forest, Prince of Wales Island, Alaska**

Revision 1

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ACRONYMS AND ABBREVIATIONS

ACOE	U.S. Army Corps of Engineers
ADEC	Alaska Department of Environmental Conservation
AHA	activity hazard analysis
B.P.	boiling point
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
CPR	cardiopulmonary resuscitation
EC	emergency coordinator
ERT	Emergency Spill Response Team
ESS	Environmental Safety Supervisor
F	Fahrenheit
F.Pt.	flash point
FCR	Field Change Request
FM	Project Field Manager
GFCI	ground fault circuit interrupter
GI	gastrointestinal
GPS	Global Positioning System
HAZWOPER	Hazardous Waste Operations and Emergency Response
HBV	Hepatitis-B virus
HS	health and safety
LEL	Lower Explosive Limit
mg/m ³	milligrams per cubic meter
mph	miles per hour
MSDS	Material Safety Data Sheet
msl	mean sea level
N/A	not applicable
NCI	Nugget Construction Incorporated
ND	No data
NIOSH	National Institute for Occupational Safety and Health
PADS	Physical Agent Data Sheets
PCB	polychlorinated biphenyl
PEL	permissible exposure limit
PM	Project Manager
PPE	personal protective equipment
PRCS	permit-required confined space
PESM	Project Safety and Health Manager
PVC	polyvinyl chloride

RC	regulatory compliance
React.	reactivity
SHP	Safety and Health Program
SHT	Safety and Health Technician
SOP	Standard Operating Procedure
Sp.G.	specific gravity
SS	Site Superintendent
SSHP	Site Safety and Health Plan
SVOC	semi-volatile organic compound
SZ	support zone
TLV	threshold limit value
TWA	Time-Weighted Average
UEL	upper exposure limit
UST	underground storage tank
UXO	unexploded ordnance
V.P.	vapor pressure
WP	Work Plan

1.0 INTRODUCTION

Newmont USA Limited (Newmont) is conducting an Engineering Evaluation / Cost Analysis (EE/CA) and supporting human health and ecological risk assessment for the Ross-Adams site (Site) located in the Tongass National Forest, in southeast Alaska. The Site is located on Prince of Wales Island, near Kendrick Bay. Newmont has retained Tetra Tech MM (TtMM), who has teamed with Tetra Tech EC (TtEC) and formed the Tetra Tech Team (Tetra Tech) to conduct the EE/CA and risk assessments.

This Site Safety and Health Plan (SSHP) addresses the work to be performed and the safety and health practices and controls that will be implemented by Tetra Tech and any and all subcontractors participating in general and hazardous material investigation activities at the Ross-Adams site. Field activities will be conducted during three separate mobilizations. The first field activity will take place in June 2009. A more extensive field program will be conducted in July 2009. A third and final mobilization will occur in September 2009. The purpose of the three separate mobilizations is to allow for the installation of sampling equipment and also to collect sufficient data to evaluate potential seasonal variations. Details of field activities are provided in the Sampling and Analysis Plan (SAP) (TtMM, 2009a).

Activities performed under this SSHP will comply with applicable sections of 29 Code of Federal Regulations (CFR) 1910.120, 29 CFR 1926.65, and the Code of Federal Regulations (CFR) 40 CFR 311. A separate Radiation Safety Manual is included in Appendix A. Modifications to the SSHP may be made with the required approvals (see Section 11.2 for specific details) using the Field Change Request Form found in Appendix B. Any proposed changes to this plan shall be reviewed and approved by TtEC's Project Environmental Safety Manager (PESM), TtMM's Project Manager (PM), and the Newmont Project Coordinator.

The Tetra Tech Team does not guarantee the safety or health of any person entering this site. Due to the nature of this site and the activity occurring thereon, it is not possible to discover, evaluate, and provide protection for all possible hazards that may be encountered. Strict adherence to the safety and health guidelines set forth herein will reduce, but not eliminate, the potential for injury at this site. The safety and health guidelines in this plan were prepared specifically for this site and should not be used on any other site without prior research and evaluation by trained safety and health specialists.

Prior to the commencement of site activities, a premobilization Safety Conference will be held to acquaint site personnel with policies and procedures that will be observed during the execution of the work and to develop mutual understanding relative to the administration and technical aspects of the contract.

Public (including mine claim holders and agency personnel) access to the Site is unrestricted. However, the Site can only be accessed via boat, float plane, or long overland approach. Regardless, Tetra Tech is not responsible for the safety of non-project personnel or visitors coming on-site at any time, including during times when project personnel are on-site performing work. Safety of project-related visitors is discussed in Section 9.11.

2.0 SITE BACKGROUND AND HISTORY

The Ross-Adams site is proceeding through the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process as a non-time-critical removal action. Two preliminary site assessments (BLM, 1998; Kent & Sullivan, 2004) have been performed at the Site. The next step in the non-time-critical removal action process is the Engineering Evaluation/Cost Analysis (EE/CA), which will include ecological and human health risk assessments. The SAP (Tetra Tech, 2009a) and the companion QAPP (Tetra Tech, 2009b) provide the basis for collecting the data to conduct the EE/CA.

The Ross-Adams site is a former uranium mine located in the Tongass National Forest (TNF) near the southern end of Prince of Wales Island approximately 38 miles southwest of Ketchikan, Alaska. The Site is located on the southeast flank of Bokan Mountain in the Kendrick Creek watershed. The Ross-Adams site was initially developed as an open-pit mine in 1957, with subsequent underground mining occurring sporadically until about 1971. The mine has three major surface expressions named after their approximate elevation: the “900-foot level”, which includes the open pit; the “700-foot level; and the “300-foot level”. Between 1957 and 1971, ore from all levels was conveyed via haul roads to at least two staging areas on the north shore of the West Arm of Kendrick Bay. The operations of the original stockpile area and the loading of the barges are not known. For operations in 1971, a new ore stockpile area and floating dock were constructed. Stockpiled ore was loaded onto barges from a floating dock, which is no longer present. The Site, as defined in the SOW (USFS, 2009), includes the mine, haul roads, at least one ore stockpile area, two former barge loading areas, and downstream potentially impacted areas including the Kendrick Creek delta.

The following sections provide a physical description of the Ross-Adams site and site characteristics such as climate, topography, demography and land use, wildlife, and vegetation.

2.1 Physical Description

2.1.1 Location

The Ross-Adams site is located on Prince of Wales Island, in southeast Alaska. It is approximately 38 miles southwest of Ketchikan, Alaska (Figure 2-1). The island is accessible by boat and chartered air flights (float planes) out of the Ketchikan, Alaska. The mine is on the southeast flank of Bokan Mountain in the Kendrick Creek watershed. The Ross-Adams site is approximately 1 mile west of the head of Kendrick Bay (Figure 2-2). Kendrick Bay is a 5 mile long fiord that opens into Clarence Strait on the east side of Prince of Wales Island. The location of the Site in NAD 1983 Alaska Datum measured at the 900 foot level of Mine Fork Creek Bridge is:

Latitude – 54° 54' 37.65" North
Longitude – 132° 8' 21.33" West
Elevation – 965 feet mean seal level (msl)
Reference (Kent & Sullivan, Inc, 2004)

Map coverage for the Site is provided by the United States Geological Survey (USGS) 15-minute quadrangle map titled *Dixon Entrance (D-1), Alaska*. The mine and associated areas are located in Sections 22, 26 and 27 of Township 80 South, Range 88 East of the Copper River Meridian.

2.1.1.1 Site Description

The Ross-Adams site is in the Bokan Mountain uranium-thorium area in southern southeast Alaska. The mine produced approximately 94,500 tons of ore averaging approximately 0.8 percent uranium oxide (U₃O₈) from mining operations between 1957 and 1971. Production was from open pit and underground workings.

Access to the Site is unrestricted, however it is not on any road systems. The Site can be reached only by boat, aircraft, or long overland approach. All-terrain-vehicles (ATVs), four wheel drive vehicles, or foot traffic can access the mine portals and open pit via the haul road.

2.1.1.1 Mine Description

The Ross-Adams site was initially developed by open-pit mining and later by underground operations from two haulage adits. The mine area is divided based on the approximate elevations of the workings into the 900 foot level, the 700 foot level, and the 300 foot level. A haul road runs from the 900 foot level to the north shore of the west arm of Kendrick Bay where the ore was stockpiled in the ore staging area (OSA) and an ore loading dock was located. The haul road branches approximately 0.8 miles inland from the OSA with the lower branch serving the 300 foot level (Figure 2-2).

900 Foot Level

The ore body was exposed at an elevation of approximately 970 feet on a broad bench with gently rolling topography. The ore body was mined in 1957 from an open pit approximately 380 feet long (north to south), and 60 to 160 feet wide. The depth of the open pit ranged from 25 feet to 40 feet. An estimated 20,000 to 30,000 cubic yards (cy) of rock was removed from the open pit. At the south end of the open pit the ore body turns abruptly to the west and is down-faulted which prevented further open pit mining. A portal and underground mining was initiated from the open pit until the dip of the ore was too steep to mine. An air shaft serving the underground workings is located approximately 150 feet south of the open pit. Truck access to the pit was from the north and the pit floor slopes gently to the south. Sub ore-grade material (<0.5 percent U₃O₈) crops out on the pit walls and occurs as slough on the pit bottom.

Mine rock at the 900 foot level occurs in piles located north and east of the open pit. The largest mine rock pile is located on the north side of Mine Fork Creek and is referred to as the north dump. A smaller pile (the south dump) borders the south side of Mine Fork Creek northeast of the pit. Small mine rock piles are present in the area east of the pit. The remains of a shop or storage building is located east of the north dump and a small building remains standing at the edge of the south dump. The remnants of the mine camp including a drill core shack are present northwest of the open pit.

700 Foot Level and Mine Road

The ore body was worked from the 700 foot level between 1961 and 1964. The area is on a steep, south-facing slope south of the 900 foot level. A haulage adit was driven 390 feet through granite to intercept the ore body south of the open pit. The adit is approximately 9 feet by 7 feet. A mine rock dump approximately 230 feet wide is located at the adit portal and forms an extensive fan down slope from the portal. The 700 foot level was reported flooded by water two feet deep within 19 feet of the portal (BLM, 1998). Surface water flow from the adit was not observed during 2003, however a continuous flow from the adit and onto the mine rock dump was observed in November 2004. The mine road between the 700 foot and 900 foot level appears to be constructed in part with mine rock (Kent & Sullivan, 2004).

300 Foot Level

The ore body was mined in 1971 from the 300 foot level. A haulage adit was driven approximately 1,300 feet through quartz monzonite and granite to below the ore body which terminated at an elevation of approximately 430 feet. The ore was reached by several raises from the end of the adit. The adit portal is 100 feet west of Mine Fork Creek and 115 feet north of Kendrick Creek. Mine rock was brought out of the mine and placed along Mine Fork Creek and Kendrick Creek in an area approximately 200 feet wide and 330 feet long. Two buildings, two trailers, and a large pile of drill core remained at the Site in 2004 (Kent & Sullivan, 2004).

Haul Roads

Haul roads connect the mine to the OSA and former barge sites. The haul road to the 900 foot level was presumably constructed as part of the initial development work on the mine and was used during mining of the 900 foot and 700 foot levels. The 300 foot level road was constructed to facilitate the 1971 mining.

Ore Staging Area (OSA) and Floating Dock

During the 1971 operation, ore was stockpiled at the OSA prior to loading onto barges. The OSA is on gentle slope on the north side or the west arm of Kendrick Bay, approximately 0.25 miles east of the head of the arm. The area cleared for the staging area was approximately 200 by 280 feet and encompasses approximately 1 acre. A dike was constructed to divert surface water to the east of the staging area. A residual amount of ore material remains primarily in the 160 foot by 200 foot area on the southwest side of the dike and adjacent to the ramp leading to the former dock. A small floating dock, a cabin, and a generator shed are on the north shore of the west arm just west of the OSA.



NOT TO SCALE



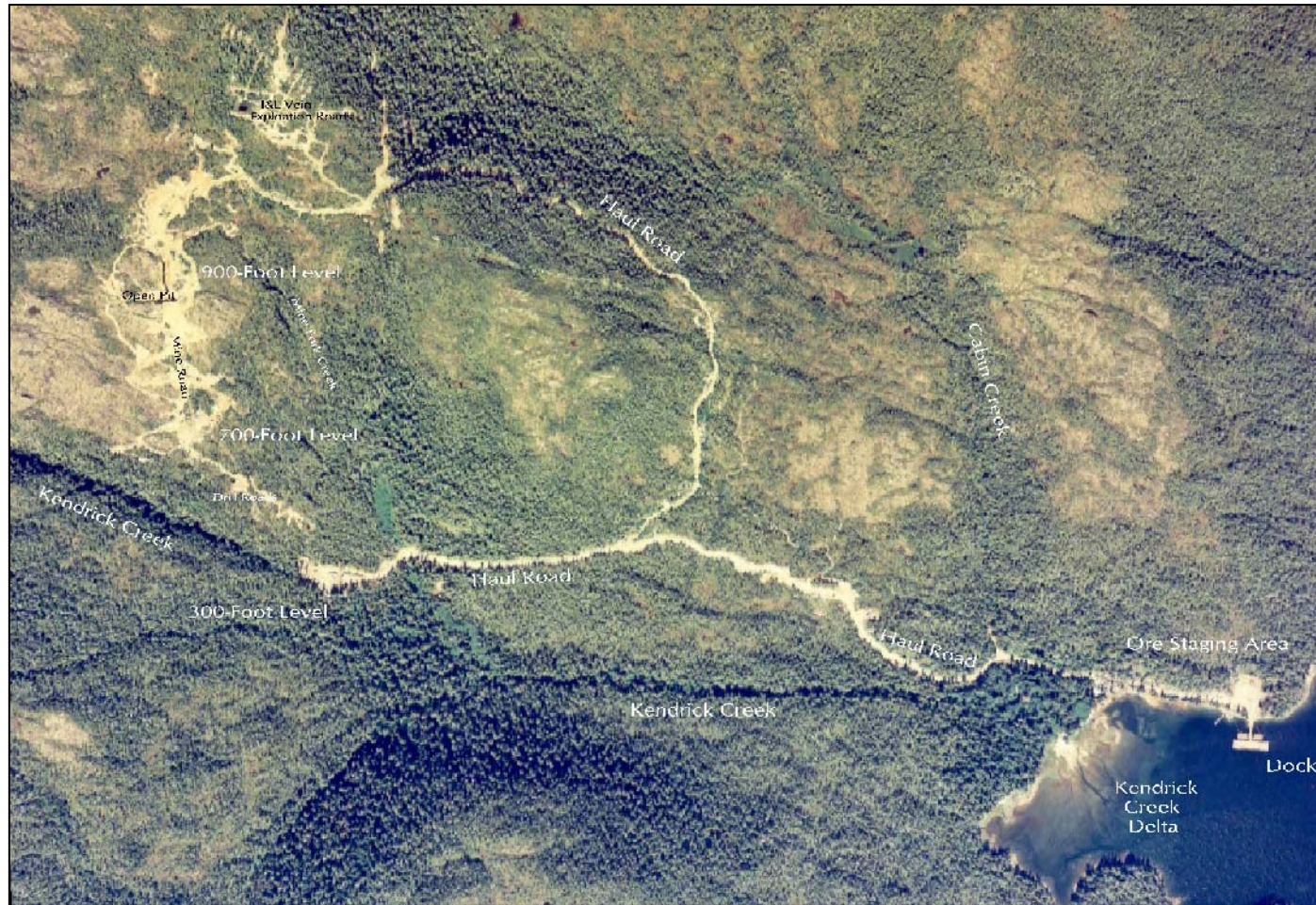
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May 2009



Figure 2-1
Ross-Adams Site Location



Source: USDA Forest Service, Alaska Region, 1971

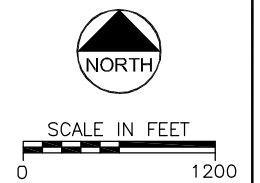


Figure 2-2
Aerial View of the Ross-Adams Site

2.2 Site Characteristics

2.2.1 Climate

The nearest climatological data station (54.0° North, 131.6° West, 111 feet msl) to the Site is located on Annette Island, south of Ketchikan. The 24-hour average temperature range at this station from May through October ranges from 46.8°F (October) to 58.3°F (August) (<http://www.worldclimate.com/cgi-bin/grid.pl?gr=N55W131>). The average monthly rainfall from May through October ranges from 4.8 inches (July) to 16.3 inches (October) (<http://www.worldclimate.com/cgi-bin/grid.pl?gr=N55W131>).

2.2.2 Wildlife

The southeast portion of Prince of Wales Island supports Sitka black-tailed deer, black bear, wolves, river otter, marten, mink, bald eagles, loons, and common waterfowl. The American Peregrine falcon may migrate through the area. Trumpeter swans, marbled murrelets, osprey, and Peale's peregrine falcons, as well as the Queen Charlotte goshawk, may occur in the area. Several species of clams, red rock and Dungeness crab, chiton, star fish, nudibranchs, anemone, and sea cucumber are present in Kendrick Bay (Kent & Sullivan, 2004).

2.2.3 Vegetation

Coastal Western Hemlock and Sitka Spruce forest surround the Site; whereas, Alder predominates in the disturbed mining areas. Moss covers much of the ground and lichens drape many of the trees. Muskegs and small ponds are common around the 900 foot level and above the beach and waste ore piles. Alpine tundra is present above the 900 foot level and Bokan Mountain is bare, steep, and rocky (Kent & Sullivan, 2004).

3.0 SCOPE OF WORK

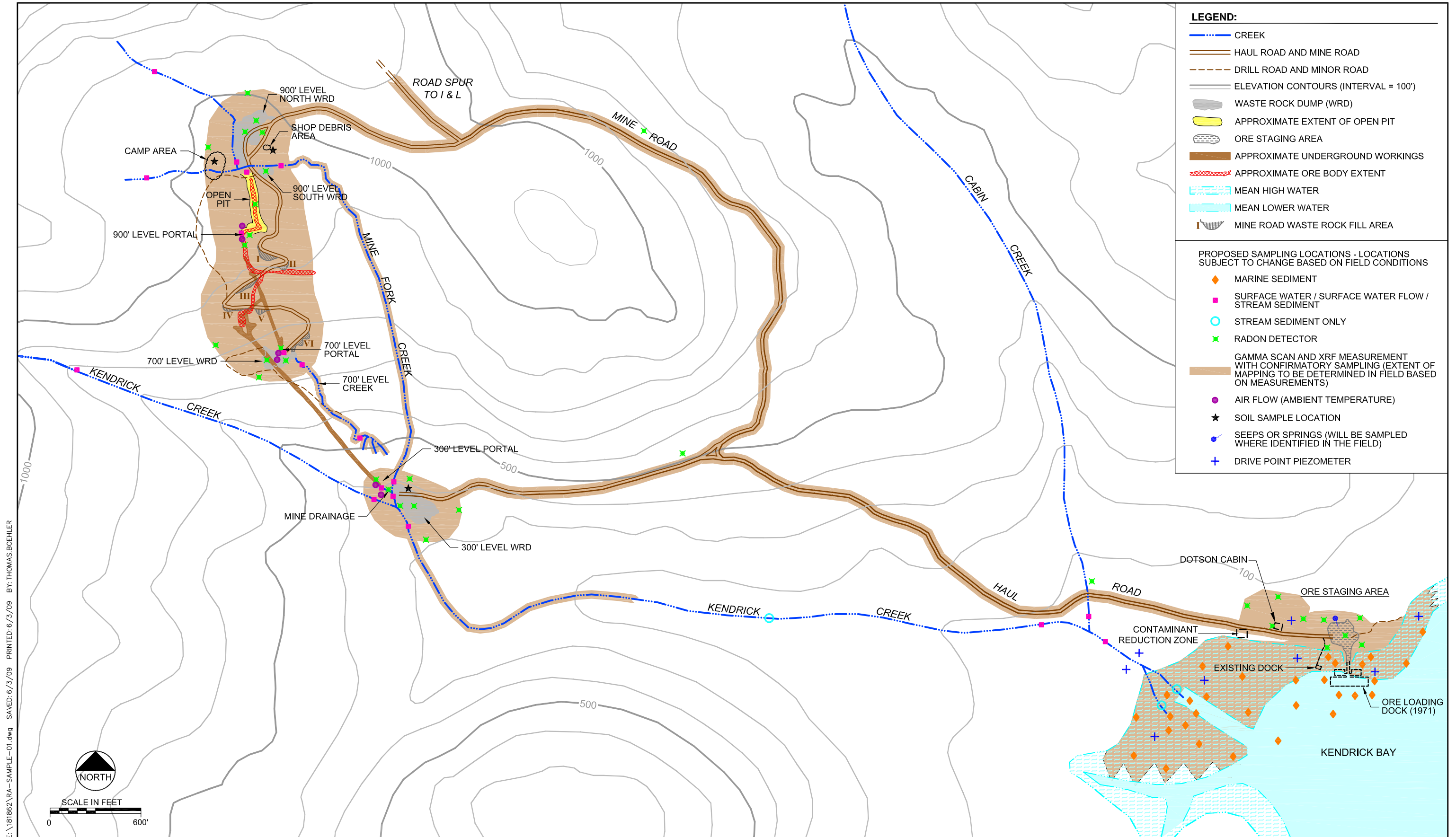
The scope of work to be performed includes the gauging of stream flow, sediment sampling in creeks, sediment sampling in the west arm of Kendrick Bay, surface soil and mine waste sampling, piezometer installation, groundwater sampling, conducting gamma scans, conducting an XRF survey, engineering characterization of mine openings, and radon air monitoring.

Section 3.1 provides a brief physical description of the Sites where investigation activities are planned, the material located at the Site, and site-specific activities. Section 3.2 provides a more detailed description of the task-specific activities. Figure 3-1 shows the planned sampling locations for the Ross-Adams site. The SAP provides additional information regarding the area to be investigated, samples to be collected, location description, purpose, and constituents to be measured.

3.1 Site-Specific Activities

3.1.1 Open Pit

Radon measurements will be collected in the open pit during each of the three mobilizations to the Site. Stream gauging and stream sediment sampling will be conducted during each of three mobilizations at the north end of the open pit and at the south end of the open pit mine portal. Ambient air temperature monitoring for the purposes of air flow modeling will be conducted at the portal. A gamma scan will be conducted in July to determine the extent of radioactive material and local background concentrations.



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Base Map Reproduced from Kent & Sullivan, 2004

May 2009

Note:
Final Sampling Locations will be Refined
by Field Reconnaissance.

Figure 3-1
Proposed Sampling Locations
at the Ross-Adams Site

3.1.2 900 Foot Level

Site activities at the 900 foot level include radon measurements will be collected at numerous locations shown on Figure 3-1 during all three mobilizations. Stream gauging will be conducted in Mine Fork Creek and select tributaries during all three mobilizations. Sediment sampling in Mine Fork Creek will be conducted in July. Surface soil sampling will be conducted in July outside the shop area. A gamma scan of the entire area with confirmatory sampling will be conducted in July. XRF measurements may be conducted in July to evaluate metals concentrations in surface soils.

3.1.3 700 Foot Level

Activities at the 700 foot level include radon measurements will be collected at numerous locations during all three mobilizations. Stream gauging will be conducted in the mine drainage from the 700 foot level portal, the creek downgradient from the 700 foot level, and the confluence Mine Creek (if applicable) during all three mobilizations. Ambient air temperature monitoring for the purposes of air flow modeling will be conducted inside the 700 foot level portal during all three mobilizations. Sediment sampling in the 700 foot level creek will be conducted in July. A gamma scan of the entire area with confirmatory sampling will be conducted in July. XRF measurements may be conducted in July to evaluate metals concentrations in surface soils.

3.1.4 300 Foot Level

Activities at the 300 foot level include radon measures will be collected at various locations during all mobilizations. Stream gauging will be conducted in Kendrick Creek, Mine Fork Creek, and from the mine drainage from the 300 foot level portal during all three mobilizations. Sediment samples will be collected in July. Ambient air temperature monitoring for the purposes of air flow monitoring will be conducted inside the 300 foot level portal during all three mobilizations. Surface soil samples will be collected at the northeast side of the generator shack in July to evaluate PCB concentrations. A gamma scan with confirmatory sampling will be conducted in July to determine the extent of radioactive material. XRF measurements may be conducted in July to evaluate metals concentrations in surface soils.

3.1.5 Mine and Haul Roads

Activities at the Site include radon measurements will be collected at numerous locations during all three mobilizations. A gamma scan of the entire area with confirmatory sampling will be conducted in July followed by the collection of confirmatory soil samples. XRF measurements may be conducted in July to evaluate metals concentrations in surface soils.

3.1.6 Confluence of Kendrick Creek and Cabin Creek

Cabin Creek and Kendrick Creek meet just south of the Haul Road near the west arm of Kendrick Bay.

Stream gauging will be conducted upgradient of the confluence on both creeks and downgradient of the confluence during all three mobilizations. Sediment samples will be collected in July.

3.1.7 Kendrick Bay Delta

The Kendrick Bay Delta is where Kendrick Creek discharges into Kendrick Bay. Kendrick Creek divides into a north and south branch as it enters Kendrick Bay creating a deltaic deposit.

Activities at the Kendrick Bay Delta include sediment sampling downstream of the confluence of Kendrick Creek and Cabin Creek in the north and south drainage in July. Marine surface sediment samples will be collected in the vicinity of the delta of Kendrick Creek, Ore Loading Dock, and surrounding tidal area in July. Drive point piezometers will be installed on either side of Kendrick Creek just before the tidal area and across the tidal zone to determine subsurface water quality conditions in July. A gamma scan with confirmatory sampling will be conducted in July to determine the extent of radioactive material and local background concentrations. XRF measurements may be conducted in July to evaluate metals concentrations in surface soils.

3.1.8 Ore Staging Area (OSA)

Activities at the OSA include radon sampling at various locations during all mobilizations. A gamma scan with confirmatory sampling will be conducted in July to determine the extent of radioactive material and local background concentrations. XRF measurements may be conducted in July to evaluate metals concentrations in surface soils.

3.1.9 Spring Sampling

Springs identified in the field will be sampled to determine groundwater quality during all three mobilizations.

3.2 Task-Specific Activities

The following subsections briefly describe some of the task-specific activities associated with the work to be conducted at the Ross-Adams site. This section is for information purposes, not to determine site requirements. If there are discrepancies between this section and other sections or documents, such as the AHAs in Appendix C or the SAP, the other sections or documents take precedence.

3.2.1 Stream Gauging

Stream gauging will be conducted at approximately 20 locations within the Kendrick Creek Drainage. Depending on flow conditions it will consist of determining stream discharge by one of two methods. For the first method, discharge will be calculated by measuring flow velocity at a number of vertical profiles across the stream width. These velocities, in conjunction with the cross-sectional area of the stream allow the discharge to be calculated. The second method involves the installation of a portable, temporary flume in the stream bed. The stream bed will be modified such that flow will be directed through the flume allowing direct calculation of discharge.

3.2.2 Stream Sediment Sampling

Stream sediment sampling involves the collection of fine-grained sediment from the active stream channel. Ideally, samples will be collected from visible deposits of fine-grained sediments. If this is not possible, shallow cobble-sized grains will be overturned in an attempt to find sediment deposits beneath them. Samples will be collected using a stainless steel spoon and bowl, hand auger, or equivalent.

3.2.3 Stream Water Sampling

Water sampling in streams involves the direct collection of water from a free flowing stream. Sample containers may either be filled directly from the stream or from a dedicated container used only for a single sample location. In deep or fast moving flows, the sampling container may be attached to a rod to eliminate the need to enter into areas where flow conditions pose a hazard.

3.2.4 Surface Soil Sampling

Soil samples will be collected for analysis of COPCs and radionuclides. Soil samples will either be collected on a grid pattern (such as some gamma scans and some XRF measurements), or at discrete locations based on the professional judgment of the field staff. Soil samples will be collected by hand using a stainless steel spoon or disposable sampling device. Specific methodology for soil sampling is identified in the SAP.

3.2.5 Piezometer Installation and Groundwater Sampling

In intertidal areas, a stainless steel drive point piezometer will be driven into the sediment to a maximum depth of 5 feet. It will be driven using a slide hammer to eliminate the need for the piezometer to be held vertically during placement. The piezometer will be “developed” by surging and pumping. Groundwater samples will be collected using a mini bailer or peristaltic pump with disposable tubing. After a groundwater sample has been collected, the piezometer will be removed. If the piezometer is difficult to withdraw from the sediment, two “hi-lift” jacks will be used to remove it rather than having personnel try to withdraw it manually.

3.2.6 Gamma Scans

Gamma radiation survey measurements will be conducted to document existing gamma exposure rates at the Ross Adams project site. The gamma survey will provide a direct spatial characterization of terrestrial sources of radioactivity, will help define the limits of disturbance and/or radiological impacts from historical uranium mining, and will aid in selection of soil sampling locations at the Site. Gamma surveys will utilize GPS-based gamma scanning systems mounted on backpacks. Specific methodology for gamma surveying is identified in the SAP.

3.2.7 XRF Measurements

In-situ X-Ray Fluorescence (XRF) analysis of soil will perform a screening analysis of soils, mine rock and other solids at the Site as a guide to soil sampling. In-situ XRF analysis will use a field-portable XRF Spectrometer. Specific methodology for In-situ XRF measurements is identified in the SAP.

3.2.8 Marine Surface Sediment Sampling

Marine surface sediment sampling will be conducted from a vessel using a van Veen sediment sampler. In this case, surface grabs will be collected at each sampling location until there is sufficient volume for the sample. Precautions will be taken to prevent injuries due to overhead hazards and energy release from taut wires. Since sampling will be conducted from a vessel, all safe boating procedures as described in Appendix E (EHS 6-6) will be followed.

4.0 PROJECT ROLES AND RESPONSIBILITIES AND ORGANIZATION

All employees working on this project are expected to maintain vigilance at all times to ensure that the work is conducted in a safe and efficient manner. Site personnel will also be required to follow general safe work rules as discussed in Section 12 of this plan. Employees and subcontractors will be expected to comply with the requirements of the SSHP.

Site personnel will be assigned specific project roles and responsibilities to ensure that lines of authority, efficient communications, and well-defined work requirements and responsibilities are maintained throughout the duration of the project. These project roles and responsibilities are described below. Regardless of their project role, all Site personnel will have the authority and responsibility to stop work upon encountering a potentially dangerous situation.

4.1 Project Roles and Responsibilities

4.1.1 TtMM Project Manager

Bruce Marshall is the designated TtMM PM for this project. He is responsible for overall administration of the project. His duties include project planning, budgeting, communications, and coordination. He is also responsible for ensuring that adequate personnel and equipment resources are available to complete the project safely. In addition, he may assist the Project Field Manager (FM) in the enforcement of the SSHP. The TtMM PM reports to the client (Newmont USA).

4.1.2 TtEC Project Manager

Gary Drendel is the designated TtEC PM for this project. He is responsible for administering the regulatory compliance and health and safety services that will be provided by TtEC for the project. His duties include assigning and logistically supporting regulatory compliance (RC) and health and safety (HS) personnel participating in the project, budget tracking, RC and HS equipment procurement, and coordinating work activities.

4.1.3 Project Environmental Safety Manager (PESM)

The PESH assigned to this project is Grey Coppi, Certified Industrial Hygienist (CIH), Certified Safety Professional (CSP). The PESH shall (a) be responsible for the development, implementation, oversight, and enforcement of the SSHP; (b) sign and date the SSHP prior to submittal; (c) conduct initial site-specific training; (d) visit the Site as needed; (e) be available for emergencies; (f) provide on-site consultation as needed to ensure the SSHP is fully implemented; (g) coordinate any modification to the SSHP with the Site Superintendent (SS) and the PMs; (h) provide continued support for upgrading/downgrading of the level of personal protection; (i) be responsible for evaluating air-monitoring data and recommending changes to engineering controls, work practices, and personal protective equipment (PPE); and (j) review accident reports and results of daily inspections.

4.1.4 Project Field Manager

Randy Whicker is the TtMM Project Field Manager (FM) for the Project. The FM has the responsibility to implement the SSHP and the authority to direct work performed and verify compliance. The FM reports directly to the TtEC and TtMM PMs or his designated representative.

4.1.5 Environmental Safety Supervisor

The designated Environmental Safety Supervisor (ESS) is a full-time position that will serve as the single point of contact on all safety issues. During the course of this project, the role of ESS will be filled by Walter Bowles.

The ESS shall (a) assist and represent the PESH in on-site training and the day-to-day on-site implementation and enforcement of the accepted SSHP; (b) be assigned to the Site on a full-time basis for the duration of field activities; (c) have authority to ensure site compliance with specified safety and health requirements, federal, state, and OSHA regulations and all aspects of the SSHP including, but not limited to, activity hazard analysis, air monitoring, use of PPE, decontamination, site control, SOPs used to minimize hazards, safe use of engineering controls, the emergency response plan, confined space entry procedures, spill containment program, and preparation of records by performing a daily safety and health inspection and documenting results on the Daily Safety Inspection Log; (d) have authority to stop work if unacceptable health or safety conditions exist, and take necessary action to re-establish and maintain safe working conditions; (e) consult with and coordinate any modifications to the SSHP with the PESH, the FM, and the PMs; (f) review results of daily quality control inspections and document safety and health findings into the Daily Safety Inspection Log; and (h) in coordination with site management and the PESH, recommend corrective actions for identified deficiencies and oversee the corrective actions.

4.1.6 First Aid/CPR Personnel

At least two persons who are currently certified in first aid and cardiopulmonary resuscitation (CPR) by the American Red Cross or other approved agency will be on site at all times during site operations. They will be trained in universal precautions and the use of PPE as described in the Bloodborne Pathogens Standard of 29 CFR 1910.1030.

4.1.7 Site Workers

All site workers, including subcontractors, have the responsibility to report any unsafe or potentially hazardous situations to the ESS or FM. Site workers will maintain knowledge of the information, instructions, and emergency response actions contained in the SSHP. All site workers will comply with the rules, regulations, and procedures as set forth in the SSHP.

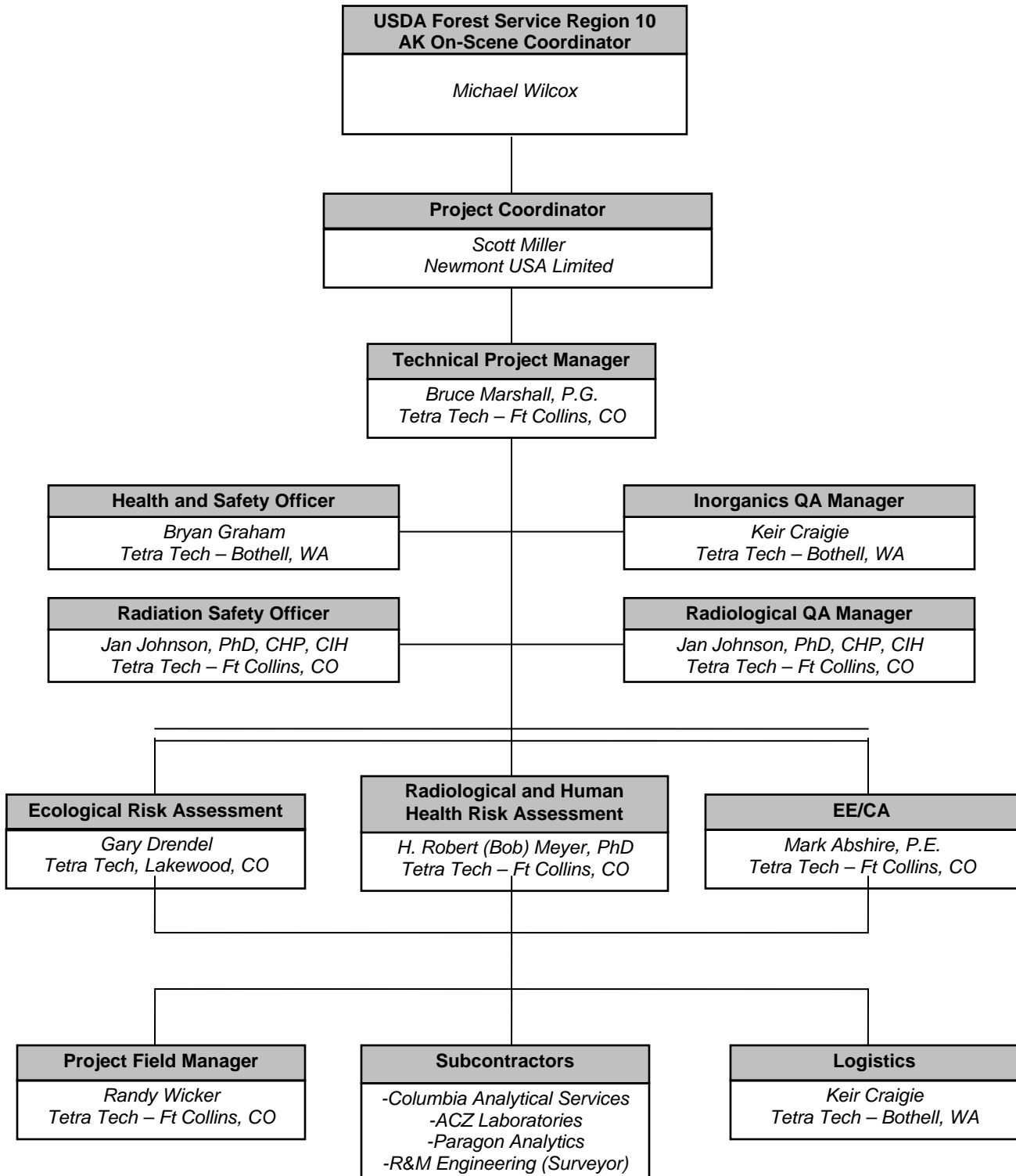
4.1.8 Subcontractors

Different subcontractors may be used during the completion of the field activities. All subcontractors must comply with the applicable portions of the SSHP. Subcontractors will not be allowed to enter the work zones until they have met the qualifications of the SSHP and been properly briefed by the ESS.

4.2 Project Organization

Figure 4-1 shows the project organization and primary lines of communication. This does not imply that communication is limited to the lines shown, but does highlight the primary lines of responsibility and accountability.

Figure 4-1. Project Organization



5.0 HAZARD ANALYSIS

The following sections describe the general chemical, physical, and biological hazards that are associated with many of the routine activities that will be conducted at the Site. This section also discusses task-specific hazards and the control measures that will be instituted to manage them. To support this discussion, Activity Hazard Analysis (AHA) tables have been prepared for each task and are included in Appendix C. The AHA tables will be amended to account for changes during the work. All significant AHA changes will be reviewed by the PESM and communicated to affected employees

5.1 General Chemical Hazards

Previous remedial investigations conducted at the Ross-Adams site on Prince of Wales Island identified several contaminants that may present exposure hazards to site personnel performing a variety of activities at the Site.

Some soils contain low concentrations of metals, such as lead, arsenic, and radionuclides. Chemical hazards associated with radionuclides are described in Appendix A. It is possible that PCB-contaminated soils, from past spills of transformer dielectric fluid, are present near the generator shack at the 300 foot level. Fortunately, none of the aforementioned soil contaminants, except scattered detections of radionuclides, are present in the soils at concentrations that could be considered occupationally significant with regard to OSHA's Permissible Exposure Limits (PELs) where inhalation of the chemical agent is the exposure route of concern. This evaluation is based on the fact that the aforementioned site contaminants consist of solids (metals) and, at least with respect to the PCBs, are likely to be adsorbed onto the surface of the soil particles. As such, any inhalation exposures to these materials would require the actual inhalation of dust from the contaminated soils, which is not likely given the normally wet conditions on Prince of Wales Island. And even if some dust is produced, the concentration in the air could not realistically approach levels in excess of the aforementioned PELs.

5.1.1 Radionuclides

Health hazards associated with radionuclides are described in Appendix A.

5.1.2 Polychlorinated Biphenyls

Polychlorinated biphenyl (PCB) is a generic term for a range of polychlorinated biphenyl compounds used commercially in heat transfer media and in the chemical/coatings industry. PCBs have been marketed commercially under the trade names Askarel[®] and Aroclor, with a designation referring to the percent weight of chlorine. Prolonged skin contact with PCBs may cause acne-like symptoms, known as chloracne. Irritation to eyes, nose, and throat may also occur. Acute and chronic exposure can cause liver damage and symptoms of edema, jaundice, anorexia, nausea, abdominal pain, and fatigue. If pregnant women accidentally ingest PCBs, stillbirth or infant skin and eye problems may occur. PCBs are suspect carcinogens. The EPA currently classifies PCBs as Class B2 or probable human carcinogens. The PEL time-weighted average (TWA) for PCBs with 54 percent chlorine content is 0.5 milligrams per cubic meter (mg/m^3), while the PEL-TWA for PCBs with 42 percent chlorine is 1 mg/m^3 . Skin exposure may contribute to uptake of these chemicals; therefore, skin exposure should be evaluated and controlled.

Sources of PCBs include fluorescent light ballasts, transformer oil, waste oil, tank sediments, and the transformer pad. There is also potential for PCB contamination in some painted surfaces. At the Ross-Adams site, PCBs are considered potential contaminants associated with oils from the generator shack at the 300 foot level.

5.1.3 Inorganic Lead

Lead is a systemic poison that affects a variety of organ systems, including the nervous system, kidneys, reproductive system, blood formation, and GI system. The most important way lead enters the body is through inhalation, but it can also be ingested when lead dust or unwashed hands contaminate food, drink, or cigarettes. Once in the body, lead enters the bloodstream and circulates to various organs. Lead concentrates and remains in bone for many years. The amount of lead the body stores increases as exposure continues, with possibly cumulative effects.

An acute, short-term dose of lead could cause acute encephalopathy with seizures, coma, and death. However, short-term exposures of this magnitude are rare. Reversible kidney damage can occur from acute exposure as can anemia.

Symptoms of chronic, long-term overexposure include appetite loss, nausea, metallic taste in the mouth, lead line on gingival tissue, constipation, anxiety, anemia, pallor of the face and the eye grounds, excessive tiredness, weakness, insomnia, headache, nervous irritability, fine tremors, numbness, muscle and joint pain, and colic accompanied by severe abdominal pain. Paralysis of wrist and, less often, ankle extensor muscles may occur after years of increased lead absorption. Kidney disease may also result from chronic overexposure, but few, if any, symptoms appear until severe kidney damage has occurred. Reproductive effects are characterized by decreased sex drive, impotence, and sterility in men; and decreased fertility, abnormal menstrual cycles, and miscarriages in women. Unborn children may suffer neurologic damage or developmental problems due to excessive lead exposure in pregnant women. Lead poisoning's severest result is encephalopathy manifested by severe headache, convulsions, coma, delirium, and possibly death.

Sources of lead include naturally occurring materials (ore body) at the mine.

Table 5-1. Exposure Limits and Physical Properties

Compound	TLV/PEL	LEL	UEL	F.Pt.	V.P.	B.P.	Sp.G.	React.
Inorganic lead	.05 mg/m ³	N/A	N/A	N/A	N/A	N/A	11.34	Oxidizer, H ₂ O ₂
PCBs	0.5 mg/m ³	N/A	N/A	N/A	0.00006	689°F	1.38	Oxidizers

LEL= lower explosive limit F.Pt.=flash point V.P.=vapor pressure TLV=threshold limit value

B.P.=boiling point UEL= upper explosive limit React.=reactivity N/A=not applicable

Sp.G.=specific gravity ND = No data

5.2 General Physical Hazards

This section provides a description of the possible physical hazards that are associated with the planned field activities. Additional hazards and their controls are identified in the AHA tables.

5.2.1 Vehicle Operation

Motorized equipment will be used on this project to transport personnel and equipment on the island. There is a potential for workers to be struck by these vehicles or to be injured by contact with exposed mechanical parts (i.e., gears and pulleys). In addition, there is a risk of vehicle

accidents and of fire during refueling. To control these hazards, regulated work areas will be established and safe distances will be maintained between site personnel and mechanical equipment. Mobile equipment will be equipped with backup alarms if applicable and spotters will be used to direct operators. In addition, all exposed gears and pulleys on mechanical equipment will be guarded to eliminate pinch and grab hazards. Vehicles will also be equipped with fire extinguishers and spill-control equipment will be available during refueling operations in the event of fuel, hydraulic fluid, or lubricant release.

All Terrain Vehicles (ATVs) use requires additional safety measures, which include the following:

1. Proper safety gear and protective clothing must be worn: eye protection, over the ankle boots, sleeved shirt and long pants. Employees using any type of motorcycle, unenclosed off-road or all-terrain vehicle are required to wear approved head protection any time the vehicle is in motion regardless of speed or distance traveled. This requirement applies regardless of state law requirements.
2. Driving care should be taken with correct posture, turns, navigating obstacles, and uphill and downhill traverses. Training in ATV use will be required of all TT staff.
3. ATVs should only be used on the Site roads and other designated areas. ATVs shall not be used on steep slopes (slopes with any potential for rollover).

All vehicles will be operated and inspected in accordance with the TtEC Vehicle Safety Program (Appendix E).

5.2.1.1 Vehicle Inspections

All equipment and vehicles brought to the job site will be inspected for structural integrity, cleanliness, operational performance, and proper functioning of safety devices in accordance with the manufacturer's specifications before being put into service. Equipment not conforming to operational and safety requirements will be repaired and re-inspected or "tagged-out-of-service". All equipment will be provided with an operators manual and verified upon initial acceptance inspection. Daily inspections of vehicles will follow the requirements of the equipment manufacturer and TtEC Vehicle Safety Program.

If applicable, vehicles will have backup alarms, seat belts, brakes, and lights. The operator will take out of service any equipment that does not comply with manufacturer's specifications. Deficiencies will be noted and referred to the FM, who, in turn, will ensure that all repairs are made before the vehicle is returned to service.

5.2.1.2 Operator Qualifications

Vehicle operators must be qualified to operate the specific type of equipment or vehicle they have been assigned. In addition, they must be proficient in the type of equipment they will be using. The FM will ensure that a proficiency test is administered to each operator for each type of equipment operated.

5.2.1.3 Equipment and Vehicle Safe Work Practices

Operators, drivers, and passengers must wear seat belts at all times, if provided. The driver is responsible to ensure that passengers are seated and properly secured before moving the

vehicle. Under no circumstance will personnel ride on fenders, running boards, or vehicle top; on beds of pickup trucks; or in any other area where a passenger cannot be secured by a properly installed seat belt. Operators and drivers will obey signs, postings, and instructions.

Those personnel directly involved with spotting for an operator are typically the personnel allowed on the ground in the vicinity of the equipment. Other personnel will remain a safe distance away from operations. Personnel needing to approach equipment while the equipment is operating will observe the following protocols:

- Make eye contact with the operator
- Signal the operator to cease equipment activity, if applicable
- Approach the operator and inform the operator of intentions

When temporarily parked, the keys are to remain in the ignition switch. Vehicle chocks are required to be used to reduce the potential for rolling when parked.

5.2.1.4 Traffic Control

The speed limit for traffic is 15 miles per hour (mph) on all areas of the Site except the main roads (identified by the ESS) where the speed limit is 25 mph. The ESS and FM may temporarily change speed limits if required for safe operations.

5.2.1.5 Site Roads and Slopes

When the roads are wet, they may be slippery and may pose a driving hazard. Also there is a potential for loss of traction, falling or driving off the road, and overturning a vehicle. The ESS marks areas of known or potential hazards on a map. All vehicles will be kept a minimum of 2' from all edges and 6' away if possible. The ESS and/or FM or alternate will regularly inspect site roads. The ESS or designee discusses current site road hazards and the status of site roads (e.g., closed, under repair, one way, etc.) at the daily tailgate meetings. Personnel will report unsafe road conditions, if observed, to their supervisor or the ESS.

5.2.2 Weather Hazards

Prince of Wales Island is subject to high winds, rain, and snow. On occasion, weather conditions can become so severe as to present a danger to those working outdoors. In these situations, the PM and ESS will evaluate conditions and make the determination if work will stop and the control measures discussed in the Emergency Action of the Plan - Section 13 - will be instituted.

5.2.3 Thermal Stress

Since all planned work activities will be conducted outside where environmental conditions are typically wet, cold, and windy, there is a significant risk that site workers could develop cold stress. In addition, for those workers required to wear chemical protective clothing, there is a possibility that they could develop heat stress depending on their work activities. The likelihood of such thermal illnesses occurring is dependent on environmental conditions, the level of work activity, and the personal control measures that are used to manage heat loads (work / rest cycles, use of clothing and / or cooling devices, hydration, etc.). Appropriate control measures will be taken to manage these thermal stress concerns. This includes the use of "warm-up tents" as necessary. The ESS, for example, will monitor ambient temperatures in the work area, track thermal work loads, and determine the need for personal protective and administrative

controls. In addition, all site workers will be instructed in the recognition and control of thermal stress symptoms and in the treatment procedures listed in the State of Alaska Cold/Heat Stress Physical Agent Data Sheets provided in Appendix D.

To guard against cold injury, appropriate clothing and warm shelters for rest periods shall be provided. The American Council of Governmental Industrial Hygienists (ACGIH) practices for cold stress shall be implemented. A copy of the ACGIH Threshold Limit Value (TLV) handbook shall be available on site.

5.2.4 Unexploded Ordnance/Explosives

There have been no reports of unexploded ordnance (UXO)/explosives at the Site. In the unlikely event that UXO, anything suspicious or not recognizable is identified in the field, all work will stop immediately and the emergency procedure in Section 13.11 will be followed.

5.2.5 Building Hazards

The buildings at the Ross-Adams site are in various states of disrepair due to age and weathering. In most cases, the interior walls and ceilings of these structures have collapsed exposing the steel, structural supports, wiring, and piping that lie within. Building debris litters the floors in almost all cases, presenting a trip hazard to anyone who enters these structures. Because of severe rusting and corrosion on all exposed steel supports, there is a possibility of building collapse. Entry into the buildings will be prohibited.

5.2.6 Mine Shafts, Open Pits, and Adits

The Ross Adams mine has an open pit, one ventilation shaft, and adits that may contain standing water. Additionally, elevated levels of radon gas may be present at these areas. Entry into the adits or shafts will be prohibited. The locations and potential locations of these entry points will be addressed in the SSHP orientation after an initial site inspection.

5.2.7 Slips, Trips, and Falls

There is a potential for site personnel to fall off of cliffs, dock and access walkways, equipment and fall into open excavations. In addition, the work area is scattered with debris that could present a trip hazard for site personnel. The entire project site is subject to wet weather that makes most walking surfaces slick and increases the potential for slips and falls.

These slip, trip, and fall hazards will be addressed by keeping the work area as free as possible of debris and other litter. Prior to the commencement of site activities, the Site will be inspected for hazards. Site personnel will wear high-traction, steel-toed safety boots and pay careful attention to surface conditions to prevent slip, trip, and fall injuries. The work area will be inspected before the start of each work day to identify any hazards that could cause injury. The results of these inspections will be communicated to site personnel during the daily tailgate safety meetings.

5.2.8 Lock Out/Tag Out

Portable electrical generators are used to supply power to the primary facilities and may be necessary on site. The generators will be maintained by qualified site personnel as directed by the FM. There are sources of electrical energy, other than the portable generators and equipment brought in for this project that would require lockout/tagout. When it becomes necessary to install or repair portable electrical power systems, appropriate lockout/tagout

protocols will be followed as per TtEC's Lockout/Tagout Procedure (Appendix E). Implementation of this lockout/tagout program will be administered by the ESS.

5.2.9 Confined Space Entry

Confined spaces are defined as spaces meeting all of the following criteria:

- Is large enough and so configured that a worker can bodily enter and perform assigned work
- Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry)
- Is not designed for continuous worker occupancy

This includes all adits, portals, and mine openings on site. Due to rockfall and radiation hazards, however, entry into adits or portals will be prohibited. Trenches and the open pit will be considered non-permitted confined spaces. As part of the initial site activity, potential confined spaces will be identified and the Site personnel will be informed.

All entries into confined spaces will be done in accordance with TtEC's Confined Space Procedure (Appendix E). This procedure requires employee training and the issuance and posting of a Confined Space Entry Permit at all confined space work sites.

5.2.10 Electrical Safety

For most workers, electrical safety is focused on the proper use of electrical portable tools and equipment (including lighting). All electrical portable tools and equipment shall be inspected prior to use. In addition, these tools and equipment shall be used with ground fault circuit interrupters (GFCIs) unless using a portable or vehicle mounted generator in accordance with the following:

When using a portable or vehicle-mounted generator, the generator is not required to be grounded. However, the following must be done (per NEC 250-6[a], EM 385, and OSHA interpretation letter 11/05/91):

- The ground conductor must be bonded to the portable generator frame.
- The noncurrent carrying metal parts of the equipment are bonded to the generator frame. This may be done by using a three-prong cord.
- GFCIs shall be used unless the generators are 5kW capacity or less, if the output is a two-wire, single-phase system and the circuit conductors are insulated from the generator frame and all other grounded surfaces (29 CFR 1926.404[b]). If in doubt, use the GFCIs.

In addition to the above, the following shall be followed for cords:

- Inspect cords, connections, and outlets before each use. Do not use if damaged.
- Use the appropriate extension cord for current load (no longer than 100' and a gage 12 or 10 minimum).
- Use only extension cords with a three-blade grounding plug.

- Cords placed on the ground must be visible, must not interfere with normal foot traffic, and must not present a trip hazard.
- Cords are never permitted across any road where vehicles may run over the cord.

Electrical tools, equipment, connections, etc., must be explosion proof if used in an area of flammable materials or flammable vapors.

Electrical installations shall be performed by certified electricians in accordance with 29 CFR 1926 Subpart K, NFPA 70 "National Electric Code."

5.2.11 Hearing Conservation Program

High noise levels are not expected to be an issue for the planned field activities at the Ross Adams mine. Any personnel who may be exposed to noise levels greater than 85 decibels averaged (dBA) over an 8-hour work period will be enrolled in a hearing-conservation program as required by federal OSHA's Hearing Conservation Regulation, 29 CFR 1910.95. Personnel exposed to noise in excess of 90 dBA will be provided with appropriate hearing protection. Appendix D provides the State of Alaska Physical Agent Data Sheet for Noise. Engineering controls will be evaluated for all high noise operations.

5.2.12 Hand and Power Tools

Hand tools, such as hand picks and shovels, may be used for sampling purposes. Power tools such as chain-saws may be used for selected vegetation cutting. All hand and power tools will be used in accordance with and manufactures instructions and TtMM's Standard Work Practice for Hand Tools (Appendix E).

5.2.13 Heavy Equipment

A small skid loader (or equivalent small excavator) may be used on the Site to perform shallow excavations. Excavations shall not be greater than 4 feet deep. Any excavator will be used in accordance with manufactures instructions and Tetra Tech's Standard Work Practice for Heavy Equipment (Appendix E).

5.2.14 Ultraviolet Radiation

Ultraviolet radiation from the sun causes sunburn and skin cancer. Ultraviolet radiation from other sources can also cause skin burns varying in degree from mild reddening of the skin (first degree burns) to more severe and painful blistering (second degree burns). Long-term skin exposure to ultraviolet radiation can cause actinic skin (a dry, brown, inelastic wrinkled skin) and skin cancer. Fair skinned individuals are more likely to develop both sunburns and skin cancer. Some drugs, such as the antibiotic tetracycline, can cause skin burns from ultraviolet radiation to happen faster and to be more severe. Products containing coal tar can also cause this reaction. These substances are called photosensitizers. Ultraviolet radiation exposure may also trigger cold sores (Herpes Simplex) in some individuals.

When ultraviolet radiation is absorbed by the eyes and eyelids, it can cause keratoconjunctivitis or "welders flash." This is a very painful condition that feels like grit in the eyes and may make the eyes water and very sensitive to light. The condition usually occurs 6–12 hours after exposure and may last 6–24 hours. The painful injury may make a person unwilling or unable to open his/her eyes during this time period, but most discomfort is gone within 48 hours with no lasting injury.

The ultraviolet radiation physical agent data sheet (PADS) is provided in Appendix D.

Under sunny conditions on water, snow, and ice, extra precautions should be taken to protect against reflected sunlight. Sunglasses with side shields should be worn. When applying protective ointments or lotions, special attention should be paid to the nose, lips, underside of the chin, and tops of the ears.

5.2.15 X-Ray Radiation

X-ray radiation will be emitted during the use of the portable XRF. Exposure of the skin to the primary x-ray beam may result in severe radiation burns in a matter of seconds. These burns heal poorly, and on rare occasions have required amputation of fingers. There have occasionally been reports of accidental exposure of the eye during use of analytical x-ray equipment. Doses capable of causing skin burns are also capable of producing serious permanent damage to the eye. The hazards most often associated with long-term exposure to x-ray radiation include increased risk of cancer and increased risk of genetic effects in exposed populations.

5.3 Biological Hazards

The primary biological hazards of concern are black bears, wolves, and bacteriological hazards. Biting or stinging insects are also a concern and the use of long sleeved shirts and insect repellants should be considered based on need.

5.3.1 Black Bears

Black bears may be found on the island year round. Adult males can weigh more than 1,500 pounds and reach a height of more than 4 feet at the shoulder. Females are usually smaller. Bears are curious, intelligent, and potentially dangerous animals.

All black bears should be treated as unpredictable. In general, they are tolerant of humans and will steer clear of people if given the opportunity, however, black bears may be curious. If you encounter a bear let the bear know you are human and talk to the bear in a normal voice and wave your arms. This will help the bear recognize you. Bluff charges occur very rarely, and a charging bear should be treated as a direct attack. You cannot outrun a bear as they have been documented to travel at speeds up to 35 miles per hour. If the bear charges continue waving your arms and talking, raise your voice if the bear gets close and becomes more aggressive. Never imitate bear sounds or make a high-pitched squeal. You should play dead if attacked by a female bear with cubs. The body position that you take on the ground should minimize the exposure of vital areas: place your hands behind your neck with fingers interlocked, draw your forearms and elbows up to protect your face, and bring your knees up to a fetal position. The female views you as a threat to her cubs and she will probably leave once you are immobilized. Remain completely passive until the bears have left the area. If a lone bear attacks, the motive is probably predation; get away or fight for your life. While the odds are against an unarmed person, fighting back is something the bear is unlikely to expect. It may gain you valuable time and someone nearby may be able to help. Always work with a buddy.

To minimize the risk from black bears:

- Locate storage areas away from any cooking, food, or sleeping quarters. Remember that only early detection and avoidance of bears guarantee your safety.
- Be vigilant.

- Always check outside before leaving a building.
- If working outside, post a lookout. Always use the buddy system in areas where bears may be present.
- Always carry a radio.
- Have quick access to a safe place, such as a truck or trailer.
- Never carry food.
- Do not feed wildlife.
- If you see a bear, bear tracks, or droppings, notify the ESS or FM immediately.
- Avoid blood stains, which probably indicate the location of a bear kill. Notify the ESS or FM immediately.
- Know where the bears are and how many.
- Minimize potential bear hiding places (e.g., unskirted structures).
- Dispose of garbage and waste materials correctly. Keep food in a secured area in bear-proof containers. Trucks and other vehicles cannot be considered secure because bears looking for food have been known to break into vehicles.

5.3.2 Wolves

Wolves may also be encountered at the Site. Extreme caution should be exercised to avoid any work activities in close proximity to a wolf. Work in areas that wolves may inhabit should always be performed with a buddy.

5.3.3 Bacteriological Hazards

Potential bacteriological hazards, such as salmonella, fecal coliform, and hepatitis, are associated with the residual structures and standing bodies of water at the Site. To avoid contamination, these areas will be entered only during sampling activities. If these sites are entered, all personnel will wear the appropriate PPE and follow the necessary decontamination procedures.

5.3.4 Devil's Club

Devil's Club (*Oplopanax horridus*) is a large shrub native to the Pacific Northwest, found in moist woods and along streams. It has large maple-like leaves, and can grow up to eight feet high. The plant has sharp thorns over the stem and edges of its leaves that can pierce clothing and cause an allergic reaction, and the red berries produced in mid to late summer are poisonous. Devil's Club forms dense thickets that can only be passed through with heavy clothing and gloves. Protective goggles or safety glasses are also recommended if walking through patches of Devil's Club that are higher than shoulder length.

5.4 Task-Specific Hazards

The following subsections describe in greater detail the hazards associated with each specific task. Appendix C contains AHA tables identifying the activity, potential hazards, controls/inspections, training, PPE, and monitoring required for each task. All personnel will employ the buddy system while conducting field activities at the Site.

5.4.1 Stream Gauging

Stream gauging will be conducted at approximately 20 locations within the Kendrick Creek Drainage. Gauging will be done by collecting flow velocities at a number of vertical profiles across the stream width, or by constructing a temporary flume in the stream bed. Besides the chemical hazards associated with potentially encountering impacted soil, there are physical hazards associated with working in the stream bed. The streams are relatively shallow however they are cold. Insulated boots should be worn to reduce the potential for hypothermia. The walking surface in the creeks represents an uneven surface that presents a slip, trip, and fall hazard, coupled with the force of the water moving through the creek. Care should be taken to ensure footing is secure when working in the creeks or streams. Avoid stepping on large slippery rocks that may be unstable. In addition, a prolonged amount of time in a single position may lead to differential erosion around one's foot causing the area to become unstable. When working in the stream always be cognizant of the walking surface and potential changes that may be occurring during the activity.

5.4.2 Stream Sediment Sampling

The chemical and physical hazards are the same as those described in Section 5.4.1.

5.4.3 Stream Water Sampling

The chemical and physical hazards are the same as those described in Section 5.4.1.

5.4.4 Surface Soil Sampling

Surface soil samples will be collected at grid nodes and at discrete locations at the discretion of the FM. Besides the chemical hazards associated with digging in potentially impacted soil, physical hazards exist that could cause muscle and joint strains resulting from digging in difficult material. Only clean and competent sampling gear shall be used to remove soil from the ground for sampling. Damaged equipment could break causing injury to the sampler. Proper lifting and posture are also important to avoid strains and repetitive stress disorder.

5.4.5 Piezometer Installation and Groundwater Sampling

The chemical and physical hazards associated with the piezometer installation and groundwater sampling are similar to those described in Section 5.4.4. For piezometer installation, there is a greater potential of shoulder and back strain as one advances and/or removes the piezometer from the sample location. Proper lifting techniques include not lifting anything over 50 lbs., bending the knees and avoiding direct strain on the back. If necessary, use two people to remove the piezometer equipment from the sample location.

5.4.6 Gamma Scans

Gamma survey measurements will be made at discrete locations at the discretion of the FM. Gamma surveys will utilize GPS-based gamma scanning systems mounted on backpacks. The use of a backpack present slip, trips, and fall hazards. Move carefully and slowly in rough, uneven terrain. Keep eyes focused on the immediate path of travel and maintain balance at all times.

5.4.7 XRF Measurements

XRF measurements will be made at discrete locations at the discretion of the FM. XRF measurements will be performed using a NITON XRF 700 series spectrometer. The NITON XRF 700 uses a cadmium (Cd-109) radioisotope source to produce x-rays for the analysis of inorganic metal concentrations. The radioisotope source is sealed and virtually no measureable

radiation external to any part off the instrument can escape when the instrument is closed. While the shutter is open, however, ionizing radiation is continuously emitted through the kapton window at the front of the instrument. Care should be taken to open the shutter only when the kapton window is in contact with the ground or sample surface. The instrument should never be pointed at anyone when the shutter is open. Trained personnel will wear dosimetry badges while operating the portable XRF. The XRF will be transported in a shock-proof case.

5.4.8 Marine Surface Sediment Sampling

Marine surface samples will be collected using a van Veen, or equivalent discrete sampling apparatus from a small (< 12 foot) vessel or sampling platform. Chemical hazards as described above are a potential. Physical hazards include falling overboard into the bay and pinch points are associated with this activity. Personnel will wear the appropriate PPE including personal flotation devices. Coast Guard approved flotation equipment, PFD's Type I, II, or selected Type II or V will be worn when working on dock(s) within 6' of the edge, or other areas of water >3' deep. The appropriate type and number of Type IV PFD's (life ring(s) with throw line will be available on dock area for emergency use. Fingers could get caught while setting the sampling devices and/or retrieving the samples. Leather gloves or equivalent will be worn to protect hands from potential pinch hazards. When a potential exists for contact with sediment disposable nitrile or equivalent gloves will be worn to ensure the integrity of the sample. Additional information on boating safety is provided in TtEC's Boating Safety Procedure (Appendix E).

5.4.9 Sampling

Environmental samples will be collected from different media. Hazards associated with sampling are primarily chemical in nature and discussed in Section 5.1. The level of PPE will depend on the type and location of the samples being collected. Sampling crews may be required to walk on uneven or slick surfaces. Running and "horse play" will not be tolerated while on site and personnel will use "stop and look" procedures when walking into a new area.

6.0 SITE CONTROL MEASURES

Although the Ross Adams Mine site is not subject to radioactive material licensing requirements, from a perspective of radiological health and ALARA principles, and in a context of the work to be performed, the entire site is considered analogous to a radiologically controlled or “restricted” area. For this reason, all workers, contractors and site visitors will be subject to radiation safety training requirements before being allowed to access the Site and must abide by the provisions of the Radiation Safety Program during the course of the project. Offshore boats, barges, or float planes will constitute unrestricted areas. The ALARA radiation safety principle will apply in terms of the potential to track contamination from the Site onto these vessels.

It will be necessary to designate a temporary “unrestricted” area on shore in order to provide a safe area for resting, washing, eating, drinking, staging equipment, conducting safety meetings, etc. This temporary unrestricted area will be determined on site by the Field Manager, in collaboration with the project team, such that the potential for radiation doses as well as exposure to potential physical hazards will be minimized.

A monitoring station for conducting personal contamination and equipment surveys will be established directly adjacent to the temporary unrestricted zone. In addition, a designated decontamination area will be established nearby. All of these functional areas for staging onsite operations will be as close as possible to the loading dock. Based on the map shown in Figure 3-1, it appears that the current dock area itself may be the best location for the temporary unrestricted zone, though onsite evaluation of all practical and potential safety issues will be carefully considered before finalizing this location.

6.1 Personal Contamination Surveys

The goal for personal contamination surveys is to ensure that before leaving restricted areas, measured radiation levels are indistinguishable from pre-established instrument baseline readings at the survey station. These personal contamination action levels will be determined by the Field Manager at the beginning of the project, and will be indicated on the personal exit survey log sheets. Before leaving the Site, all personnel are required to survey their shoes, hands, clothing and any personal gear that may have become contaminated. Personnel will be instructed in use of the alpha survey meter and a pancake GM probe, or equivalent, for personal and equipment surveys. The exit monitoring station, most likely a temporary tent of some sort, will be equipped with an alpha survey meter for personal contamination surveys and a GM pancake probe for equipment and vehicle release surveys. Specific, detailed procedures for these surveys will be developed onsite based on local conditions, but will generally involve the following:

- A pre-determined, site-specific, action level (e.g. counts in a specified time interval) will be listed on a survey log sheet provided at the exit monitoring station.
- Slowly scan the surface of each potentially contaminated area (at about 1-2 inches per second) with the sensitive surface of the detector positioned within about 1 centimeter of each surface being surveyed.
- If the action limit is exceeded, the subject area will be re-surveyed one time. If readings are still in excess of the action level, proceed to the decontamination station and attempt to remove the contamination (see Section 6.3).

- Repeat process until action levels are no longer exceeded.
- Initial and date the log sheet to signify that the action levels were not exceeded prior to entry into the unrestricted zone.

The survey log sheets will serve as documentation that contamination was not transported into the unrestricted zone or offsite. An example personal survey log sheet is included in Appendix A.

6.2 Equipment Contamination Surveys

Equipment and vehicles used at the Site will be surveyed for fixed and, if necessary, removable contamination before being released for unrestricted use and transported to the barge, boat, or plane in Kendrick Bay. If the fixed activity measurement indicates contamination levels below the limit for removable contamination, a wipe test need not be performed. It is advisable, however, to perform wipe tests on equipment used in muddy conditions or to excavate or move contaminated materials even if the fixed activity measurement indicates acceptable levels. In the event that the level of contamination exceeds the Site-specific release limits provided in Table 6-1, the equipment will be pressure washed and allowed to dry before repeating the exit survey.

Table 6-1. Surface Contamination Limits for Unrestricted Release

Element	Removable Surface Activity (d/m-100 cm ²)	Ave. Total Activity (fixed + removable) (d/m-100 cm ²)	Max. Total Activity (fixed + removable) (d/m-100 cm ²)
U-nat and decay products	1,000 (total alpha)	5,000 (total alpha)	15,000 (total alpha)
Th-nat	200	1,000	3,000
Beta/gamma Emitters	1,000	5,000	15,000

6.3 Decontamination

Prior to leaving the Site to return to the base vessel or float plane in Kendrick Bay, all personnel will perform a personal contamination exit survey (Section 6.1). This will include a survey of any personal gear to be carried back to the base vessel or plane. Larger equipment such as ATV's will also be surveyed prior to transport offsite (Section 6.2). Should an exit survey reveal evidence of contamination, the contamination will be removed, contained and managed in the designated decontamination area. This area will have a supply of moist towelettes for washing skin, and a stiff-bristled brush for removing visible mud, soil or sediment from clothing and equipment as needed. A small gas-powered pressure washer will be available for washing ATV's and other equipment where appropriate. The decontamination area will have a containment barrier system in place (e.g. a durable tarp secured to the ground across a slight depression) to prevent migration of contaminated residues. Any solid residues accumulated on the containment barrier from decontamination activities will be returned to a mine rock pile well removed from the bay shoreline or any stream drainages.

In cases where use of pressure washing is not appropriate and where visible accumulations of mud, soil or sediment on personnel or equipment are present, a brush or similar means will be provided for removing accumulated material onto the containment barrier in the decontamination area. The use of moist towelettes to clean hands and face should only be employed for skin surfaces where accumulations of soil or sediment are not visually apparent. For visible accumulations, soft brushes or other means of removing the accumulated material will be provided as indicated above. Abrasive measures should not be used on skin. If contamination on skin cannot be removed with the use of towelettes, the Field Manager should be notified. The potential to accumulate significant amounts of radioactivity on moist towelettes should be very small. However, used moist towelettes will be managed as follows:

- Towelettes will be biodegradable and will be collected in biodegradable trash bags.
- Demobilization from the Site will include surveys of exterior surfaces of trash bags containing used towelettes with a GM probe for evidence of elevated beta/gamma activity.
- A representative sample of used towelettes will also be surveyed directly with an alpha probe for evidence of measurable alpha activity in excess of pre-established instrument baseline at the survey station.

It is not expected that used towelettes will contain measurably elevated radioactivity, but confirmatory survey checks will be performed at the end of each sampling trip. If elevated activity is not detected, the used towelettes will be managed in the same manner as other ordinary trash generated during the project. In the unlikely event of measurably elevated activity on used towelettes, the biodegradable trash bags and used towelettes will be buried at one of the mine rock piles for ultimate management as part of remedial plans for the mine rock piles.

In the case of site visitors coming to the Site during periods when a decontamination station and associated equipment are not available, a brush should be brought along and used to remove visible accumulations of material as described above, and in an area such as the ore staging area or a mine rock pile (well away from drainages or the bay shoreline). The brush should then be rinsed with clean water (carried in water bottles or similar containers) in that same area. Once the brush is free of visible soil residues it should be adequately decontaminated and can be taken off site.

7.0 AIR MONITORING

Environmental radon monitoring will be performed throughout the Site. Health hazards from intake of radionuclides is discussed in Appendix A.

Track Etch[®] alpha track radon detectors (radon cups) will be deployed across the Site for evaluation of average radon concentrations over the Site. The radon cups will be deployed at thirty-two locations across the Site, including background locations and at the mine adits. With the exception of those deployed at the adits, the radon cups will be deployed during the first sample event and retrieved during third event. Radon cups deployed at the adits will be installed during the first sample event, replaced during the second event, and then the retrieved during the third event. Ambient air temperatures will be periodically measured to help assess air exchange in the underground workings.

Radon cups will be installed in the following areas:

- 900-Foot Level: Mine rock piles and background areas (6 sample locations)
- Open Pit: 900-Foot Level portal and in the pit (3 sample locations)
- 700-Foot Level: Mine rock pile and portal (5 sample locations)
- 300-Foot Level: Mine rock pile and portal (7 sample locations)
- Mine Road and Haul Road (3 sample locations)
- Dotson Cabin (4 sample locations)
- Ore staging area (5 sample locations).

Approximate sample locations are illustrated on Figure 3-1. Final locations will be access dependent and determined during the first sampling visit; significant departures from planned locations will be described in the Site Characterization Report. All air monitoring shall be performed in accordance with equipment manufacturers' instructions.

8.0 PERSONAL PROTECTIVE EQUIPMENT

PPE will be selected and used sufficient to protect employees from the hazards and potential hazards they are likely to encounter as identified in Section 5 of this plan. In general, high visibility clothing or safety vests (meeting ANSI standard) will always be worn. Due to the nature of the tasks involved and the size of the Site, the ESS will choose PPE on a daily basis depending on the operation, location, and the hazards involved in each task. The level of PPE protection will be upgraded or downgraded based on changes in site conditions. Several factors that may indicate the need to re-evaluate site conditions and PPE selections include:

- Contaminants other than those previously identified are encountered/handled
- Commencement of a new work phase
- Change in job tasks during a work phase
- Change of season/weather
- Change in work scope that affects the degree of contact with contaminants
- Change of ambient levels of contaminants

All PPE changes must be approved by the ESS. Any changes in PPE for specific tasks will be communicated as soon as possible to the field crew during the daily periodic training sessions conducted by the ESS. All changes will be documented in the field log book and daily tailgate briefing form as a minimum.

The types of protective equipment that will be worn for each specific work activity are listed in Table 8-1. This equipment will be selected, used, inspected, and maintained in accordance with 29 CFR 1910(g)(5), 29 CFR 1926 Section .65(g)(5), and 29 CFR 1910 Section 134. The general PPE components that make up these levels are listed below. The specific equipment components for each level and work activity are listed in Table 8-1.

Table 8-1. Anticipated Initial PPE Requirements

Site-Specific Task	Initial Anticipated PPE Level
Stream Gauging	D Modified D when chemical contact, insulated and/or waterproof boots when working in the stream
Stream Sediment Sampling	Modified D insulated and/or waterproof boots when working in the stream
Stream Water Sampling	Modified D insulated and/or waterproof boots when working in the stream
Piezometer Installation	D when no chemical contact Modified D when chemical contact, insulated and/or waterproof boots when working in the stream.
Groundwater Sampling	Modified D when chemical contact, insulated and/or waterproof boots when working in the stream.
Gamma Scans	D when no chemical contact Modified D when chemical contact
XRF Measurements	D when no chemical contact Modified D when chemical contact
Soil Sampling	Modified D
Marine Surface Sediment Sampling	Modified D

Note: Additional PPE information provided in the AHAs.

Level D protection is the minimum level of protection that will be used at the Site. Level D PPE, at a minimum shall consist of:

- Long sleeve shirts and trousers
- high visibility clothing or safety vests (meeting ANSI standard)
- High traction, steel-toed boots (ANSI Z 89.1)

The initial PPE levels for the specific tasks are identified in Table 8-1 and the AHAs. These initial levels may be modified by the ESS depending on the field conditions. Level D-Modified PPE to be used when in contact with chemical hazards, sampling, or working within streams, will include:

- Chemical resistant gloves, will be used when in contact with chemical hazards and during all soil, sediment, and water sampling activities.
- Insulated and/or waterproof boots will be used when working within a stream

Additional Level D-modified protection to be used as necessary includes:

- Cotton or cold-weather coveralls
- Poly coated Tyvek®
- Hard hat (ANSI Z 89.1)
- Safety glasses with side shields (ANSI Z 87.1)
- Chemical protective goggles
- Chemical-resistant boots covers
- Hearing protection
- Leather gloves
- Personnel floatation devices
- Rain gear and/or cold weather gear

Additional safety equipment may include, but not limited to

- Sun screen
- Insect repellent
- Satellite phone(s) carried by boat and floatplane contractors or US Forest Service personnel
- Emergency blankets
- Flares or other signaling devices
- Drinking water
- Personal radios carried by boat and floatplane contractors or US Forest Service personnel
- Bear spray carried by boat and floatplane contractors or US Forest Service personnel
- Fire extinguishers
- Emergency over-night kit – Provided by boat and floatplane contractors

8.1 Limitations of Personal Protective Equipment

8.1.1 Level D Limits

Level D clothing will be worn only in areas where site contaminants do not pose a significant dermal contact hazard. Because Level D clothing is porous and, as such, does not provide liquid contact protection, this clothing will not be worn during activities involving the handling of contaminated liquids. Leather boots and gloves that inadvertently become contaminated with these materials will be discarded because they cannot be adequately decontaminated. Field activities in standing bodies of water such as creeks or tidal areas will require waterproof/insulated boots.

8.1.2 Body Covering Limits

When liquid contact hazards are encountered on site, such as when handling groundwater or tank liquids, raingear or poly-coated Tyvek[®] may be worn. They are not recommended for use with acids and chlorinated organic solvents.

8.1.3 Face Protection Limits

Chemical protective goggles are recommended when handling liquids that may be corrosive or irritating to the eyes. If such liquids also pose a splash hazard to the face, then face shields will be worn in addition to protective goggles. Under no circumstances will safety glasses or face shields be worn as a substitute for chemical protective goggles.

8.1.4 Glove Limits

For the Ross-Adams site, all standard chemical-resistant gloves are acceptable for the primary contaminants of concern at the concentrations identified. This means that the ESS may identify locally any available chemical-resistant glove (e.g., neoprene, nitrile, polyvinyl chloride [pvc], or natural rubber) for use in any conditions where there is either contact with contaminated soil or the contact is incidental. In general, neoprene and nitrile are better for oils and petroleum products.

The glove thickness and condition is more important for this work. Thin gloves should only be used for sampling and light hand work. Thick gloves should be used for cleaning and heavy work, particularly where there is a potential for damage to skin, e.g., cuts and abrasions.

8.2 Inspection of Personal Protective Equipment

Prior to donning protective clothing, each garment will be visually inspected to identify defects, such as tears, cracks, holes, and delaminations, which may allow chemicals to penetrate the clothing. This inspection procedure will involve holding the clothing into the light to illuminate penetration points and stretching the fabric along stitched or bonded seams to confirm the structural integrity of the garment. The surface of the clothing will also be inspected for any signs of wearing, cracking, or degradation. Any openings or possible penetration points identified in this inspection process will be sealed and/or masked. Clothing that is contaminated or discolored will be discarded. Protective clothing ensembles will also be evaluated for proper fit before being worn.

Other protective equipment, such as safety glasses, chemical-protective goggles, and faceshields, will be inspected for structural integrity and cleanliness. Goggles and glasses that are severely scratched will be discarded.

8.3 Monitoring Effectiveness of Personal Protective Equipment

At the end of each shift, the ESS will examine the inside of a representative sample of chemical protective garments (polytyveks, gloves, and boots) before they are discarded or cleaned to identify evidence of chemical breakthrough. Such evidence would include any discoloration or staining of the clothing, thinning, blistering or cracking of the clothing material, and the presence of torn seams and perforations. The ESS will also note if the workers themselves have become contaminated while wearing the PPE. If, based on this examination, it is apparent that the PPE designated for the work is not adequately controlling worker exposures, the level of personal protection will be upgraded at the direction of the ESS and PESM.

9.0 TRAINING REQUIREMENTS

All project personnel entering the Site to perform work outlined in Section 3 will be required to training commensurate with the tasks they are to perform. The training will depend on the location and activity. The required training is summarized in Table 9-1.

Table 9-1. Training Requirements Summary

Personnel	Required Training
All site personnel	Site- and task-specific training
All site personnel	40-hour HAZWOPER 8-hour annual HAZWOPER refresher 3 days on-the-job supervision
All site personnel	Radiation Safety Training
Supervisors	8-hour supervisor training
Two personnel (minimum) present on site	First aid/ CPR with blood-borne pathogens (in addition to above)
Vehicle Operations	Training in accordance with SSHP
ATV	Training per vehicle operation
Portable XRF operation	Formal training by NITON representative

Procedures for project-related site visitors are described in Section 9.11. Because the Site is located on USFS land and access is unrestricted, Tetra Tech is not responsible for the safety of non-project personnel at any time.

9.1 HAZWOPER Training

All site personnel engaged in sampling activities will have received hazardous waste operations and emergency response (HAZWOPER) training. Prior to personnel arrival at the Site, all documentation must be presented to the on-site ESS for review and approval. Individuals (workers) not having evidence of 40-hour HAZWOPER training, 8-hour refresher training (when necessary), or 8-hour supervisory training (when necessary) will not be allowed to enter the Site. Individuals insisting on entering the Site without evidence of appropriate documentation will be advised of noncompliance and documented in the Site logbook.

9.2 Site-Specific Training

The ESS will provide and document site-specific training during the project site kickoff meeting and whenever new workers arrive on site. No individuals will be allowed to begin work on site until the Site-specific training is completed and documented by the ESS. This training will address this SSHP, applicable field change requests (FCRs), all safety and health issues, and procedures pertinent to site operations.

As part of the Site-specific training, the following topics shall be covered:

- Project introduction and orientation
- Requirements and responsibilities for accident prevention and maintaining safe and healthful work environments
- General safety and health policy and procedures
- Chemical, physical, and toxicological properties of site contaminants

- Spill containment procedures and notifications
- Activity hazards and the means to control/eliminate those hazards, including applicable position and/or activity hazard analyses
- Potential for UXO or explosives
- Potential locations for entry to mines
- Selection, use, and limitation of PPE
- Employee and supervisor responsibilities for stopping work and reporting all accidents
- Decontamination
- Emergency response procedures and medical facilities
- Confined space entry (if applicable)
- Bloodborne pathogen briefing
- Procedures for reporting and correcting unsafe conditions or practices

9.3 Portable XRF Operation

Proper training for safe use of the instrument and radiation training will be completed by the operator prior to use of the instrument. This will include participation in a formal training session by the NITON representative.

9.4 Transportation of Hazardous Materials

Personnel involved in the transportation of hazardous materials will be trained in accordance with 49 CFR 172 Subpart H.

9.5 Boat Safety

Boats used for both temporary habitation and marine sediment sampling will be operated by a hired charter company. The boat operators will provide boat safety instructions to all site personnel prior to use.

9.6 Safety Briefings

Site workers will attend tailgate safety meetings conducted by the ESS daily and/or prior to the start of new work activities. A copy of the tailgate safety meeting form that will be used to document these meetings is included in Appendix B. Updates in work practices and hazards, emergency evacuation routes, and emergency procedures will be addressed.

9.7 First Aid and CPR

At a minimum, the ESS and one additional site worker will have received first aid and CPR training taught by a certified instructor and approved by an organization such as the American Red Cross. Persons trained in first aid and CPR shall have received instruction on blood-borne pathogens per 29 CFR 1910.1030. Site-specific briefings will include information about site-specific blood-borne pathogen hazards. The ESS will keep a record of all site personnel having such training. All personnel will be provided with blood-borne pathogens awareness training, emphasizing avoidance of all body fluids and the need to contact first-aid-trained personnel.

For this project because of the work being performed, the risk of blood-borne pathogen contact is considered remote. However, blood-borne pathogen contact during administration of first aid could occur. Any employee involved in an exposure incident will be offered a post-exposure evaluation consisting of prophylaxis and Hepatitis-B virus (HBV) immunization within 24 hours of exposure.

9.8 Hazard Communication

The ESS, as part of the Site-specific training, shall provide hazard communication training for all hazardous materials brought on site. The purpose of a Hazard Communication or Employee Right-To-Know program is to ensure that the hazards of chemicals located at the Site are communicated to site personnel and visitors according to 29 CFR 1926.59.

Site hazard communication includes:

- Container Labeling—Personnel will ensure that drums and containers are labeled according to contents. These drums and containers will include those from manufacturers and those produced on site by operations. Incoming and outgoing labels shall be checked for identity, hazard warning, and name and address of responsible party.
- Material Safety Data Sheets (MSDSs)—There will be an MSDS on site for each hazardous chemical used or known to be on site.
- Information and Training—Training site personnel on chemical hazards is accomplished through formal safety training conducted annually and informal safety meetings. The ESS communicates project-specific chemical hazards to site personnel through an initial site orientation meeting and during daily safety meetings or AHA meetings.

At a minimum, site personnel will be instructed on the following:

- Chemicals and their hazards in the work area
- How to prevent exposure to these hazardous chemicals
- What has been done to prevent worker exposure to these chemicals
- Procedures to follow if they are exposed to these chemicals
- How to read and interpret labels and MSDSs for hazardous substances found on site
- Emergency spill procedures
- Proper storage and labeling
- Location of Hazard Communication Program in the main office complex

When new hazardous material is introduced or discovered on site, site personnel will be given information on this material at the daily safety meeting. The FM and ESS are responsible for ensuring that the MSDS on the new chemical or material is available on site. The ESS will ensure that site personnel have access to MSDSs at all times. At a minimum, MSDSs are located on the vessel.

9.9 Radionuclides

Radiation Safety Training is required for all site workers and contractors. The RSO will develop the training in accordance with the nature of activities to be performed at the Site and the types and levels of radiological hazards involved. The Project Field Manager is qualified by training and experience to conduct the actual Radiation Safety Training as outlined by the RSO. This training will be conducted for all personnel prior to commencement of their activities at the Site. Details of the radiation safety training are provided in Appendix A.

9.10 Confined Space

All workers shall be instructed not to enter any confined space (permitted or non-permitted) without permission from ESS/PM. If entry has been approved, no worker shall enter permit-required confined spaces (PRCS) without the proper permit and without following the procedures and practices outlined in the permit. PRCS are not expected to be part of routine activities, however, there are PRCS on the island and the field crew will be informed about the hazards associated with these spaces and instructed to maintain a safe distance. Confined space training requirements are fully described in the Confined Space procedure in Appendix E.

9.11 Site Visitors

During the course of field activities, it is possible that visitors¹ will come to the Site. All visitors are required to comply with applicable portions of the SSHP, check in with the FM and ESS, and sign the Site Control log before going to a specific site. The ESS will conduct a brief safety and health training session to communicate the general hazards associated with the Site and emergency procedures. Visitors will be escorted, if necessary, depending on their formal training, where they need to go and on activities being performed in the area. All visitors must sign the worker/visitor acknowledgment form after the briefing.

¹ "Visitors" refers to Newmont personnel and their contractors. This SSHP does not apply to USFS or other agency personnel, or to other non-project individuals.

10.0 MEDICAL SURVEILLANCE

All Tt personnel working on Prince of Wales Island will participate in a Medical Surveillance program. Site personnel must have passed a physical examination and have a copy of their medical clearance on file at the Site before they will be allowed to enter Site. The ESS will review each employee's medical clearance form before they begin work. An annual/biannual update physical is also required for all personnel participating in this program. Additional physical exams may be made available to program participants who terminate their employment with Tt, or who are reassigned to a job position that does not require participation in the program. This Medical Surveillance Program is designed to comply with Federal OSHA's Hazardous Waste Site and Emergency Response regulation, 29 CFR 1910.120.

11.0 RECORD-KEEPING REQUIREMENTS

All safety and health record-keeping requirements mandated by 29 CFR 1910.120, 29 CFR 1926, and 29 CFR 1904 will be followed as described in the Safety and Health Program. These records include field change requests (FCRs), accident/incident reports, Weekly Safety Inspection Checklist, Daily Tailgate Safety Briefing, safety and health field logbooks, and MSDS.

11.1 Pre-Mobilization Safety Meeting

A Pre-Mobilization Safety Meeting will be held before any work is started at the Site. The Pre-Mobilization Safety Meeting will be attended by the Tetra Tech PMs, the PESM, the FM, and the ESS. The purpose of the meeting is to ensure that there is a clear understanding of the scope of work, roles and responsibilities, and safety and health practices and to verify that all the necessary equipment is in place.

11.2 Field Change Requests

Changes and modifications to the accepted SSHP shall be made with the knowledge and concurrence of the PESM, the PMs, and the FM. Should any unforeseen hazard become evident during the performance of the work, the ESS shall bring such hazard to the attention of the FM, both verbally and in writing, for resolution as soon as possible. In the interim, necessary action shall be taken to re-establish and maintain safe working conditions in order to safeguard on-site personnel, visitors, the public, and the environment. When it becomes necessary to modify a program, task, or plan, changes will be documented on an FCR form. The FCR will be signed by the preparer, the TtEC and TtMM PMs, PESM, and the FM. Copies of the FCRs will be kept in the master copy of the WP and the SSHP.

11.3 Safety and Health Reports

A tailgate safety meeting will be held each day prior to beginning work at a site. The tailgate meeting will be documented on the appropriate field form (Appendix B) and in the logbook. The daily meeting will review the hazards associated with the activities planned for the day and measures to reduce the potential for incidents. All those involved in work at that site will sign the tailgate meeting report to document that they have received the necessary briefing.

A weekly Safety and Health report will be prepared by the ESS to document the activities performed during the week, near misses or incidents, areas for improvement (if any), and hours worked by the field crews. The weekly Safety and Health reports will be reviewed by the PESM and the Tetra Tech PMs to evaluate the effectiveness of the safety and health practices at the Site.

11.4 Personal Sampling/Monitoring Reports

During the course of the field activities, some personnel will wear dosimeter badges to measure radiation dose. This will be documented in the field logbooks, the Site Safety and Health logbook maintained by the ESS, and the sampling monitoring report as appropriate.

11.5 Incident Reports

Incident Reports (IRs) are useful tools to evaluate the overall effectiveness of the Safety and Health Program designed for the work at the Ross-Adams site. The IRs are not used to punish

those involved but to review the circumstances that may, or may not, have led to an accident. An incident is defined as:

- An injury or illness that meets the OSHA recordability criteria
- An exposure to a hazardous substance above the allowable exposure unit
- A property/vehicle/equipment/truck/passenger damage case that results in damage greater than \$500
- A fire or explosion
- A spill or release resulting from Tetra Tech, or subcontractor activities, including spills or releases from operations at a client facility of which Tetra Tech employees have become aware
- A permit exceedance
- A “near miss” or an event that has a reasonable probability in resulting in one the outcomes described above if the circumstances were different and for which modifications to management programs will reduce the probability of occurrence or the severity of the outcome

If an accident or incident should occur, the ESS is responsible for making sure an Incident Report Form is completed (see Appendix E). This form should be completed immediately and forwarded to the Tetra Tech PMs at the earliest convenience.

If the accident or incident results in personnel injury requiring medical attention, an OSHA Form 200 will be completed within 24 hours.

Areas of improvement will also be discussed and recommendations for amending project plans will be forwarded to site management.

In the event of an accident, the Tetra Tech PMs shall be notified within 24 hours, unless there is a fatality, three or more persons admitted to a hospital, or significant property is damaged, which requires immediate notification. Within 24 hours of any reportable accident, an Incident Report shall be completed in accordance with EHS 1-7 (see Appendix E).

11.6 Logbooks

The logbooks will be used to document all field activities performed at the Site. A master logbook will be kept by the ESS to document the activities of each of the field crews. The logbooks should contain the date, time, field activities performed, names of personnel, weather conditions, visitors to the Site, areas where photographs were taken, calibration records for instruments, air-monitoring results, personnel sampling information, and start and completion times of activities.

Each page of the logbook will be pre-numbered, dated, and signed by the author. The logbooks will be sturdy, weatherproof, and bound to prevent the removal of pages. All writing should be done in waterproof, black, permanent ink. No pages may be removed from the Site logbooks for any reason. Blank pages, if any, will be marked “page intentionally left blank.” Any mistakes should be crossed out with a single line, initialed, and dated. Logbooks will be numbered sequentially by the ESS who will maintain a list of logbooks issued and to whom they were issued.

11.7 Hazard Communication Program/Material Safety Data Sheets

The ESS, as part of the Site-specific training, will provide hazard communication training for all hazardous materials brought on site. The training will include reviewing the hazards of the chemical, symptoms of exposure, first aid, MSDSs for spill control information, and appropriate labeling requirements. MSDSs will be required for all hazardous materials used on site. The MSDSs will be maintained on site by the ESS.

11.8 Job-Site Inspections

The ESS shall perform daily inspections of the job site and the work in progress to ensure compliance with applicable regulations, the Safety and Health Program, and the SSHP and other occupational health and safety requirements of the contract, and to determine the effectiveness of the SSHP. Daily safety inspection logs (Appendix B) shall be used to document the inspections, noting safety and health deficiencies, deficiencies in the effectiveness of the SSHP, and corrective actions taken. Each entry shall include the following: date, work area checked, employees present in work area, PPE and work equipment being used in each area, special safety and health issues and notes, and signature of preparer. If a deficiency is noted, corrective actions taken, corrective actions proposed, expected completion dates, and personnel responsible for correction shall also be identified. The ESS's daily inspection log shall also be used to document completion of previous outstanding deficiencies. Outstanding deficiencies shall be reviewed weekly with updates provided in the ESS's daily inspection logs.

11.9 Safety and Health Phase-Out Report

At the completion of the job, a Safety and Health Phase-Out Report will be prepared. The Phase-Out Report will include:

- A summary of the overall performance of Safety and Health, including a list of accidents, incidents (including near misses), unusual events, and lessons learned
- Final decontamination documentation, including procedures and techniques used to decontaminate equipment, vehicles, and on-site facilities
- A summary of exposure monitoring and air sampling accomplished during the project
- Signatures of the PESM, Tetra Tech PMs, and the ESS.

12.0 GENERAL SITE RULES

12.1 General Safety Rules

The following general safety rules will be strictly followed on site:

1. All personnel must use the buddy system while conducting field activities at the Site.
2. All site personnel must attend each day's Safety and Health Briefing.
3. Any individual taking prescribed drugs shall inform the ESS of the type of medication. The ESS will review the matter with the PESM, who will decide if the employee can safely work on site while taking the medication.
4. The PPE specified by the PESM and the SSHP shall be worn by all site personnel. Long-sleeved shirts and trousers, and high visibility clothing or safety vests (meeting ANSI standard) will always be worn. High-traction, steel-toed boots shall also be worn in all areas unless specified by the PESM and the SSHP.
5. Facial hair (beards, long sideburns, or mustaches) that may interfere with a satisfactory fit of a respirator mask is not allowed on any person who may be required to wear a respirator. No respirator use is planned for this work site.
6. All personnel must sign the Site log at the beginning of each day before they go to work at a site.
7. Personnel must follow proper decontamination procedures.
8. Eating, drinking, chewing tobacco or gum, smoking, and any other practice that may increase the possibility of hand-to-mouth contact is permitted only in a temporary unrestricted area. (Exceptions may be permitted by the PESM to allow fluid intake during heat stress conditions.)
9. All lighters, matches, cigarettes, and other forms of tobacco are prohibited except in a temporary unrestricted area.
10. All signs and demarcations shall be followed. Such signs and demarcation shall not be removed except as authorized by the PESM.
11. No one shall enter a PRCS without a permit. Confined space entry permits must be followed as issued.
12. All personnel must follow the work-rest regimens and other practices required by the heat stress program.
13. All personnel must follow lockout/tagout procedures when working on equipment involving moving parts or hazardous energy sources.
14. No person shall operate equipment unless trained and authorized.
15. Ladders and scaffolds shall be solidly constructed, in good working condition, and inspected prior to use. No one may use defective ladders or scaffolds.
16. Fall protection or fall arrest systems must be in place when working at elevations greater than 6 feet for temporary working surfaces and 4 feet for fixed platforms.
17. Safety belts, harnesses, and lanyards must be selected by the FM. The user must inspect the equipment prior to use. No defective personal fall protection equipment shall be used. Personal fall protection that has been shock loaded must be discarded.
18. Hand and portable power tools must be inspected prior to use. Defective tools and equipment shall not be used.
19. Ground fault interrupters shall be used for cord and plug equipment used outdoors or in damp locations. Electrical cords shall be kept out of walkways and puddles unless protected and rated for the service.
20. Improper use, mishandling, or tampering with safety and health equipment and samples is prohibited.

21. Horseplay of any kind is prohibited.
22. Possession or use of alcoholic beverages, controlled substances, or firearms on the Site is forbidden.
23. All accidents, no matter how minor, must be reported immediately to the FM.
24. All personnel shall be familiar with the Site Emergency Response Plan.

12.2 Prevention of Alcohol and Drug Use

The use of alcohol or illicit drugs on site is prohibited. The FM shall immediately remove personnel from the Site who are involved in these activities. Personnel who are considered under the influence of alcohol or illicit drugs shall also be removed from the Site.

12.3 Housekeeping

All work areas shall be maintained clean and orderly. The accumulation of rags and other combustible materials in uncontrolled areas is prohibited. Flammable liquids shall only be stored in approved containers and locations. Access routes, particularly emergency access routes, shall be free of all obstructions. Failure to comply with the combustible and flammable storage and emergency access requirements of this section shall be considered an imminent danger resulting in immediate cessation of affected operations until acceptable conditions are met.

13.0 EMERGENCY RESPONSE

Given the scope and complexity of this project, it is possible that a catastrophic fire, natural disaster, significant environmental spill, or severe personal injury could occur. To prepare for these emergencies, the following emergency response plan has been drafted to address the resources, lines of authority, communication procedures, and response protocols that must be in place to respond to a given crisis. The response elements discussed in this section include: personnel roles, line of authority, communication procedures, evacuation protocols, pre-emergency planning, emergency medical and spill response procedures, and emergency notification requirements.

This Emergency Response Plan will be rehearsed prior to initial field activities and will include a staged personnel injury or environmental spill incident. Key emergency contacts will be notified during this drill to verify communications and responsiveness. At the completion of the emergency response exercise, the ESS will evaluate the effectiveness of the emergency response procedures. This Emergency Response Plan will be modified to include any changes necessary.

13.1 Personnel Roles and Responsibilities

13.1.1 Emergency Coordinator

Tetra Tech has assigned responsibility for implementation of this Emergency Response Plan to a Site Emergency Coordinator (EC). The Site EC for the project is the ESS. The Site EC will be responsible for ensuring the evacuation, emergency treatment, and emergency transport of site personnel as necessary, and notification of emergency response units and the appropriate personnel. The EC will also direct all emergency response operations and serve as liaison with on-site government officials.

The Site EC shall conduct an inspection of emergency response equipment on a regular basis and ensure that all personnel assigned to use this equipment have been properly trained. The EC has the authority to purchase any additional equipment needed to control an incident. The EC will have the authority to resolve disputes about responses actions, requirements, and precautions.

13.1.2 Emergency Response Team

Site workers will be trained to contain and control environmental spills that may occur at the Site. They will be familiar with the use of spill response equipment and with the personal protective controls that will be used to protect them in their work. They will also respond to small fires that can be controlled with portable fire extinguishers.

When responding to an incident, they will initiate evacuation of all affected employees, secure the incident scene, notify the EC, and institute site control measures. They will be qualified to administer first aid/CPR and perform limited rescue services. Emergency response team members will report to and take direction from the EC.

13.1.3 Emergency Medical Personnel

At least two site workers who are trained in first aid/CPR will be available at each job site. Critically injured workers will be airlifted to a facility by chartered commercial air carriers or by the U.S. Coast Guard (see Emergency Response Contacts, Table 13-1) for more comprehensive medical treatment.

13.1.4 Environmental Safety Supervisor

The ESS will respond to each emergency incident to assist in identifying and evaluating hazards and to advise the response team members on appropriate hazard control strategies. The ESS will have the authority to terminate a response if in his/her professional judgment the emergency is too dangerous to manage. The ESS will report jointly to the FM and the PESM.

13.1.5 TtMM's Project Manager

TtMM's PM, Bruce Marshall, will be responsible for notifying all appropriate emergency response authorities and governmental agencies (i.e., ADEC, U.S. Coast Guard, EPA, ACOE, Federal and State OSHA, etc.) in the event of a reportable spill, environmental release, or reportable injury. The TtMM PM will also ensure that all needed response equipment, personnel, and other resources are purchased and made available to the project. This will include arranging for the transportation of injured personnel to the nearest Hospital (Ketchikan) and providing delivery of needed emergency response equipment and supplies. A listing of emergency response contacts for this project is presented in Table 13-1.

Table 13-1. Emergency Response Contacts

Emergency Medical Services		
	PeaceHealth (Ketchikan Hospital)	(907) 225-5171
	Ketchikan Police	(907) 225-6631
	U.S. Coast Guard, Nome (VHF channel 16)	NA
	General Emergency (VHF channel 16)	NA
Public Safety		
	Alaska State Trooper	(907) 443-2441
Emergency Evacuation Contacts		
	Misty Fjords Air	(877) 228-4656 (907) 225-5155
	Promech Air	(800) 860-3845 (907) 225-3845
	Taquan Air	(800) 770-8800 (907) 225-8800
Regulatory Agencies		
	USFS OSC – Michael Wilcox	(907) 586-9379 Cell: (907) 723-1860
	USDA. Forest Service Dispatch (Ketchikan)	(907) 228-6211
	Alaska State OSHA	(907) 269-4957
	Federal OSHA	(206) 553-5930
	Alaska Department of Environmental Conservation (ADEC)	(907) 465-5090
	ADEC Spill Response Team	(907) 465-5340 After hours: (800) 478-9300
	National Response Center	(800) 424-8802
	U.S. Coast Guard	(800) 478-5555
Project Representatives		
	Bruce Marshall, TtMM Project Manager	Office: (970) 223-9600 Cell: (303) 775-5964 Home: (303)-666-0967
	Gary Drendel, TtEC Project Manager	Office: (303) 980-3546 Cell: (303) 589-8886 Home: (303) 989-2850
	Scott Miller, Newmont Project Representative	Office: (303)-837-5469 Cell: (720)-224-3945 Home: (303)-567-2865
	Jennifer Fadden, TtEC Compliance Manager	Office: (360) 598-8108 Cell: (360) 808-2145 Home: NA
	Grey Coppi, TtEC PESM	Office: (973)-630-8101 Cell: (215)-327-0751 Home: NA

13.2 Pre-Emergency Planning

A daily safety and health meeting will be conducted by the ESS prior to the commencement of work. The topics discussed and the names of personnel in attendance will be recorded on a form designed for this purpose (see sample form in Appendix B). Copies of this form will be retained in the job file. In the event of an emergency (except for a tsunami warning), all personnel will egress by the most direct route and gather at the Dotson Cabin (Figure 3-1). In the event of a tsunami warning, all personnel will proceed post-haste to higher ground and then gather at the camp area near the open pit (Figure 3-1).

All site personnel will be instructed in the Site topography, layout, and points of ingress or egress specific to their job site. Weather and wind directions will be noted daily to identify safe routes of evacuation in case of an emergency. The locations of emergency equipment will be discussed. Specific hazards or conditions that may affect the safety and health of workers, and the procedures for mitigating personnel exposure will be reviewed and discussed. Special emphasis will be placed on any changes in site characteristics or procedures that are a result of project activities.

Field personnel will have access to a satellite communications system telephone. Emergency phone numbers and call signs will be posted near all communications devices. Instructions on setup and use will be provided with the equipment.

13.3 Communications

13.3.1 Internal Communications

Intrinsically safe portable 2-way hand-held radios will be used by the work crews to communicate with each other and with the Site supervisor. One designated member of each work crew will be responsible for operating their radio. The radio will be used to communicate the status and location of their work activities to the ESS and to alert the ESS and all other site personnel of emergencies. Radio frequencies will be assigned to the crews at the daily site briefings.

When necessary, such as when noise levels or work activities preclude the use of radios, hand signals will be used to direct site personnel. Each work crew will also be given an air horn to initiate emergency evacuations.

13.3.2 Off-site Communications

A SatCom radio-telephone will be available in the project field office for off-site communications. Instructions in the use of this equipment along with a listing of emergency phone numbers will be posted by this equipment. All site personnel will have ready access to these communication devices.

Boats used on site will have radio communication capability. Boat operators will instruct site personnel on emergency use of boat radios.

13.3.3 Evacuation and Emergency Notification

An air horn will be used to alert site personnel of an emergency. Air horns will be located at each work site, in each vehicle, and at the field office (vessel). The ESS will test the effectiveness of the air horn during initial site activities to ensure that all site personnel can clearly perceive the alarm above operational noise levels. If operational noise levels prevent site personnel from detecting the air horn alarm, other means of notification will be implemented.

One long blast on the air horn will be the signal to evacuate the Site immediately. The initial assembly point for all personnel will be the Dotson Cabin or the existing dock (see Figure 3-1 and Table 13-2), where a head count will be conducted. Repeated short blasts on the air horn will be the signal that a tsunami is imminent; personnel will immediately make for higher ground and then proceed to the Cabin area near the Open Pit, where a head count will be conducted.

Once everyone is accounted for, they will evacuate further to a safe location designated during the daily tailgate safety briefing and the Site EC will assess the situation and outline the actions to be taken. Two short blasts will be the “all clear” signal, indicating that personnel can once again re enter the Site. Table 13-2 presents a summary of air horn signals.

Table 13-2. Summary of Air Horn Signals

Signal	Meaning	Action
1 long blast	Evacuate	Evacuate immediately to the landing area
2 short blasts	All clear	Continue working
Repeated short blasts	Tsunami	Evacuate immediately to the Camp Area near the Open Pit

In the event of an emergency situation, such as a fire, spill, explosion, etc., the Site EC shall immediately:

- Sound evacuation alarm (air horn)
- Secure the scene
- Establish the safety of all personnel, direct the administration of first aid as appropriate
- Shut down all non-essential equipment in proximity to the scene
- Notify appropriate emergency response personnel, such as, emergency response team and applicable off-island emergency support services (i.e., medical)
- Notify the PMs regarding the status of accident and advise them on the need to contact other regulatory agencies
- Provide emergency equipment as appropriate

13.4 Emergency Equipment

As a minimum, the following emergency equipment shall be available:

- First aid and medical emergency supplies per 13.5.2
- Emergency eyewashes that comply with ANSI Z358.1
- Fire extinguishers per section 13.7
- Confined space retrieval equipment
- Spill equipment per Section 13.6
- Global Positioning System (GPS) units and compasses per Section 13.8
- Emergency air horns

13.5 Medical Emergencies

13.5.1 Emergency Medical Procedures

In the event of serious personnel injury (fatality, patient unconscious, possibility of broken bones, severe bleeding, burns, blood loss, shock, or trauma), the first responder shall immediately:

- Administer first aid if qualified; if not qualified, immediately seek out a person qualified to administer first aid
- Notify the Site EC of the name of the individual involved, their location, and the nature of injury

Note: For major or life-threatening injuries, the injury takes precedence over any contamination. When possible, contamination spread should be minimized through decontamination or covering the contamination.

The Site EC, upon receipt of notification of the injury, shall immediately:

- If necessary, call Ketchikan Hospital and arrange for an emergency medical team to be transported to the island to attend to the injured victim
- If necessary, call commercial air carrier or U.S. Coast Guard in Ketchikan to provide emergency transport of medical team and transport of victim to Ketchikan Hospital
- Provide a copy of the injured party's medical data sheet and pertinent MSDS sheets to responding medical personnel
- Designate someone to accompany the injured party to the hospital
- Notify the Tetra Tech PMs and applicable regulatory agencies (i.e., OSHA)
- Complete TtEC's Incident Report and Investigation Form

Minor first-aid injuries that do not require the attention of medical professionals will be treated on-site by first-aid-trained personnel.

13.5.2 Emergency Medical Supplies

The ESS will have emergency first-aid supplies sufficient to treat a minimum of 8 workers. In addition, each job site and site vehicle will have a first-aid kit with a quantity of supplies needed to treat a normal size crew of 2 to 3 individuals. As a minimum, these first-aid kits will contain:

- Adhesive bandages
- Adhesive tape
- Antiseptic wipes
- Dressing pads
- Elastic and stretch bandages
- Disposable latex gloves
- Resuscitation mouth guard
- Eye irrigation solution
- Scissors

- Antiseptic ointment
- Tweezers
- Aspirin
- Gauze pads

13.6 Spill Response Procedures

In the event of a hazardous material spill, the Site EC will mobilize the emergency spill response team (ERT) to the scene and evaluate the nature and extent of the incident. If the spill is small and can be managed with available spill response equipment, the ERT will proceed to contain and control the spilled material. Larger spills that cannot be managed with available resources will be isolated and the spill scene secured until off-island emergency support personnel can respond. The EC will notify the Tetra Tech PMs of the situation as soon as possible. The TtMM PM will, in turn, notify all appropriate outside regulatory agencies, including the National Response Center, the Forest Service OSC, and the ADEC Spill Response Team (Table 13-1).

13.6.1 Spill Response Equipment

The following chemical spill response equipment will be available at the project site:

- 50 pounds of inert powdered absorbent (i.e., vermiculite)
- Spill pads
- Sorbent spill boom
- Dry chemical, acid and base neutralizers
- Plastic shovels and scoops
- Plastic 55-gallon disposal bags
- Drain mats
- Brooms
- Duct tape
- Portable emergency eyewash
- 10-pound portable fire extinguisher
- Disposable poly-tyvek coveralls
- Disposable silvershield gloves
- Chemical protective goggles
- Disposable PVC boot covers

These items will be stored in an appropriate container at the work site. Response equipment will be replenished immediately after each use. The ESS or designee will inspect spill equipment stores each week.

13.6.2 Spill Notification Requirements

Any release of a hazardous substance, oil in excess of 55 gallons, and/or oil to water must be reported immediately to the local ADEC Spill Response Team office, located in Juneau. Any release of oil in excess of 10 gallons but less than 55 gallons must be reported to ADEC Division of Spill Prevention and Response (2009) within 48 hours. Immediately after telephone notification, a Spill Report Form must be submitted to ADEC by facsimile, hand delivery, or first class mail. Small discharges of oil (1 to 10 gallons) must be logged and submitted to ADEC on a monthly basis.

Discharges of oil into navigable waters in any quantities that may be harmful must also be immediately reported to the National Response Center. These quantities include discharges that violate applicable water quality standards, cause a film or "sheen" upon, or discoloration of the surface of the water or adjoining shorelines, or cause a sludge or emulsion to be deposited beneath the surface of the water or upon adjoining shorelines.

Within 15 days after the cleanup is completed, or if no cleanup occurs, within 15 days after the discharge, an Oil & Hazardous Materials Incident Final report must be submitted to the Juneau ADEC office at

Division of Spill Prevention and Response
Department of Environmental Conservation
410 Willoughby Ave., Ste. 303
P.O. Box 111800
Juneau, AK 99811-1800.

13.7 Fires

Fire protection and prevention systems will be incorporated in accordance with EM 385-1-1, Section 9. Minimum 2A, 10BC type ABC fire extinguishers will be placed in each work site where fire hazards exist. Portable fire extinguishers will be available on the vessel and site vehicles. These are generally 5 lb. in vehicles, 10 lb. for work sites, and 20 lb. for flammable liquid storage areas. All site crews will be trained in their use. Portable fire extinguishers will be used to extinguish small, localized fires only. Large fires that cannot be extinguished with this equipment will necessitate evacuation of the burning structure or job site. The first person to arrive at a fire scene will determine the magnitude of the fire hazard and either attempt to quell the fire with a fire extinguisher or initiate emergency evacuation procedures. The ESS will be notified immediately of all fire events and coordinate subsequent fire-fighting efforts. The ESS will also make appropriate notifications to air evacuation if demobilization is necessary. Fire extinguishers will be checked monthly to ensure they are in good working order. Smoke detectors will be installed in the living quarters and storage areas. All personnel will be trained in the proper use and maintenance of the smoke detectors.

13.8 Adverse Weather

Weather conditions on Prince of Wales Island are typically cold, wet, and windy and sometimes punctuated by severe winds. In the event of such extreme weather, the ESS working with the FM will determine if work can continue without jeopardizing the health and safety of field workers. If not, work will be suspended and crews will take shelter in secure location until weather conditions improve and work can resume. Some of the items to be considered prior to determining if work should continue are:

- Extreme cold and wind
- Heavy precipitation
- Limited visibility
- Potential for accidents or damage to site structure and equipment

The ESS will monitor weather forecasts daily when assessing field conditions. Imminent severe weather events will be communicated to site personnel.

Adverse weather at the Site can include thick fog that could hamper visibility. At the discretion of the ESS, field crews working in remote locations will be issued radios and may be issued GPS units or compasses to use in the event of thick fog. The ESS will train the crew in the proper use of the instruments. The coordinates for the base camp will be identified prior to the crews' departure. In the event that the Site becomes fogged in, the crew will be called back to the camp if necessary. If the crew becomes disoriented, they will radio the base with their coordinates and await retrieval. Air horns may not be useful in locating lost crews due to the possibility of echoes from the surrounding terrain.

13.9 Tsunami

In the unlikely event of a large earthquake occurring in the vicinity of Prince of Wales Island, there is a possibility that a tsunami could strike the island. This hazard will be addressed by having site management monitor weather alerts on the radio for tsunami events and initiating evacuation procedures if a tsunami strike is imminent. Repeated short blasts of the airhorn will be the signal to evacuate the Site and proceed to the Camp Area located near the Open Pit at the top of the Site. All site vehicles will be mobilized to transport site personnel to the staging area. Once the tsunami hazard has passed, the ESS will signal two short blasts on the air horn and normal site operations will resume. Any emergency notification would be made to the Site by the Ketchikan Department of Emergency Services.

13.10 Incident Reporting, Critique and Follow Up

After each emergency incident, the PM will prepare an incident report describing the event and the response measures that were taken in accordance with Section 11.5.

13.11 Unexploded Ordinance/Explosives

There have been no reports of UXO at the Site. In the unlikely event that UXO is identified in the field, all work shall stop immediately. The location of the UXO will be marked and the Site will be barricaded or isolated at least 300 feet to restrict access. A sign will be placed in the area identifying it as a UXO area. The ESS will be contacted immediately and to identify it as a UXO area. The ESS will notify the FM and the PESM. They, in turn, will contact the PMs whom will notify the Newmont Representative. In addition, the TtEC UXO Manager will be notified (Dave Keller (425) 482-7749). Work will not commence at that specific site until a resolution has been agreed upon with the Newmont PM, Tetra Tech PMs, PESM, and TtEC UXO Manager.

13.12 Earthquakes

Prince of Wales Island lies in a tectonically active area. There is a potential for earthquakes. If an earthquake occurs, the following guidance from the Federal Emergency Management Association should be followed:

13.12.1 During Earthquake

If indoors:

- Take cover under a piece of heavy furniture or against an inside wall and hold on
- Stay inside
- The most dangerous thing to do during the shaking of an earthquake is to try to leave the building because objects can fall on you

If outdoors:

- Move into the open, away from buildings and other items that can fall
- Once in the open, stay there until the shaking stops

If in a moving vehicle:

- Stop quickly and stay in the vehicle
- Move to a clear area away from buildings and other items that can fall
- Once the shaking has stopped, proceed with caution. Avoid bridges or areas that might have been damaged by the quake.

After Earthquake


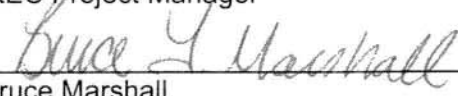
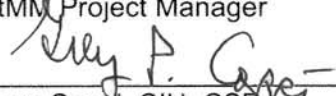
- Be prepared for aftershocks. (Although smaller than the main shock, aftershocks cause additional damage and may bring weakened structures down. Aftershocks can occur in the first hours, days, weeks, or even months after the quake.)
- Help injured or trapped persons.
- Give first aid where appropriate. Do not move seriously injured persons unless they are in immediate danger of further injury. Call for help.

13.13 Hypothermia

Hypothermia is initially characterized by uncontrolled shaking. If not corrected, it can lead to unconsciousness and death. Prevention and actions to take in the case of hypothermia are provided in the Cold Stress Physical Agent Data Sheet (PADS). At temperatures of 36°F or less, workers who become immersed in water or whose clothing becomes wet shall immediately be provided a change of clothing and treated for hypothermia.

14.0 SAFETY AND HEALTH PLAN APPROVAL

This SSHP has been reviewed and hereby approved. By their signatures, the following undersigned certify that this SSHP meets the requirements of 29 CFR 1910.120 and other applicable regulations for the protection of the safety and health of all persons entering upon this site.

 _____ Gary Drendel TtEC Project Manager	<u>6/10/09</u> _____ Date
 _____ Bruce Marshall TtMM Project Manager	<u>6/9/09</u> _____ Date
 _____ Grey Coppi, CIH, CSP TtEC Project Environmental Safety Manager	<u>6/10/09</u> _____ Date

15.0 SAFETY AND HEALTH PLAN CERTIFICATE OF WORKER/VISITOR ACKNOWLEDGMENT

Project Name: Ross-Adams site EE/CA and Risk Assessment
Project Address: Ross-Adams site, Prince of Wales Island, Alaska
Contractor's Name:
Worker/Visitor Name:

The contract for the above project requires the following: that you be provided with and complete formal and site-specific training; that you be supplied with proper personal protective equipment; that you be trained in its use; and that you receive a medical examination to evaluate your physical capacity to perform your assigned work tasks, under the environmental conditions expected, while wearing the required personal protective equipment. These things are to be done at no cost to you. By signing this certification, you are acknowledging that your employer has met these obligations to you.

I HAVE READ, UNDERSTAND, AND AGREE TO FOLLOW THE SITE SAFETY AND HEALTH PLAN FOR THIS SITE.

Name Date

FORMAL TRAINING: I have completed the following formal training courses that meet OSHA's requirements:

Date Complete

40 hour: _____
8 hour supervisory: _____
8 hour refresher: _____

SITE-SPECIFIC TRAINING: I have been provided and have completed the Site-specific training required by this Contract. The Environmental Safety Supervisor conducted the training.

MEDICAL EXAMINATION: I have had a medical examination within the last twelve months which was paid for by my employer. The examination included health history, pulmonary function tests, and may have included an evaluation of a chest X-ray. A physician made a determination regarding my physical capacity to perform work tasks on the project while wearing protective equipment. I was personally provided a copy and informed of the results of that examination. My employer's industrial hygienist evaluated the medical certification provided by the physician and checked the appropriate blank below. The physician determined that there:

- _____ were no limitation to performing the required work tasks;
- _____ were identified physical limitations to performing the required work tasks.

Date Medical Exam Completed: _____

[Employee's][Visitor's] Signature _____

Date _____

Printed Name _____

Social Security Number _____

Contractor's Environmental Safety Supervisor Signature _____

Date _____

Printed Name _____

Social Security Number _____

16.0 REFERENCES

- Alaska Department of Environmental Conservation (ADEC), Division of Spill Prevention and Response (SPAR), 2009. <http://www.dec.state.ak.us/spar/index.htm>
- Kent & Sullivan, Inc., 2004, *2004 Preliminary Assessment/Site Inspection Report, Ross Adams Uranium Mine, Prince of Wales Island, Alaska*, prepared for U.S. Department of Agriculture, Forest Service, Alaska Region, KSI Project No: 25-10, December 30.
- Tetra Tech, Inc., 2009a. *Sampling and Analysis Plan*, prepared for Newmont USA Ltd., May.
- Tetra Tech, Inc., 2009b. *Quality Assurance Project Plan*, prepared for Newmont USA Ltd., May.
- U.S. Bureau of Land Management (BLM), 1998, *Final Report Removal Preliminary Assessment, Bokan Mountain Mine, Craig Ranger District, Tongass National Forest, Region 10-Alaska*, 50 p.
- U.S. Forest Service (USFS), 2009, *Administrative Settlement Agreement and Order on Consent for Engineering Evaluation/Cost Analysis*, United States Department of Agriculture *in the matter of* Ross Adams Mine Site, Tongass National Forest, Newmont USA Limited and Dawn Mining Company (Respondents), April 17.

**APPENDIX A
RADIATION SAFETY MANUAL FOR
ROSS-ADAMS SITE INVESTIGATIONS**

Radiation Safety Program for Environmental Site Investigations at the Ross Adams Mine Site, Tongass National Forest, Prince of Wales Island, Alaska

Revision 1

Prepared for:

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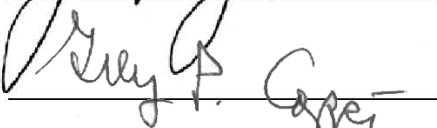

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June 5, 2009

APPROVALS

This Radiation Safety Manual for Environmental Site Investigations at the Ross Adams Mine has been reviewed and approved by the following:

Name	Title	Date
 _____	Radiation Safety Officer _____	6/9/09 _____
 _____	Health and Safety Officer _____	6/10/09 _____
 _____	Project Field Manager _____	6/9/09 _____

Changes to the Ross Adams Radiation Safety Program as described in this Radiation Safety Manual, must be reviewed and approved by the above project personnel

One controlled hard copy of the Radiation Safety Manual will be maintained by the Radiation Safety Officer (RSO) and one will be maintained by Newmont USA Limited.

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- Attachment 2: Example Personal Exit Survey Form

DEFINITIONS: ACRONYMS, TERMINOLOGY, AND UNITS

ALARA	Acronym for “as low as reasonably achievable”, keeping doses to workers and members of the public as far below regulatory dose limits as is practicable, given the work that must be accomplished.
Alpha (α)	Alpha radiation in the form of a relatively large charged particle ejected from the nucleus of an unstable atom. An alpha particle contains two protons and two neutrons (no electrons), equivalent to the nucleus of a helium atom. It carries a 2+ charge and is thus highly effective at ionizing or “stripping” large numbers of electrons from atoms in the vicinity of its path of travel.
Beta (β)	Beta radiation in the form of a relatively small charged particle ejected from the nucleus of an unstable atom. Beta particles carry a 1- charge and are indistinguishable from electrons except that they originate in the nucleus. Some radionuclides decay with a beta particle that carries a 1+ charge (known as a positron). Smaller and carrying less charge than alphas, betas will ionize far fewer atoms per unit length of travel and as a result, are more penetrating in matter versus alpha particles.
Bq	Becquerel (Bq), a Système International (SI) unit definition of a quantity of radioactivity equal to 1 radioactive transformation per second. See <i>Curie</i> for equivalent traditional units of radioactivity.
CDE	Committed Dose Equivalent, absorbed dose in a given tissue or organ following an intake of radionuclides into the body, adjusted with a radiation weighting factor to account for the relative effectiveness of the type of radiation involved at producing detrimental biological effects, and with biological retention and radioactive decay properties considered to determine the total future committed dose to the affected tissue or organ over the remaining lifetime of the person (usually evaluated as a 50-yr dose commitment).
CFR	Code of Federal Regulations
Curie (Ci)	Curie (Ci), a traditional unit of measure of a quantity of radioactivity, defined as 3.7×10^{10} radioactive transformations per second. Because 1 becquerel (Bq) = 1 radioactive transformation per second (see <i>Bq</i>), the Système International (SI) unit equivalent of the curie is 3.7×10^{10} Bq. One curie is also approximately equal to the amount of radioactivity in 1 gram of pure Ra-226.
d/m-100cm ²	Radioactive decays per minute per 100 square centimeters. Commonly used in a context of evaluating the degree of radioactive contamination present on the surfaces of work areas, equipment, etc.
Dose	Unless otherwise specified or implied by use of special units, dose refers to “absorbed” dose: the average energy absorbed (imparted) from incident ionizing radiation within a specified mass of matter. Defined for any type of radiation and any material, but for the purposes of this manual the term is generally used in a context of energy deposited in human tissue. The fundamental units of dose are joules of energy absorbed per kilogram of tissue [1 J/kg = 1 Gray (SI units) = 100 rad (traditional units)].

Gamma (γ)	Gamma radiation, a form of electromagnetic radiation (see <i>photons</i>) that originates in the nucleus of an unstable atom. Similar to x-rays, but differs with respect to place of origin (the nucleus versus orbital electron shells) and has higher kinetic energies versus x-rays. Gamma radiation and x-rays are highly penetrating in matter as they have no mass or charge. Both have sufficient kinetic energy to result in ionization of electrons from atoms, but unlike charged particles (see <i>alpha</i> and <i>beta</i>) they are not considered directly ionizing because electrical coulomb forces are not involved in such interactions, only transfer of kinetic energy.
GM	Geiger Muller Detector, a radiation measurement instrument sensitive to both gamma and beta radiation. Often used for detection of beta contamination in area or equipment surveys.
Half Life	The amount of time required for an initial quantity of a radioactive element to decay to one half of its initial amount. Half lives for radioactive elements range from fractions of a second to billions of years. The shorter the half life, the more radioactive the nuclide.
ICRP	International Commission on Radiation Protection and Measurements
Ion	An atom with more or fewer electrons than protons; a charged atom
Ionizing radiation	Radiation with sufficient energy to strip an electron from an atom to form an ion
Isotopes	Nuclides or atoms with the same number of protons in their nuclei (i.e. the same element in the periodic chart), but having different numbers of neutrons in their nuclei.
mg	Milligram, a unit of mass, equivalent to 0.001 gram
mrem	Millirem, a unit of dose to human tissue, equivalent to 0.001 rem (see <i>rem</i>)
NRC	U.S. Nuclear Regulatory Commission
NVLAP	National Voluntary Laboratory Accreditation Program
Nuclide	Generic term for atoms with specific numbers of protons and neutrons
OSHA	Occupational Safety and Health Administration
OSL	Optically Stimulated Luminescent Dosimeter, a small device for monitoring external radiation doses.
pCi/L	Picocuries per liter, a unit of radioactivity concentration equivalent to 1×10^{-12} Ci/L (see <i>Curie</i>).
Photon	A fundamental quantum or discrete "wave-packet" of light or other form of electromagnetic radiation that exhibits properties of a particle but has no rest mass or electronic charge, and travels with a velocity equal to the speed of

light in empty space. Like all particles in motion, photons exhibit particle-wave duality properties. Photons with wavelengths shorter than 100 nanometers (x-rays and gamma radiation) can have sufficient kinetic energy to result in the indirect ionization of electrons from atoms.

Radiation	For the purposes of this Radiation Safety Manual, the term “radiation” refers to ionizing radiation unless otherwise specified, and is defined as any elementary particle or photon emitted from a source and having sufficient electrical coulomb forces and/or kinetic energy to eject an electron from an atom as a result of an interaction between the incident particle and the atom.
Radiation Worker	Any person who in the course of their occupation is likely to receive an annual effective dose in excess of 100 mrem, excluding background and medical radiation doses. Member of the public means any individual except when that individual is receiving an occupational dose (10 CFR 20).
Radioactivity	The spontaneous emission of radiation from an unstable atom, generally in the form of alpha or beta particles from the nucleus, often accompanied by emission gamma rays from the nucleus or x-rays from orbital electron shell transitions.
Radionuclide	A nuclide that is unstable and decays by emitting ionizing radiation.
rem	A modified unit of absorbed dose to human tissue, adjusted with a radiation weighting factor to account for the relative effectiveness of the type of radiation involved at producing detrimental biological effects, and for internal doses, further adjusted with a tissue weighting factor to account for the relative radiosensitivity of the tissue or specific target organs in question. The term is derived from the phrase “Roentgen Equivalent Man”. In equivalent Système International (SI) units, 1 rem = 0.01 Sievert (Sv).
Roentgen	A unit of measurement for ionizing photon radiation (gamma radiation and x-rays), defined as the absorbed dose rate to air at a specific point of interest. One roentgen of absorbed dose to dry air produces an electrostatic charge of 2.58×10^{-4} coulombs per kilogram due to ionizations. The roentgen is often referred to as “exposure rate” in air in a context of a location at which a person may be present and subject to potential external doses.
RSO	Radiation Safety Officer
SSHP	Site Safety and Health Plan
TEDE	Total Effective Dose Equivalent, the sum of the deep-dose equivalent (DDE) for external exposures, and the committed effective dose equivalent (CEDE) for internal exposures. Expressed in units of rem or Sievert (see <i>rem</i>).
	DDE = dose equivalent at tissue depth of 1 cm for external whole-body exposure (in units of rem or Sv)

CEDE = sum of products of all committed dose equivalents for affected organs (CDE values in units of rem or Sv) multiplied by respective radiation tissue weighting factors.

TLD Thermoluminescent Dosimeter, a small device for monitoring external radiation doses.

USFS United States Forest Service

WL Working level, a measure of exposure to short-lived radon decay products in air. Defined as any combination of short-lived decay products of radon in 1.0 liter of air under ambient temperature and pressure that will ultimately result in the emission of 130,000 MeV of alpha particle energy. Approximately equal to 100 pCi/L of Rn-222 in equilibrium with its short-lived decay products (Po-218, Pb-214, Bi-214, and Po-214)

WL_c Working level concentration, a measure of the concentration of radon decay products in air, expressed in terms of working level (WL):

$$WL_c = \text{measured radon conc.} \left(\frac{\text{pCi}}{\text{L}} \right) \times \text{equilibrium ratio} \times \left(\frac{1 \text{ WL}}{100 \frac{\text{pCi}}{\text{L}}} \right)$$

WLM Working Level Month, a measure of exposure to a given working level concentration (WL_c) in one working month (170 hours).

μR/hr Micro-roentgen per hour (one millionth of a roentgen, see *roentgen*).

1.0 OVERVIEW OF RADIOLOGICAL HAZARDS

The Ross Adams Site is a former uranium mine located in the Bokan Mountain area of the Tongass National Forest in southeast Alaska, near the southern end of Prince of Wales Island. Extraction of uranium ore at the site ceased in about 1971. Current site conditions consist of mine related features including old buildings and waste rock piles as well as undisturbed areas, some of which are known to have natural uranium mineralization present at or near the ground surface. In addition, certain areas within and near the site are being actively explored for potential future commercial uranium mine development. Some important site features depicted from a previous study (Kent & Sullivan, 2004) are illustrated in Figure 1.

According to data from Kent and Sullivan, Inc., (2004), areas of the Ore Staging Area, the 300-foot, 700-foot, and 900-foot level waste rock dumps, the open pit mine area, and certain portions of haul roads have areas where gamma exposure rates exceed 1,000 $\mu\text{R/hr}$ (Figure 1). Elevated radioactivity levels present at the site are due to elevated concentrations of naturally occurring radionuclides in terrestrial materials, primarily those associated with the uranium-238 and thorium-232 radioactive decay series (Figure 2).

Many of the decay chain radionuclides shown in Figure 2 emit gamma radiation in addition to the particulate radiation emission types listed (α or β particles). All three forms of ionizing radiation are thus present at the site. Additional sources of gamma radiation include cosmic sources and potassium-40 in soils and rocks, but the most ubiquitous local sources of gamma radiation are the short lived decay products within these two decay series (Pb-214 and Bi-214 from the U-238 series, and Ac-228, Pb-212, and Tl-208 from the Th-232 series). These sources of gamma radiation are of potential concern with respect to external radiation doses.

The U-238 and Th-232 decay series each include an isotope of radon, an inert gas (Rn-222 in the U-238 series; Rn-220, also known as thoron, in the Th-232 series). Radon gas itself is not a significant health hazard since it is an inert gas and is inhaled and exhaled with little interaction with body tissues. However the alpha emitting radon daughter products are an inhalation hazard because they exist in solid form, and have a strong ionic affinity for dust particles in air that can be adsorbed onto the lining of the lungs when inhaled. In direct contact, alpha radiation can damage living cells in lung tissue. In outdoor environments, radon is usually not a significant concern as radon daughters tend to mix rapidly with ambient air to become highly diluted, but near mine portals or waste rock piles, radon concentrations can be high.

Additional radiological inhalation hazards at the site may exist if conditions are dry and windy. Blowing dust raises the potential for inhalation of radionuclides and direct doses to the lung. When cleared from the lung to enter the digestive system, other internal tissues may also receive radiation doses. Other potential radiological hazards at the site include accidental ingestion of radionuclides or intake through open wounds on the skin surface. Radiological doses to workers will be monitored under this program, and radiological hazards will be minimized with a combination of radiation safety training and mandatory adherence to safe working practices and procedures contained in this radiation safety plan.

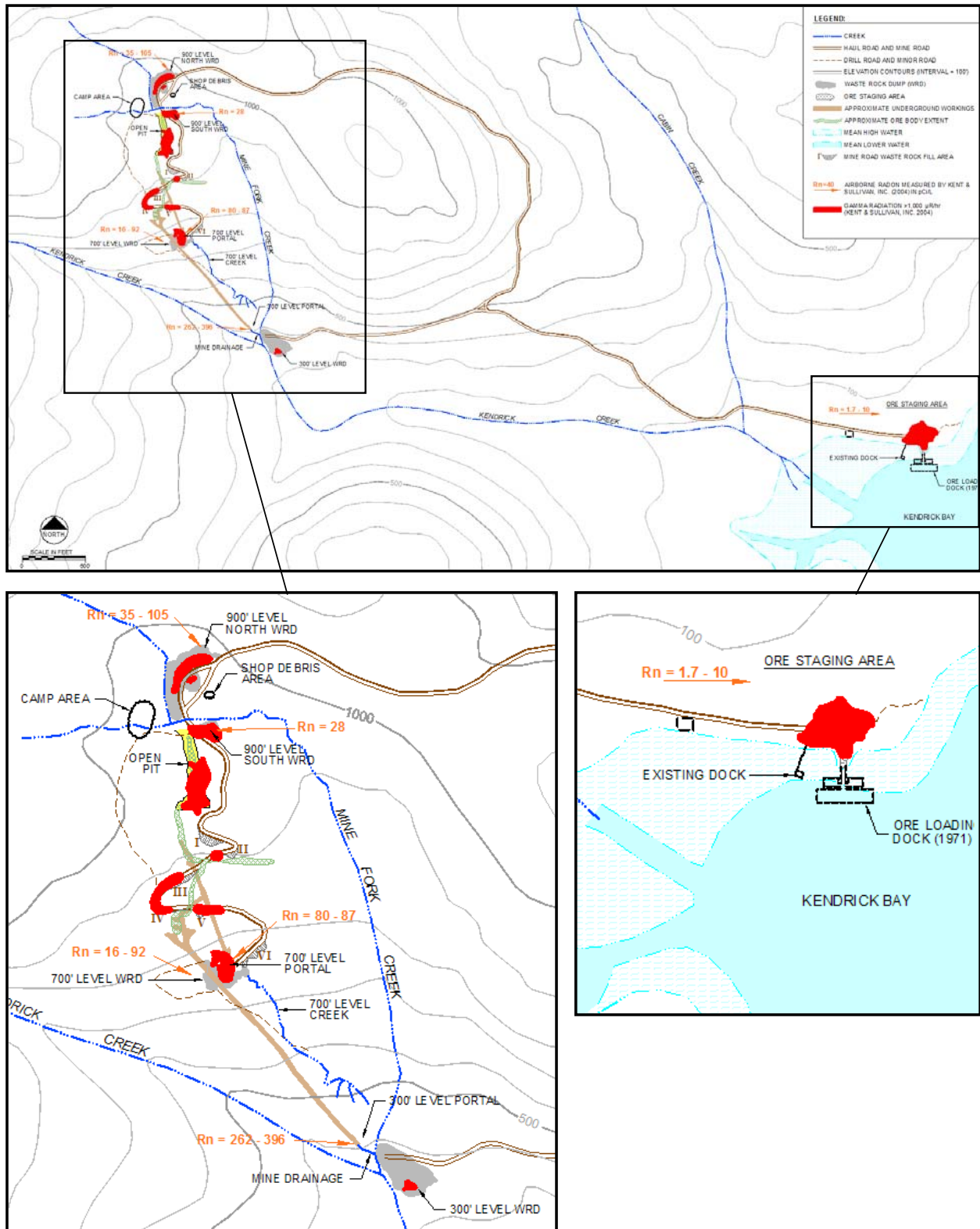


Figure 1. Site map showing access roads, mine features, and some radiological data measured by Kent and Sullivan, Inc. (2004). Areas in red are reported to have gamma exposure rates in excess of 1,000 µR/hr

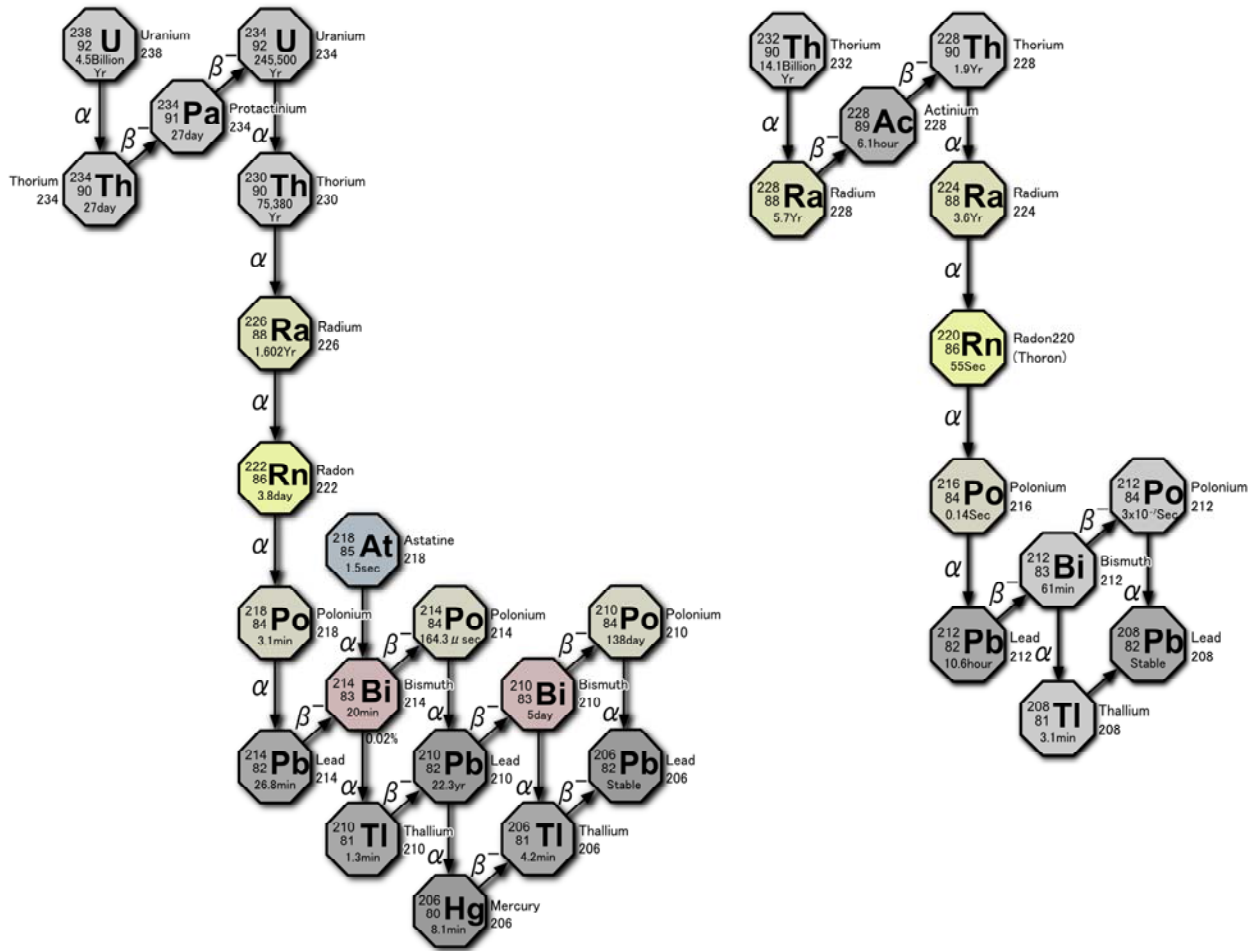


Figure 2. Radioactive decay series for U-238 (left) and Th-232 (right).

2.0 RADIATION DOSE LIMITS

The Ross Adams site is not licensed with the U.S. Nuclear Regulatory Commission (NRC), nor is it an active mine site. Occupational Safety and Health Administration (OSHA) regulations for protection from ionizing radiation (29 CFR 1910.1096) are applicable for this site and scope of work. A summary of OSHA occupational dose limits is as follows:

- 1.25 rem per quarter (5 rem/yr) Dose Equivalent to whole body, blood-forming organs, lens of eyes, or gonads.
- Total accumulated Dose Equivalent to whole body may not exceed $5 \times (N-18)$ rem, where "N" equals age in years.
- 7.5 rem per quarter (30 rem/yr) Dose Equivalent to Skin of whole body.

While these OSHA dose limits apply, NRC regulations regarding radiation protection (10 CFR 20) are based on more recent scientific recommendations (ICRP 26, 1977; ICRP 30, 1978) and in some cases are more restrictive. NRC dose limits will be adopted for this work to comply with both sets of standards and to ensure that workers and the public are protected in accordance with all applicable regulatory criteria as well as with more recent scientific recommendations. The 10 CFR 20 occupational dose limits for radiation workers are as follows:

- 5 rem per year Total Effective Dose Equivalent (TEDE)
- 50 rem per year committed dose equivalent (CDE) to any single organ
- 50 rem per year to the skin of the whole body
- 15 rem per year to the lens of the eye
- 0.5 rem to the fetus for the period of gestation
- Less than 10 mg soluble uranium intake in any one week.

The 10 CFR 20 dose limits for members of the public are as follows:

- 100 mrem per year (maximum dose from all sources attributable to an operating licensed facility; 10 CFR 20.1301)
- 25 mrem per year [license termination standard for unrestricted use (10 CFR 20.1402), excluding doses from radon (Federal Register, July 22, 1997, pg. 39083)].

In addition to these dose limits, radiation doses must be kept as low as reasonably achievable (ALARA). Any females that may visit or work at the site during this project will require special radiation safety training with respect to prenatal exposures. The uranium intake limit is based on chemical toxicity. The primary potential pathway for uranium intake is inhalation of airborne dust generated from mine waste deposits. The Field Manager will have authority to suspend work should airborne dust become a concern (see Section 3.2).

3.0 POTENTIAL DOSES

Potential doses of ionizing radiation to individuals performing site investigation activities will include both external and internal exposure pathways as described in Section 1.0. This radiation safety program is designed to protect workers and to ensure that any potential doses are kept well below occupational dose limits for radiation workers, and are further kept to levels that are ALARA. It also contains provisions to protect the general public by ensuring that contamination is not spread offsite by personnel or equipment during the course of this work.

The occupational dose limit of 5 rem/yr (5,000 mrem/yr) has been set by the U.S. Nuclear Regulatory Commission (NRC) in 10 CFR 20 to limit the hazard to radiation workers from long term radiological health risks to levels commensurate with risks from “safe” industries. These risks include the development of certain cancers as well as genetic effects. Occupational standards are based on a concept of informed risk versus benefit, where no exposure is justified unless a direct benefit is accepted with informed knowledge of the potential risks.

Various scientific and regulatory agencies have attempted to quantify the health “risks” of radiation doses. Such estimates are based on epidemiological studies at higher doses and pertain to populations rather than individuals. Various risk factors have been proposed by different agencies for making recommendations on radiation protection and for developing regulations. To put radiation health risks in perspective relative to ordinary everyday risks and common industries that are considered “safe”, corresponding estimates of loss of life expectancy from the NRC (1994) are shown in Table 1.

Table 1. Relative risks of lifespan reduction from occupational radiation doses compared to ordinary risks as well as industries generally considered to be “safe” or acceptable.

<i>Health Risk</i>	<i>Estimate of Life Expectancy Lost (average)</i>	<i>Industry Type</i>	<i>Estimated Days of Life Expectancy Lost (Average)</i>
Smoking 20 cigarettes a day	6 years	All industries	60
Overweight (by 15%)	2 years	Agriculture	320
Alcohol consumption (U.S. average)	1 year	Construction	227
All accidents combined	1 year	Mining and Quarrying	167
Motor vehicle accidents	207 days	Transportation and Public Utilities	160
Home accidents	74 days	Government	60
Drowning	24 days	Manufacturing	40
All natural hazards (earthquake, lightning, flood, etc.)	7 days	Trade	27
Medical radiation	6 days	Services	27
Occupational Exposure			
0.3 rem/y from age 18 to 65	15 days		
1 rem/y from age 18 to 65	51 days		

There is no scientific evidence of measurable increases in cancer incidence at radiation dose levels commensurate with current regulatory radiation dose limits (NRC, 1994), nor with exposure to radiation levels in areas of high natural background such as those found at the Ross Adams site.

Regulatory dose limits for members of the general public are lower (100 mrem/yr), primarily because the models used as the basis for dose standards suggest a possibility that any exposure, no matter how small, carries some risk. Furthermore, public exposures may be involuntary, the public may not receive a direct benefit from such exposures, and the public is not afforded the same monitoring or training with respect to radiological risks and radiation safety.

3.1 External Dose

The primary pathway for radiation doses to workers during the onsite investigation at the Ross Adams site will be from external exposure to gamma radiation. To illustrate the potential magnitude of external doses that could be received during work planned for calendar year 2009, exposure rate data for various onsite areas (from Kent and Sullivan, 2004) are compiled in Table 2, along with corresponding dose estimates based on conservative assumptions about the total amount of time that could be spent in these areas.

Table 2. Estimated potential for external doses to workers from gamma radiation

Area	Range of Radiation Across Area ($\mu\text{R/hr}$)	Hours per day at each Location (hr)	Days on site (days)	Total hours per Location (hr)	Estimated Maximum Effective Dose ¹ (mrem)
Ore Staging Area	100 - 7,000	2	30	60	149
300-ft Level WRD	100 – 1,000	1	30	30	12
700-ft Level WRD	200 – 4,000	1	30	30	44
900-ft Level North WRD	100 – 2,000	1	30	30	22
900-ft Level South WRD	200 – 1,000	1	30	30	13
Open Pit Mine Area	200 – 2,000	1	30	30	23
Haul Road	100 – 1,000	1	30	30	12

Total Effective Dose (mrem) = 274

¹Assumes average exposure rates and a dose conversion factor of 0.7 mrem/mR (UNSCEAR, 2000)

The estimated total effective dose from external sources under these assumptions is about 274 mrem, less than 10% of the annual occupational dose limit of 5,000 mrem/yr (10 CFR 20). This value is likely an overestimate of the potential for external dose as it is not anticipated that the work will require any individual worker to spend this amount of time each working day in these higher gamma field areas. Much of the work will be conducted away from such areas.

For comparison, the average person in the United States receives about 620 mrem/yr of total effective dose from natural background sources (mostly indoor radon), medical procedures, consumer products, and occupational exposures (NCRP Report 160, 2009). If a person were to spend 8 hours per day in the maximum gamma field listed above (7,000 $\mu\text{R/hr}$) for 30 days, the total external dose would be about 1,176 mrem, or about 23% of the annual occupational dose limit for radiation workers.

Despite the low potential for workers to receive external doses in excess of regulatory limits during this project, all workers must comply with the provisions of this radiation safety plan, including foundational ALARA protocols for minimizing the amount of time needed to complete

necessary work in higher radiation fields, and maximizing distance from such fields wherever possible. All site workers will wear personal dosimeter badges to monitor actual external radiation doses throughout the project (see Section 7.1).

“Caution Radiation Area” signage is currently posted at certain locations at the site. Additional radiation area signage will be posed as needed at any readily accessible identified locations where gamma exposure rates are in excess of 5,000 $\mu\text{R/hr}$ to further notify workers and visitors and to comply with OSHA requirements [as required for areas with potential for doses > 5 mrem in any one hour per 29 CFR 1910.1096(d)(3)(ii) and 1910.1096(e)(2)].

3.2 Internal Dose

The potential pathways for internal doses to workers during field investigations at the Ross Adams site include intakes of radionuclides into the body by inhalation, ingestion, or intake through open wounds. Of these pathways, inhalation poses the largest risk. The potential for accidental ingestion or intake through skin can be essentially eliminated by good hygiene combined with avoidance of eating, drinking, and use of tobacco products in contaminated areas, along with use of protective medical dressings and proper clothing to cover any abrasions or cuts that may occur during the course of the field work.

A number of locations at the site are expected to have airborne radon concentrations that exceed levels in unmineralized areas. Table 3 presents reported radon concentration ranges at various locations as measured by Kent and Sullivan (2004). The table also provides conservative estimates of the amount of time workers could spend at these locations, along with corresponding estimates of radon Working Level concentrations (WL) and potential radon exposures expressed in Working Level Months (WLM). A daughter/radon equilibrium ratio of 0.7 for outdoor environments (NCRP, 1987) was used for these calculations.

Table 3. Estimated potential for doses to workers from radon exposure

Area	Radon Concentration (pCi/L)	Hours per day per Location (hr)	Total Hours in 30 days (hr)	WL ¹	WLM
Ore Staging Area	1.7 – 10	2	60	0.04	0.014
300-ft Level Adit	262 – 396	0.5	15	2.30	0.200
700-ft Level WRD	16 – 92	1	30	0.38	0.066
700-ft Level Adit	80 – 87	0.5	15	0.58	0.051
WRD	35 – 105	1	30	0.49	0.085
WRD	28	1	30	0.20	0.034
900-ft Level Stope	24	0.25	7.5	0.17	0.007
Shaft	40	0.25	7.5	0.28	0.012

$$\text{Number of WLM's} = \boxed{0.47}$$

$$\text{Effective Dose}^2 \text{ (mrem)} = \boxed{234}$$

¹Based on average Rn conc. and a daughter/Rn equilibrium ratio of 0.7 (NCRP, 1987)

²Based on a dose conversion factor of 500 mrem/WLM for workers (ICRP 65)

The annual limit on the radon daughter exposure for radiation workers is 4 WLM/yr. Using a dose conversion factor of 500 mrem/WLM (ICRP 65, 1994), the effective dose from exposure to radon daughters under the above scenario is about 234 mrem. This value is likely to be an overestimate of the actual potential for radon dose. It is not anticipated that the work will require personnel to spend this much time working in these particular areas. Entering mine portals or similarly enclosed areas is prohibited. In addition, the equilibrium ratio used in the above calculation is appropriate for global radon but the actual ratio for locally generated radon concentrations would be significantly lower.

Regarding inhalation hazards associated with windblown dust, this region of Alaska is known to have a moist, humid, cool climate much of the year. Significant generation of dust by dry windy conditions may be an unlikely circumstance. The Field Manager will have the authority to stop work if such conditions develop to the point where airborne dust generation is readily visible and becomes a concern. Physical dust suppression measures (e.g. area watering trucks) will not be available during this project. Dust masks are not considered to be respiratory protection against inhalation hazards, but may provide a degree of worker comfort in moderately dusty conditions.

4.0 RADIATION SAFETY PROGRAM MANAGEMENT

4.1 Radiation Safety Officer

The Radiation Safety Officer (RSO) is responsible for developing the Radiation Safety Program for this work, overseeing related worker training, enforcing compliance with radiation protection policies, and general advising in all matters related to radiological health and safety, including emergency situations. The RSO for the Ross Adams site investigation work is:

Dr. Janet Johnson, PhD, CHP, CIH
Mobile: (970) 481-5101
Home: (970) 963-1195
Email: janetj@sopris.net or janet.johnson@tetrattech.com

4.2 Field Manager

The Field Manager is responsible for day-to-day implementation of the Radiation Safety Program in the field. The Field Manager reports to the RSO, and is responsible for ensuring proper routine monitoring of personnel and equipment during the field work as well as enforcing compliance with all protocols set forth in this Radiation Safety Program. This includes worker radiation safety training, documentation of all applicable monitoring and procedures, and ensuring that the ALARA Policy is communicated to all employees. The Field Manager is responsible for suspending activities at the site, if necessary, to maintain safe conditions and ensure compliance with the Radiation Safety Program and all applicable federal regulations. The Field Manager for the Ross Adams site investigation work is:

Randy Whicker, MS
Mobile: (970) 556-1174
Home: (970) 484-5144
Email: randy.whicker@tetrattech.com

4.3 Dosimetry Program Coordinator

The project dosimetry program will be managed and implemented by Tetra Tech's Health and Safety Coordinator out of the Fort Collins, Colorado office, who will be responsible for handling badge ordering, issuance, collection, and record-keeping for all personnel, as well as badge shipping to a dosimetry services vendor (U.S. Dosimetry) for analysis, and forwarding of results to the RSO. The project Dosimetry Program Coordinator is:

Tory Fravel
Phone: 970-223-9600
Email: tory.fravel@tetrattech.com

4.4 Workers

Workers are responsible for reading and understanding this Radiation Safety Plan, attending required radiation safety training, and complying with all specified radiation protection and safety rules. Workers are responsible for incorporating ALARA work practices into job functions and work performance and for bringing ALARA concerns to the attention of the Field Manager and/or the RSO.

4.5 Contractors

Contractors are responsible for attending required radiation safety training prior to conducting onsite work and for following all radiation safety and general safety procedures.

4.6 Site Visitors

Site visitors will be required to attend a radiation safety briefing that is commensurate with intended activities prior to entering the site. The Field Manager will conduct such briefings.

5.0 RADIATION SAFETY TRAINING

Radiation Safety Training is required for all site workers and contractors. The RSO will develop the training in accordance with the nature of activities to be performed at the site and the types and levels of radiological hazards involved. The Field Manager is qualified by training and experience to conduct the actual Radiation Safety Training as outlined by the RSO. This training will be conducted for all personnel prior to commencement of their activities at the site. The training will cover the following topics:

- Basic radiation science
- Types of radiation
- Interaction of radiation with matter
- Radiological and toxic hazards of exposure to uranium, thorium, and associated decay products
- Expected radiation exposure pathways and levels at the site
- Regulatory Standards
- Discussion of the ALARA policy
- Radiation badges for monitoring of dose
- Personnel and equipment contamination surveys
- Use of radiation detection instruments

An overview of these topics in a context of this project, and as a basis for the Radiation Safety Program, is provided in Attachment 1 to this Manual. Radiation Safety Training will be performed and documented for all site workers, contractors, and visitors. Women of child-bearing age who visit or work at the site during this project require supplemental radiation safety training with respect to potential exposures to the fetus. All unescorted visitors will receive training commensurate with the level of potential exposure to radioactive materials. The extent of the training required will be determined by the RSO or Field Manager, but at a minimum will include radiation safety awareness training.

Special circumstances may develop during the course of the work that require modification of the Radiation Safety Program and/or additional radiation safety training. Any deviations from related circumstances should be discussed with the Field Manager. The RSO must approve any significant deviations from the basic provisions of this Radiation Safety Plan.

6.0 ALARA POLICY

The radiological safety procedures, precautions and general underlying intent of this manual are based on a commitment that all reasonable measures will be taken to keep doses to workers, contractors, visitors, and members of the public as low as reasonably achievable (ALARA). This ALARA Policy will be communicated to all personnel present at the site before and during the course of this project.

The basic philosophy of radiation protection is to maintain radiation exposures ALARA below the regulatory requirements. "Reasonable" means that the costs, benefits, and risks are considered in trying to keep doses low. In accordance with 10 CFR 20 and 10 CFR 61, Tetra Tech has developed this radiation protection program for the Ross Adams Mine Site Investigation to be commensurate with the anticipated extent and nature of radiation-related activities under the scope of work outlined by Newmont USA Limited and the United States Forest Service (USFS).

This Radiation Safety Program incorporates the ALARA philosophy through a combination of sound radiation protection principles, close program management and documentation, worker training, personnel and equipment monitoring, engineering controls, and through the personal commitment of each and every site worker. Tetra Tech is committed to providing resources in the form of personnel, training, preparation and planning, design, equipment, monitoring devices, and necessary controls to achieve ALARA doses at all radiation related projects.

Each employee and contractor is expected to be knowledgeable of work activities, and to abide by all ALARA requirements. In addition to taking individual responsibility for minimizing their own personal dose, each employee is responsible for minimizing doses to other workers and members of the public. Tetra Tech encourages employee suggestions to incorporate additional ALARA practices into the performance of this work.

The provisions of this Radiation Safety Program are designed to keep radiation doses ALARA, but not all circumstances and factors can be anticipated. Some examples of practices that are consistent with the ALARA policy for this project include:

- Offering suggestions at daily safety meetings of reasonably achievable ways to further reduce potential radiation exposures, given previous site observations and the day's objectives.
- Planning activities to be performed in higher gamma radiation areas in advance to maximize the efficiency with which the work can be performed, thus minimizing the amount of time needed to complete the work in such areas.
- Washing hands and face with moist towelettes frequently, not necessarily just prior to eating or drinking during the work day. This can further reduce the potential for intake of small amount of contaminated soil or water due to incidental contact between soiled hands and the mouth/nose area.
- When working in pairs, alternate between personnel any task functions that require close proximity to areas or materials with potentially higher exposure levels.
- Maintain close observation of the work environment and communicate any previously unidentified conditions that may pose a radiological hazard to the Field Manager and other site workers (e.g. sudden development of winds and airborne dust, previously unidentified "hot spots" of gamma radiation, etc.).

- Lead by example, vocally encourage safe work practices consistent with the provisions of the Radiation Safety Program and underlying ALARA philosophy. Commend co-workers who suggest methods to further reduce the potential for exposures while performing the work at hand.

7.0 RADIATION SAFETY PROCEDURES

Basic radiation safety procedures and protocols for conducting environmental sampling, measurements, and monitoring at the Ross Adams Mine site are detailed in this section. Additional safety procedures may be implemented during the course of the work at the discretion of the Field Manager, subject to approval by the project RSO.

7.1 Personnel Dose Monitoring

As indicated in Section 2.0, NRC regulatory standards for radiation protection (10 CFR 20) will be adopted for this work to ensure that workers and the public are protected in accordance with both OSHA and NRC radiation safety criteria. As specified in 10 CFR 20.1502, occupational radiation doses will be calculated to determine compliance with dose limits for any workers with potential to receive an annual dose of more than 10% of the annual dose limit (10% of 5,000 mrem/yr or 500 mrem/yr). Based on the assessment of potential doses from both external and internal exposure pathways as calculated in Section 3.0, the 10% benchmark could conceivably be exceeded under worst case circumstances and this requirement will thus be implemented for the Ross Adams Site Investigation project. Dose calculations are usually based on personal dose monitoring (TLDs, OSLs, or equivalent) and airborne radionuclide concentration data, as appropriate. A formal dosimetry program will be implemented for this project to measure direct radiation doses. Internal doses will be estimated based on airborne radon concentration data that will be available from planned environmental monitoring activities. The specifics of the dose monitoring and evaluation program are described below.

7.1.1 External Dose

External radiation doses to site workers during the course of the project will be monitored using thermoluminescent dosimeters (TLDs) or optically stimulated luminescent dosimeters (OSLs) provided by a laboratory certified under the National Voluntary Laboratory Accreditation Program (NVLAP). All site workers will be required to wear a personal dosimeter badge outside of the clothing, between the waist and the neck. Contractors or visitors who will be on site only for a short period of time (less than one week) will not be issued personal dosimeters, but are still subject to radiation safety training requirements and must follow all radiation safety rules and ALARA practices while conducting onsite activities.

The Radiation Safety Training will include instruction on the proper use and handling of dosimeter badges. Lost dosimeters must be reported to the Field Manager. The RSO will be notified and a replacement badge will be issued as soon as is practicable. The RSO will calculate the "missed dose" by pro-rating the dose recorded on the replacement badge or extrapolating from measured co-worker doses.

The project dosimetry program will be managed and implemented by Tetra Tech's Health and Safety Coordinator out of the Fort Collins, Colorado office (Section 4.0). Tetra Tech will handle badge ordering, issuance, collection, shipping to a dosimetry services vendor (U.S. Dosimetry) for analysis, and records keeping. U.S. Dosimetry is certified by the National Voluntary Laboratory Accreditation Program (NVLAP). For personnel based in the Bothell, Washington office of Tetra Tech, separate control badges will be sent to the Bothell office to be separately maintained there during the course of the project. All personnel dosimeter monitoring results will be reviewed by the project RSO (Dr. Janet Johnson).

7.1.2 Internal Dose

Internal intake of radionuclides by pathways other than exposure to airborne radon daughter products should be effectively eliminated by adherence to the procedures and ALARA policies specified in this Radiation Safety Plan. For this reason, no routine bioassay program will be required. However, in the event of a suspected intake of uranium, an individual may be required to submit a urine sample for bioassay. Internal doses from radon exposure will not be monitored directly, but will be estimated based on results of planned environmental monitoring of ambient radon across many areas of the site, combined with descriptions of site activities and time spent by personnel in various locations. In all cases, internal doses due to airborne radon daughter products are expected to be far below regulatory limits for occupational exposures.

Average ambient radon concentrations will be measured using alpha track detectors deployed at various strategic locations across the site. The purpose of this monitoring is to estimate environmental concentrations for risk assessment and EE/CA purposes, but the information generated can also serve as a basis for estimating dose to workers during the site investigation work. The radon detectors will be supplied and analyzed by Landauer Inc. Some of these detectors will be placed near mine adits or ventilation shafts. In such cases, monitoring periods will be limited to less than two weeks during the second planned field trip (in July of 2009). This will help to prevent the potential for overexposures that can render track etch detectors unreadable in areas of high concentrations when exposed over longer periods.

7.1.3 Calculation of Total Effective Dose Equivalent (TEDE)

An estimate of the total effective dose equivalent (TEDE) received during the project will be calculated by the RSO for each worker based on personal dosimeter data (external dose) and potential radon daughter exposures (internal dose) derived from environmental radon monitoring results. In the event of a known or suspected accidental intake of significantly elevated radioactive material, the Field Manager and RSO will be notified and the potential dose to the worker will be calculated as soon after the exposure as feasible.

7.1.4 Records

Copies of personnel dosimetry records shall be provided to applicable personnel upon request or termination, and the original records will be retained by Tetra Tech. Estimates of the total effective dose equivalent (TEDE) from combined external and internal exposures during this project will be part of the personnel records. Records shall be retained, in either hard copy or electronic format.

7.2 Working Area Designations

Although the Ross Adams Mine site is not subject to radioactive material licensing requirements, from a perspective of radiological health and ALARA principles, and in a context of the work to be performed, the entire site is considered analogous to a controlled or "restricted" area. For this reason, all workers, contractors and site visitors will be subject to radiation safety training requirements and the provisions of this Radiation Safety Program before being allowed to access the site during the course of the project. In essence, offshore boats, barges, or float planes will constitute unrestricted areas, though ALARA radiation safety principals will still apply in terms of the potential to track contamination from the site onto these vessels.

It will be necessary to designate a temporary "unrestricted" area on shore in order to provide a safe area for resting, washing, eating, drinking, staging equipment, conducting safety meetings,

etc. This temporary unrestricted area will be determined on site by the Field Manager, in collaboration with the project team, such that the potential for radiation doses as well as exposure to potential physical hazards will be minimized.

A monitoring station for conducting personal contamination and equipment surveys will be established directly adjacent to the temporary unrestricted zone. In addition, a designated decontamination area will be established nearby. All of these functional areas for staging onsite operations will be as close as possible to the loading dock. Based on the map shown in Figure 1, it appears that the current dock area itself may be the best location for the temporary unrestricted zone, though onsite evaluation of all practical and potential safety issues will be carefully considered before finalizing this location.

7.3 Personal Contamination Surveys

The goal for personal contamination surveys is to ensure that before leaving restricted areas, measured radiation levels are indistinguishable from pre-established instrument baseline readings at the survey station. These personal contamination action levels will be determined by the Field Manager at the beginning of the project, and will be indicated on the personal exit survey log sheets. Before leaving the site, all personnel are required to survey their shoes, hands, clothing and any personal gear that may have become contaminated. Personnel will be instructed in use of the alpha survey meter and a pancake GM probe, or equivalent, for personal and equipment surveys. The exit monitoring station, most likely a temporary tent of some sort, will be equipped with an alpha survey meter for personal contamination surveys and a GM pancake probe for equipment and vehicle release surveys. Specific, detailed procedures for these surveys will be developed onsite based on local conditions, but will generally involve the following:

- A pre-determined, site-specific, action level (e.g. counts in a specified time interval) will be listed on a survey log sheet provided at the exit monitoring station.
- Slowly scan the surface of each potentially contaminated area (at about 1-2 inches per second) with the sensitive surface of the detector positioned within about 1 centimeter of each surface being surveyed.
- If the action limit is exceeded, the subject area will be re-surveyed one time. If readings are still in excess of the action level, proceed to the decontamination station and attempt to remove the contamination (see Section 7.5).
- Repeat process until action levels are no longer exceeded.
- Initial and date the log sheet to signify that the action levels were not exceeded prior to entry into the unrestricted zone.

The survey log sheets will serve as documentation that contamination was not transported into the unrestricted zone or offsite. An example personal survey log sheet is included in Attachment 2 to this Radiation Safety Manual.

7.4 Equipment Contamination Surveys

Equipment and vehicles used at the site will be surveyed for fixed and, if necessary, removable contamination before being released for unrestricted use and transport to the barge, boat, or plane in Kendrick Bay. If the fixed activity measurement indicates contamination levels below the limit for removable contamination, a wipe test need not be performed. It is advisable,

however, to perform wipe tests on equipment used in muddy conditions or to excavate or move contaminated materials even if the fixed activity measurement indicates acceptable levels. In the event that the level of contamination exceeds the site-specific release limits provided in Table 4, the equipment will be pressure washed and allowed to dry before repeating the exit survey.

Table 4. Surface Contamination Limits for Unrestricted Release (NRC, 1993)

Element	Removable Surface Activity (d/m-100 cm²)	Ave. Total Activity (fixed + removable) (d/m-100 cm²)	Max. Total Activity (fixed + removable) (d/m-100 cm²)
U-nat and decay products	1,000 (total alpha)	5,000 (total alpha)	15,000 (total alpha)
Th-nat	200	1,000	3,000
Beta/gamma Emitters	1,000	5,000	15,000

7.5 Decontamination

Prior to leaving the site to return to the base vessel or float plane in Kendrick Bay, all personnel will perform a personal contamination exit survey (Section 7.3). This will include a survey of any personal gear to be carried back to the base vessel or plane. Larger equipment such as ATV's will also be surveyed prior to transport offsite (Section 7.4). Should an exit survey reveal evidence of contamination, the contamination will be removed, contained and managed in the designated decontamination area. This area will have a supply of moist towelettes for washing skin, and a stiff-bristled brush for removing visible mud, soil or sediment from clothing and equipment as needed. A small gas-powered pressure washer will be available for washing ATV's and other equipment where appropriate. The decontamination area will have a containment barrier system in place (e.g. a durable tarp secured to the ground across a slight depression) to prevent migration of contaminated residues. Any solid residues accumulated on the containment barrier from decontamination activities will be returned to a waste rock pile well removed from the bay shoreline or any stream drainages.

In cases where use of pressure washing is not appropriate and where visible accumulations of mud, soil or sediment on personnel or equipment are present, a brush or similar means will be provided for removing accumulated material onto the containment barrier in the decontamination area. The use of moist towelettes to clean hands and face should only be employed for skin surfaces where accumulations of soil or sediment are not visually apparent. For visible accumulations, soft brushes or other means of removing the accumulated material from skin will be provided as indicated above. Care should be taken to prevent damage to the skin during decontamination, i.e., abrasions, cuts, etc. If skin contamination persists the Field Manager must be notified and additional measures taken under his direction. The potential to accumulate significant amounts of radioactivity on moist towelettes should thus be very small. However, used moist towelettes will be managed as follows:

- Towelettes will be biodegradable and will be collected in biodegradable trash bags.
- Demobilization from the site will include surveys of exterior surfaces of trash bags containing used towelettes with a GM probe for evidence of elevated beta/gamma activity.
- A representative sampling of used towelettes will also be surveyed directly with an alpha probe for evidence of measurable alpha activity in excess of pre-established instrument baseline at the survey station.

It is not expected that used towelettes will contain measurably elevated radioactivity, but confirmatory survey checks will be performed at the end of each sampling trip. If elevated activity is not detected, the used towelettes will be managed in the same manner as other ordinary trash generated during the project. In the unlikely event of measurably elevated activity on used towelettes, the biodegradable trash bags and used towelettes will be buried at one of the waste rock piles for ultimate management as part of remedial plans for the waste rock piles.

In the case of site visitors coming to the site during periods when a decontamination station and associated equipment are not available, a brush should be brought along and used to remove visible accumulations of material as described above, and in an area such as the ore staging area or a waste rock pile (well away from drainages or the bay shoreline). The brush should then be rinsed with clean water (carried in water bottles or similar containers) in that same area.

Once the brush is free of visible soil residues it should be adequately decontaminated and can be taken off site.

7.6 Emergency Response

In the event of emergency situations, the emergency response procedures outlined in the Site Safety and Health Plan (SSHP) will take precedence over radiological considerations, depending on the gravity of the situation and the magnitude of the potential for immediate risks to worker health and safety. In all cases, immediate life threatening circumstances will take precedence over radiological considerations. Immediate response to the maximum credible accident, for example a fall down a slope or a fire or explosion, must be focused on providing medical help to any individuals injured in the accident. Mitigation of radiological exposures and potential contamination are secondary considerations. Workers must understand and accept this responsibility.

In the case of an accident resulting in serious injury, first aid treatment should be immediately administered to the injured worker, followed by actions to seek professional medical help as soon as possible as outlined in the SSHP. Only if medically safe to do so, should the injured worker be moved away from an area of potential radiological contamination. If this is feasible, the area should then be secured to prevent further access. The Field Manager will conduct contamination surveys of personnel and equipment as warranted once it is safe to do so and all critical health and safety risks have been addressed and controlled.

In the unlikely event of emergency evacuations from the site, the Field Manager will determine whether exit surveys and decontamination procedures are warranted relative to the gravity of the situation and the potential for immediate risks to worker health and safety. In all cases, life threatening circumstances will take precedence over the potential to transport minor amounts of contamination off site. The selected float plane company will be informed of this potential in advance, including a discussion of the nature of radioactive materials present at the site, relative risks involved, and how such materials can be detected and safely removed from the plane following an emergency evacuation from the site. If other agencies and aircraft are involved in an emergency evacuation (e.g. fire/rescue/medical agencies) they will also be notified of these issues.

7.7 Instrument Quality Control

All portable survey instruments will have been calibrated by the manufacturer within one year prior to use on this project. Calibration records will be maintained by Tetra Tech staff in the Fort Collins office. Instrument function and reproducibility will be verified each day by the Field Manager (or trained designee) by comparison of average readings in a fixed location and measurement geometry against pre-established control limits (within ± 3 standard deviations of the mean of initial control limit measurements) for background and for an appropriate check source. These daily instrument quality control (QC) measurements will be recorded in an instrument QC log.

7.8 Control of Radioactive Materials

The radioactive materials present at the Ross Adams site are limited to low specific activity uranium mining wastes. Elevated levels of both natural uranium and thorium are known to exist in these deposits. Control of the spread of contamination offsite is addressed above in Sections 7.3 through 7.5.

This project will involve the collection of samples of various environmental media including soils and water. Some of these samples may contain elevated levels of uranium, thorium, and their decay products relative to levels found in non-mineralized areas. All samples will be double bagged in plastic zip-lock baggies or approved containers, properly labeled with unique identification numbers, and placed in coolers to provide an additional layer of containment for transport and shipping to a commercial laboratory that is qualified to receive such samples. Some samples may be sent to the Tetra Tech office in Fort Collins, Colorado for XRF analysis prior to going to a commercial laboratory, commensurate with the conditions of the Tetra Tech (Fort Collins) Colorado radioactive materials license.

United States Department of Transportation shipping requirements for radioactive materials are found in 49 CFR 173. For natural material and ores containing naturally occurring radionuclides that are not intended to be processed for use of these radionuclides, the exemption limits are 10 times the limits specified in 49 CFR 173.436 [49 CFR 173.401(b)(4)]. The relevant shipping exemption limits for samples collected at the Ross Adams site are provided in Table 5.

Table 5. DOT Shipping Exemption Limits for Radionuclide Ore/Samples

Radionuclide (in equilibrium with all decay products)	Concentration (pCi/g)	Total Activity (pCi)
U-nat	270	270,000
Th-232	270	270,000

It is not anticipated that any samples will be of high enough activity to be subject to special shipping requirements. This will be evaluated in the field based on sample screening measurements with a GM probe. Samples with evidence of radioactivity concentrations in excess of the exempt shipping limits will either require special DOT shipping procedures or will be returned to waste rock piles.

Tetra Tech has several exempt quantity instrument check sources. Some of these sources will be taken to the site to perform instrument QC measurements. Standard precautions will be in place to maintain control of these small check sources, including keeping an inventory log and ensuring proper, secure packaging for transport.

7.9 Personal Protective Equipment

From a radiation protection perspective, full-length standard durable work clothing, boots, hats, work gloves and safety glasses will be adequate. Skin surfaces other than the face should be covered as much as possible at all times with durable materials to help prevent cuts and abrasions that may result in dermal contact with radionuclides. Gloves should be worn whenever possible, recognizing that some tasks may require a degree of dexterity not possible with gloved hands. A supply of moist towelettes should be carried when conducting activities around the site to clean hands and face as necessary. Management of used towelettes is discussed in Section 7.5.

7.10 Respiratory Protection

A formal respiratory protection program (i.e. face masks) for this work is not appropriate or warranted. However, ALARA protocols to minimize potential inhalation hazards will be in effect at all times. As previously indicated, a number of locations at the site are expected to have

airborne radon concentrations that exceed levels in non-mineralized areas. Although the potential for related doses is very small, well below occupational limits for radiation workers, personnel are expected to minimize the time needed to perform work in known or suspected areas of potentially high radon concentrations (e.g. near mine portals or other enclosed areas) in accordance with the ALARA policy.

Significant generation of dust by dry windy conditions is believed to be an unlikely circumstance in this normally damp, costal region of Alaska. The Field Manager has the authority to stop work if such conditions develop to the point where airborne dust generation is readily visible and becomes a concern. Physical dust suppression measures (e.g. area watering trucks) will not be available during this project. Dust masks are not considered to be respiratory protection against inhalation hazards, but may provide a degree of worker comfort in moderately dusty conditions.

7.11 Female Personnel and Fetal Exposures

All female employees as well as female contractors and female visitors who will be entering the site will be given special instruction about the concerns for exposure to the fetus and the regulations concerning such, their options and responsibilities. Such instructions are based on the information provided in NRC Regulatory Guide 8.13. The 10 CFR 20 dose limit for the embryo/fetus (500 mrem for the period of gestation) and associated monitoring requirements will be implemented for any "declared pregnant woman", i.e., a woman who has declared in writing to Tetra Tech that she is pregnant. The RSO will notified and she will determine any additional precautions or actions that may be required to limit potential dose to the fetus.

7.12 Radiation Protection Work Rules

Radiation safety work rules are as follows:

- No use of tobacco products, eating, or drinking from open containers will be permitted at onsite locations other than within the designated temporary unrestricted zone. Hands and face should be washed prior to eating, drinking or using tobacco products in unrestricted areas. Drinking from screw-cap type containers in other areas of the site will be allowed to prevent dehydration, but care should be exercised to clean hands and the mouth area with moist towelettes prior to drinking.
- Time spent in areas known to have elevated gamma radiation or radon concentrations should be minimized to only what is needed to complete necessary work in such areas. Entering mine portals or similarly enclosed areas is prohibited for this project.
- Standard full-length work clothing, boots, hats, gloves and safety glasses are required.
- Before entering the temporary unrestricted area or leaving the site, workers, contractors and visitors must survey hands, feet, and other parts of the body that might have become contaminated, as well as any personal gear. An exit survey station will be located near the temporary unrestricted zone, and will have an alpha survey meter and a GM pancake probe for performing personal and equipment exit surveys. A log sheet will be provided to record initials and signify that the action levels were not exceeded.
- Personnel who have been issued personal dosimeters must wear them while at the site. Personnel will be instructed in proper care and handling of their dosimeters to ensure that the devices do not become contaminated, damaged, or lost and that they are stored properly when not in use. The Field Manager will designate a storage location well removed from any mine waste materials or mineralized areas to minimize direct gamma exposure rates.

It is every worker's responsibility to understand and follow these work rules, and to take any additional and reasonable measure necessary to keep radiation doses ALARA.

8.0 REFERENCES

- ICRP (International Commission on Radiological Protection). 1994. *Protection against Radon-222 at home and at work. ICRP Publication 65*. Annals of the ICRP, Volume 23/2.
- ICRP (International Commission on Radiological Protection). 1994. *Protection against Radon-222 at home and at work. ICRP Publication 65*. Annals of the ICRP, Volume 23/2.
- ICRP (International Commission on Radiological Protection). 1977. *Recommendations of the International Commission on Radiological Protection (adopted 1977)*. ICRP Publication 26. Annals of the ICRP, Vol.1, No.3 (1977)
- ICRP (International Commission on Radiological Protection). 1978. *Limits for the Intake of Radionuclides by Workers. ICRP Publication 30. A Report of Committee 2 of the ICRP (adopted 1978, supersedes ICRP 2)*. Annals of the ICRP, Vol.8, No.1-3 (1982)
- NCRP (National Council on Radiation Protection and Measurements). 1984. *Recommendations of the National Council on Radiation Protection and Measurements, Evaluation of Occupational and Environmental Exposures to Radon and Radon Daughters in the United States. Report No. 78*. Bethesda, Maryland.
- NCRP (National Council on Radiation Protection and Measurements). 2009. *Ionizing Radiation Exposure of the Population of the United States. Report No. 160*. Bethesda, Maryland. http://www.ncrponline.org/PDFs/Elec_prepub_160.pdf
- UNSCEAR (United Nations Scientific Committee on the Effects of Atomic Radiation). 2000. *Sources and Effects of Ionizing Radiation, Volume 1: Sources. UNSCEAR 2000 Report to the General Assembly with Scientific Annexes*. United Nations. New York.
- U.S. Code of Federal Regulations, Title 10, Part 20. (10 CFR 20)
- NRC (U.S. Nuclear Regulatory Commission). 1993. *Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material*. Division of Fuel Cycle Safety and Safeguards. April 1993.
- NRC (U.S. Nuclear Regulatory Commission). 1994. Instruction concerning risks from occupational radiation exposure. Regulatory Guide 8.29.

ATTACHMENT 1
OVERVIEW OF THE BASIS FOR THE ROSS ADAMS
RADIATION PROTECTION PROGRAM

Overview of the Basis for the Ross Adams Radiation Protection Program

BIOLOGICAL EFFECTS OF IONIZING RADIATION

The principal health hazard from chronic exposure to ionizing radiation is increased risk of cancer. Ionizing radiation has been shown to be a carcinogen at high doses; however, there are no data to show that negligible doses of radiation, in the range of radiation doses anticipated for workers at the Ross Adams Mine site, cause cancer. The estimated risks of cancer for low doses of radiation are based on risk estimates derived from human epidemiologic studies of atomic bomb survivors and, in the case of radon decay products, underground miners. The Radiation Safety Program outlined in this Radiation Safety Manual was developed assuming that low doses of radiation can cause cancer and that the risk is proportional to the dose.

Other potential adverse health effects of chronic radiation exposure include increased risk of genetic mutations and adverse reproductive effects. Genetic effects have been observed in experimental animals but not in human populations. Potential effects on the fetus from in-utero exposure to high radiation doses include increased risk of childhood leukemia and spontaneous abortion. The human epidemiological data show an increased risk of childhood leukemia in children of women exposed to diagnostic x-rays during pregnancy.

Alpha, beta, and gamma radiation, commonly termed "ionizing radiation", are emitted by uranium and thorium decay series radionuclides. Alphas and betas are charged particulate radiation, possessing characteristic masses and electrical charges in addition to kinetic energy. Gamma radiation is a form of electromagnetic radiation, similar to x-rays, visible light, and ultraviolet radiation. Electromagnetic radiation has kinetic energy but no mass or electrical charge. Of the types of radiation in the electromagnetic spectrum, only x-rays and gamma rays have sufficient kinetic energy to ionize atoms; hence they are also termed ionizing radiation.

Alpha radiation penetrates only very short distances, less than 0.1 mm in tissue. Alpha particles are not hazardous outside of the body because all of the energy of the alpha radiation is absorbed by the layer of dead cells on the skin surface. However, alpha emitting radionuclides which are taken into the body by inhalation or ingestion can cause damage by coming into direct contact with live cells. Beta radiation is somewhat more penetrating than alpha radiation and can damage the living growth layers of the skin. Gamma rays, like x-rays, are very penetrating, and, depending on the energy can reach any organ in the body.

RADIOUCLIDES OF CONCERN AT THE ROSS ADAMS SITE

The primary radionuclides of concern at the Ross Adams Mine Site are uranium-238 (U-238) decay series products along with natural thorium (Th-232) decay series products (see Figure 2 of this Radiation Safety Manual). These decay series each emit all three types of ionizing radiation (alpha, beta, and gamma radiation) at various characteristic frequencies and kinetic energies as a result of radioactive transformation processes.

Natural uranium (U-nat) consists of three isotopes: U-238, U-234, and U-235. Some relative characteristics of these isotopes are shown in the table below. There are a number sub-series in the U-238 decay chain, each headed by a long-lived parent (see Figure 2 in Section 1), including the U-238, U-234, Th-230, and Ra-226. Each sub-parent within the overall chain has a half life long enough to potentially exist at activity concentrations different from the long-lived precursor parent, depending on geophysical or anthropogenic processes. Activity

concentrations of intermediate short-lived decay products tend to be in secular equilibrium with respective sub-parents. In many undisturbed environments, most decay products of U-238 can be found in approximate secular equilibrium with one another, meaning that the activity concentrations of each radionuclide will be about the same as that of U-238.

Isotopic Composition of Natural Uranium (U-nat)				
	U-234	U-235	U-238	Total
Weight %	0.01%	0.71%	99.28%	100%
Activity %	48.90%	2.20%	48.90%	100%
Activity in 1 g U-nat	12,356 Bq	568 Bq	12,356 Bq	25,280 Bq

Radon-222 is a short-lived immediate decay product of Ra-226 and because it is a noble gas, can easily migrate, forming solid-phase radioactive decay products as it mixes in air. The amount of Rn-222 escaping from Ra-226 source material depends on the emanation characteristics of the source material. Typical radon emanation fractions for soils are in the range of 20%, meaning that about 80% of the radon (and associated daughter products) remains tied up along with Ra-226 in the soil.

Elevated air Rn-222 concentrations have been measured in a number of locations at the site. Airborne radon daughter products pose the greatest potential for internal doses for personnel working onsite during this project. Several of these same Rn-222 decay products are strong gamma emitters (namely Pb-214 and Bi-214) and because a large fraction of radon and its subsequent decay products remain bound in the soil with the long-lived Ra-226 parent, high gamma radiation levels will exist wherever soil Ra-226 concentrations are high. In other words, Ra-226 is a major concern because it is long-lived and governs the activity concentrations of short-lived daughters that pose significant potential for doses from both internal and external exposure pathways.

The Th-232 series is characterized by the long-lived parent, with a series of relatively short-lived decay products. The thorium-232 series also has isotopes of radium and radon, and poses similar concerns with respect to potential internal and external doses.

REGULATORY STANDARDS

Radiation Dose Limit

Federal radiation protection regulations (OSHA and NRC) specify that no worker should receive more than 5,000 mrem per year effective dose, including doses from external sources of radiation and internally deposited radionuclides. It is anticipated that the total dose to any worker over the course of this project will be less than 10 percent of the regulatory dose limit.

ALARA Principle

The system of radiological protection recommended by the International Commission on Radiological Protection (ICRP) incorporates the principle that doses should be kept as low as reasonably achievable (ALARA), economic and social factors being taken into account. The regulations governing facilities licensed by the US Nuclear Regulatory Commission (NRC) define ALARA as "making every reasonable effort to maintain exposures to radiation as far below the dose limits...as is practical consistent with the purpose for which the licensed activity

is undertaken." (10 CFR 20) This purpose of this manual is to describe the procedures to keep radiation doses ALARA.

BASIC PRINCIPLES OF RADIATION PROTECTION

Protection Against External Radiation

In general, external radiation doses can be minimized by:

1. Reducing the time spent in the vicinity of the source or in areas with the highest exposure rates (TIME)
2. Staying as far from the source as practical (DISTANCE)
3. Placing a shield between the source and the receptor (SHIELDING)

The third method of protection is not a feasible option for this work, but the first two methods are an integral part of radiation protection for this project as outlined in this Radiation Safety Manual. Workers should minimize the time needed to perform work in higher gamma radiation areas and take breaks in areas where exposure rates are close to background levels as possible.

Protection Against Internal Dose

The three major routes of intake for radioactive materials are inhalation, ingestion, and absorption through the skin. Minimizing time spent in areas of known or suspected potential for elevated radon concentrations, employing good hygiene practices, and following all radiation safety work rules are the best ways of preventing intakes of radioactive materials.

ATTACHMENT 2
EXAMPLE PERSONAL EXIT SURVEY FORM

**APPENDIX B
FIELD FORMS**

Corporate ESQ Report # [Insert number here](#)

Project Name: [Insert name here](#)

EHS 1-7, Attachment A Event/Near Miss Report and Investigation

Checkboxes can be toggled on and off to show an "X" or not show an "X." Double-click on the box to activate a dialog box that shows possible selections. To preserve formatting when you cut and paste text, use the "paste special" command to paste: EDIT, PASTE SPECIAL, UNFORMATTED TEXT.

Guidance for filling out this form is provided in CRL Procedure EHS 1-7.

Section 1, General Information		
Short Description/Title Below: (limited to 125 characters). This is the description that will appear in the database listing.		
Type of Event/Near Miss (check all that apply):		
Was a person injured or made ill: <input type="checkbox"/> By something at work <input type="checkbox"/> By something outside the work environment <input type="checkbox"/> No injury or illness		
Did this event occur in one of our major offices? <input type="checkbox"/> Yes <input type="checkbox"/> No List Office:		
Did this event occur in a foreign country? <input type="checkbox"/> Yes <input type="checkbox"/> No		
Did this event involve:		
A strain? <input type="checkbox"/> Yes <input type="checkbox"/> No	Fire? <input type="checkbox"/> Yes <input type="checkbox"/> No	
A motor vehicle accident? <input type="checkbox"/> Yes <input type="checkbox"/> No	Property damage (>\$500)? <input type="checkbox"/> Yes <input type="checkbox"/> No	
A repetitive motion injury? <input type="checkbox"/> Yes <input type="checkbox"/> No	Spill/release? <input type="checkbox"/> Yes <input type="checkbox"/> No	
A fall? <input type="checkbox"/> Yes <input type="checkbox"/> No	Permit exceedence? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Being struck by something? <input type="checkbox"/> Yes <input type="checkbox"/> No		
Event Information		
Case #:	Site Case #:	Workers Comp #:
Where did the event occur?	Project # (4 digits):	
Site/Location Name:	Delivery Order #'s:	
Date of event:	Military time:	
TtEC Supervisor on duty:	Was Supervisor at event scene? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Event Location:		
What employee/employer category was involved in this event?		
<input type="checkbox"/> TtEC permanent <input type="checkbox"/> TtEC craft/temp service <input type="checkbox"/> Subcontractor <input type="checkbox"/> Other		
Employer of affected employee?		
Weather conditions:	Adequate Lighting at Scene? <input type="checkbox"/> Yes <input type="checkbox"/> No	
What was the employee doing, or what was happening, just before the event occurred? Describe the activity below, as well as the tools, equipment, or material the employee was using. Be specific. For example, "climbing a ladder while carrying roofing materials," "spraying chlorine from hand sprayer," or "daily computer key-entry."		

Corporate ESQ Report # [Insert number here](#)

Project Name: [Insert name here](#)

EHS 1-7, Attachment A Event/Near Miss Report and Investigation

What happened? What was the contact or event and how did it occur? Tell us below how the injury occurred. For example, "When the ladder slipped on the wet floor, the worker fell 20 feet," "worker was sprayed with chlorine when gasket broke during replacement," or worker developed soreness in wrist over time." Attach file if necessary.			
Section 2, Affected Employee Information			
Include injured person, driver/operator, or employee whose activities resulted in the event. A new event report must be created for each injured employee.			
Employee's name:		Sex <input type="checkbox"/> Male <input type="checkbox"/> Female	
Date of Hire:	Job classification:	Number of months at TtEC:	
Work hours on shift prior to event:		Years in job classification (##):	
Did event relate to routine task for job classification? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Section 3, Injury/Illness Information (If not applicable, check here <input type="checkbox"/> and go to Section 4)			
Nature of injury of illness: Describe body part affected and how it was affected below. Be more specific than "hurt," "pain," or "sore." For example, "strained back."			
What object or substance directly harmed the employee? For example, "concrete floor," "chlorine," "radial arm saw." If this question does not apply to the event, leave it blank.			
Was First Aid provided? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Did the injury/illness result in <input type="checkbox"/> Days away (with or without restricted days) <input type="checkbox"/> Restricted days only <input type="checkbox"/> No or unknown			
Did employee die? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Medical treatment does not include examination, diagnostic tests, or First Aid. See ZIP Bulletin 109 for OSHA definition of First Aid. Attach treatment report/doctor's note or send copies to Director, EHS Services.			
Was medical treatment provided? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Section 4, Vehicle and Property Damage Information (If not applicable, check here <input type="checkbox"/> and go to Section 5)			
Damaged vehicle make:		Damaged vehicle model:	
Damaged vehicle VIN:		Vehicle owner:	
Property damaged:			
Describe property damage:			

Corporate ESQ Report # **Insert number here**

Project Name: **Insert name here**

EHS 1-7, Attachment A Event/Near Miss Report and Investigation

Section 5, Environmental Release (If not applicable, check here <input type="checkbox"/> and go to Section 6)		
<i>Environmental Release</i>		
Substance spilled or released:		
From where:	To where:	
Estimated quantity/duration:	CERCLA Hazardous substance? <input type="checkbox"/> Yes <input type="checkbox"/> No	
RQ exceeded? <input type="checkbox"/> Yes <input type="checkbox"/> No	Specify RQ:	
Reportable to agency? <input type="checkbox"/> Yes <input type="checkbox"/> No	Specify (place telecom in project file):	
Responsibility to report: <input type="checkbox"/> TtEC <input type="checkbox"/> Client <input type="checkbox"/> Other	Time frame:	
Written report (place report in project file): <input type="checkbox"/> Yes <input type="checkbox"/> No		
Response action taken:		
<i>Permit Exceedence</i>		
Type of permit:	Permit #:	
Date of exceedence:	Parameter(s):	
Criteria:	Exceedence levels:	
Exceedence duration:	Reportable to agency: <input type="checkbox"/> Yes <input type="checkbox"/> No	
Specify (place telecom in project file):	Written report: <input type="checkbox"/> Yes <input type="checkbox"/> No	
Time frame:		
Response action taken:		
Section 6, Notifications		
Insert names of TtEC personnel notified below:		
Name:	Date:	Time:
Name:	Date:	Time:
Name:	Date:	Time:
Name:	Date:	Time:
Client rep notified:	Date:	Time:
By whom:		
Agency notified:	Date:	Time:
By whom:		
Agency Contact Name:		
Section 7, Persons Preparing Report		
Signature of this form verifies that all supplied information is accurate.		
Employee's name (print):	Sign:	
Employee's name (print):	Sign:	
Supervisor's name (print):	Sign:	
Supervisor's phone number:		
Date:		
<i>Note to supervisor:</i> Supervisor is to forward a copy of the Event Report to immediate supervisor, PESM, ESS or ESC, and other personnel as identified in Table 1 of this procedure ASAP, but no later than 24 hours.		

Corporate ESQ Report # **Insert number here**

Project Name: **Insert name here**

EHS 1-7, Attachment A Event/Near Miss Report and Investigation

Section 8, Attach Sketches or Photos		
<i>Report Number:</i>		
Send sketch by mail, fax, or attach an electronic file. EHS 1-7, Attachment C, contains a template that can be used for creating sketches of accidents.		
<i>Vehicle Events</i>		
Write in the street names and, if possible, the points of the compass. Attach black-and-white hard-copy photos or JPG or BMP files (JPG file sizes are typically smaller) as appropriate. If the sketch appears on a police report or insurance form, this need not be completed. Attach the other report or send a hard copy to the Director, EHS Services.		
Section 9, Investigative Report		
Date Information:		
Date of event:	Date of investigative report:	
<i>Event Cost:</i>		
Other event costs: \$	WC claim value: \$	Estimated loss: \$
Cause Analysis		
Was the activity addressed in an AHA? <input type="checkbox"/> Yes (attach applicable section) <input type="checkbox"/> No		
Immediate Causes		
What actions and conditions contributed to this event? Check all that apply:		
Substandard Acts		
<input type="checkbox"/> Operating equipment without authority	<input type="checkbox"/> Horseplay	
<input type="checkbox"/> Failure to warn	<input type="checkbox"/> Using equipment improperly	
<input type="checkbox"/> Failure to secure	<input type="checkbox"/> Failure to follow procedure	
<input type="checkbox"/> Operating at improper speed	<input type="checkbox"/> Personnel not properly qualified	
<input type="checkbox"/> Making safety devices inoperable	<input type="checkbox"/> Failure to communicate	
<input type="checkbox"/> Removing safety devices	<input type="checkbox"/> Operating equipment outside of specified parameters	
<input type="checkbox"/> Using defective equipment	<input type="checkbox"/> Failure to check equipment prior to acceptance	
<input type="checkbox"/> Failure to use PPE properly	<input type="checkbox"/> Acceptance of defective equipment	
<input type="checkbox"/> Improper loading	<input type="checkbox"/> Failure to provide proper equipment	
<input type="checkbox"/> Improper placement	<input type="checkbox"/> Improper servicing/maintenance of equipment	
<input type="checkbox"/> Improper lifting	<input type="checkbox"/> Other substandard acts	
<input type="checkbox"/> Improper position for task	<input type="checkbox"/> Servicing equipment in operation	
<input type="checkbox"/> Under influence of alcohol/drugs		
Substandard Conditions		
<input type="checkbox"/> Guards or barriers	<input type="checkbox"/> Exposure to hazardous materials	
<input type="checkbox"/> Protective equipment	<input type="checkbox"/> Extreme temperature exposure	
<input type="checkbox"/> Tools/equipment or materials	<input type="checkbox"/> Illumination	
<input type="checkbox"/> Congestion	<input type="checkbox"/> Ventilation	
<input type="checkbox"/> Warning system	<input type="checkbox"/> Visibility	
<input type="checkbox"/> Fire and explosion hazards	<input type="checkbox"/> Radiation	
<input type="checkbox"/> Poor housekeeping	<input type="checkbox"/> Hazardous environmental conditions	
<input type="checkbox"/> Noise exposure	<input type="checkbox"/> Other substandard conditions	

Corporate ESQ Report # [Insert number here](#)

Project Name: [Insert name here](#)

EHS 1-7, Attachment A Event/Near Miss Report and Investigation

Enter brief explanation of each **immediate cause** below:

Basic Causes

What specific personal or job factors contributed to this event? Check all that apply:

Personal Factors	Job Factors
<input type="checkbox"/> Inadequate physical/physiological capability	<input type="checkbox"/> Inadequate leadership and/or supervision
<input type="checkbox"/> Inadequate mental/psychological capability	<input type="checkbox"/> Inadequate engineering
<input type="checkbox"/> Physical or physiological stress	<input type="checkbox"/> Inadequate purchasing
<input type="checkbox"/> Lack of knowledge	<input type="checkbox"/> Inadequate maintenance
<input type="checkbox"/> Lack of skill	<input type="checkbox"/> Inadequate tools and equipment
<input type="checkbox"/> Improper motivation	<input type="checkbox"/> Inadequate work standards
<input type="checkbox"/> Other personal factors	<input type="checkbox"/> Excessive wear and tear
	<input type="checkbox"/> Abuse and misuse
	<input type="checkbox"/> Change
	<input type="checkbox"/> Other job factors

Enter brief explanation of each **basic cause** below:

Section 10, Action Plan

What has or should be done to control each of the causes listed? Consider the following Management Programs in developing remedial actions:

<input type="checkbox"/> Leadership and administration	<input type="checkbox"/> Health control
<input type="checkbox"/> Training	<input type="checkbox"/> System evaluation
<input type="checkbox"/> Planned inspections	<input type="checkbox"/> Engineering controls and change management
<input type="checkbox"/> Task analysis and procedures	<input type="checkbox"/> Personal communications
<input type="checkbox"/> Task observation	<input type="checkbox"/> Group meetings
<input type="checkbox"/> Emergency preparedness	<input type="checkbox"/> General promotion
<input type="checkbox"/> Rules and work permits	<input type="checkbox"/> Hiring and placement
<input type="checkbox"/> Accident/event analysis and corrective and preventive action	<input type="checkbox"/> Materials and services management
<input type="checkbox"/> Personal protective equipment	

Corporate ESQ Report # [Insert number here](#)

Project Name: [Insert name here](#)

**EHS 1-7, Attachment A
Event/Near Miss Report and Investigation**

Remedial Actions			
Actions	Person Responsible	Target Date	Completion Date
1.	1.		
2.	2.		
3.	3.		
4.	4.		
Section 11, Persons Performing Investigation			
Investigator's name:		Date:	
Investigator's name:		Date:	
Investigator's name:		Date:	
Management Review			
Note: Signature verifies that all supplied information is accurate; the description supports the causal analysis; and the Action Plan is sufficient to address the causes.			
Project/Office Manager Approval: <input type="checkbox"/> Yes <input type="checkbox"/> No			
Comments:			
Sign:		Date of Approval:	
ESQ (PESM) Approval: <input type="checkbox"/> Yes <input type="checkbox"/> No			
Comments:			
Sign:		Date of Approval:	
Note: Attach additional information as necessary. Supervisor to forward copy of Investigative Report to the PM or Office Manager or ESQ as soon as possible, but no later than 72 hours after the event. A copy shall be sent to the Director, EHS Services, within 24 hours of completion of the report. Attach here.			

EHS 6-1 ATTACHMENT A



CONFINED SPACE ENTRY PRE-ENTRY BRIEFING CHECKLIST

Project Name: _____ **Project Location:** _____

Date: _____ **Time:** _____

Completed By: _____

Attendee(s): _____

- Hazard Communication (including the signs, symptoms, and modalities of chemical overexposure).
- Physical hazards present.
- All hazard controls.
- Acceptable entry conditions.
- Emergency procedures.
- Rescue procedures.
- Duties of entrants and attendants during routine and emergency operations.
- Frequency and Types of Monitoring.
- Communications system backup to be used.
- Review of work to be accomplished during entry.
- Decontamination procedures (if necessary).
- PPE disposal
- Potential emergencies that may occur outside the confined space.

PRELIMINARY EHS 6-1 ATTACHMENT B



CONFINED SPACE ENTRY PERMIT

PERMIT VALID FOR ONE SHIFT ONLY. ALL PERMIT COPIES REMAIN AT SITE UNTIL JOB COMPLETED.

DATE: _____ SITE LOCATION/DESCRIPTION: _____

PURPOSE OF ENTRY: _____

SUPERVISOR(S) IN CHARGE OF CREWS/TYPE OF CREW/PHONE #: _____

COMMUNICATION PROCEDURES: _____

RESCUE PROCEDURES AND PHONE NUMBERS: _____

Name of Emergency Service (ES)	Phone# of ES	Date/Time ES contacted	ES Available ? Y or N	Date/Time ES Response Made		Comments/Problems with Service
				Before Confined Space	After Confined Space	

REQUIREMENTS COMPLETED	DATE	TIME	REQUIREMENTS COMPLETED	DATE	TIME
Breathing Apparatus	_____	_____	Line(s) Broken-Cap/Blank	_____	_____
Emergency Escape/Fall Retrieval Equipment	_____	_____	Protective Clothing	_____	_____
Fire Extinguishers	_____	_____	Purge-Flush and Vent	_____	_____
Full Body Harness w/ "D" Ring	_____	_____	Respiratory Protection	_____	_____
Lifelines	_____	_____	Secure Area (Post and Flag)	_____	_____
Lighting (Explosive Proof)	_____	_____	Standby Safety Personnel	_____	_____
			Ventilation	_____	_____

Note: For items that do not apply, enter N/A in the blank. See page 2 to add any special requirements.

RECORD MONITORING RESULTS EVERY 1/4 HOUR

TEST(S) TO BE TAKEN	Permissible Entry Level	Time(s)
PERCENT OF OXYGEN	19.5% to 22.0%	_____
LOWER FLAMMABLE LIMIT	Under 10 %	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

REMARKS: _____

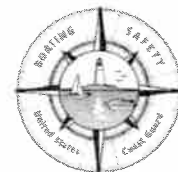


www.uscgauk.org

FLOAT PLAN

INSTRUCTIONS: Complete this plan before you go boating and leave it with a reliable person who can be depended upon to notify the Coast Guard or other rescue organization should you not return or check-in as scheduled. If you have a **change of plans** after leaving, be sure to notify the person holding your Float Plan.

Do NOT file this plan with the Coast Guard.



www.uscgboating.org

VESSEL

IDENTIFICATION:

Name & Home Port _____
 Doc. / Registration No. _____
 Year & Make _____
 Length _____ Type **PWR** Draft _____ Hull Mat **Fiber**
 Hull Color(s) _____
 Prominent Feature(s) _____

TELECOMMUNICATIONS:

Radio Call Sign _____
 DSC MMSI Number _____
 Radio-1: Type **VHF-FM** Ch / Freq Monitored _____
 Radio-2: Type _____ Ch / Freq Monitored _____
 Cell Phone _____
 Pager _____

PROPULSION:

Primary - Type **Gas IO** No. Eng. _____ Fuel Capacity _____
 Auxiliary - Type **none** No. Eng. _____ Fuel Capacity _____

NAVIGATION: (Check all on board)

Maps Charts Compass GPS / DGPS
 Radar Loran C Sounder

SAFETY & SURVIVAL

VISUAL DISTRESS SIGNALS:

Day Only type _____
 Night Only type _____
 Day & Night type _____

AUDIBLE DISTRESS SIGNALS:

Horn / Whistle _____
 Bell _____

OTHER GEAR / SUPPLIES:

Lifeboat / Life Raft Flashlight / Searchlight
 Dinghy / Skiff Signal Mirror
 Food / Water Drogue / Sea Anchor
 EPIRB **none** _____
 Foul Weather Gear

PFDs: (Do not count Type IV devices)

Quantity on board _____

GROUND TACKLE:

Anchor - line length _____ ft.

PERSONS ON BOARD

OPERATOR:

Name _____
 Address _____
 City _____ State _____ Zip code _____
 Vehicle (Year, Make & Model) _____
 Where will trailer be parked? _____

Age M/F Notes (Special medical conditions, Cert. swim, etc.)

Experience: w/Boat w/Area

Home Phone _____

Vehicle License No. _____

Trailer License No. _____

PASSENGERS:

Name & Home Phone

Age M/F Notes (Special medical conditions, Cert. swim, etc.)

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

Agree: Submit this Float Plan to the U.S. Coast Guard Auxiliary if you are a member.

ITINERARY

	DATE	TIME	LOCATION	MODE OF TRAVEL	REASON FOR STOP	CHECK-IN TIME
Depart						
Arrive						
Depart						
Arrive						
Depart						
Arrive						
Depart						
Arrive						
Depart						
Arrive						
Depart						
Arrive						

Attach Supplemental Itinerary if additional stops are required.

Contact 1 _____

Phone Number _____

Contact 2 _____

Phone Number _____

If you have a genuine concern for the safety or welfare of any persons on board this vessel, who have not returned or checked-in within a reasonable amount of time, then follow the step-by-step instructions on the Boating Emergency Guide included with this plan, or on the World Wide Web at:

<http://www.uscgauk.org/~floatplan/BoatingEmergencyGuide.htm>

BOATING EMERGENCY GUIDE

You will need the following items before you begin: 1) The Float Plan, if one was given to you; 2) Pen or Pencil; 3) Clean sheet of paper or writing tablet, and 4) Telephone Directory

Step 1

Is there a genuine concern for the safety or welfare of any persons on board the vessel, who have not returned or checked-in within a reasonable amount of time?

If YES, continue with **Step 2**. If NO, then Stop. No further action is required at this time.

Step 2

Were you given a prepared Float Plan by anyone onboard the vessel?

If YES, continue with **Step 3**. If NO, then go to **Step 5**.

Step 3

On the Float Plan, locate the two contact lines, below the "Itinerary" at the bottom of the Float Plan. Call the telephone number of Contact-1.

IF:	THEN:						
A person answered the phone...	Take notes during your conversation.						
	1. Let the person know that you are responding to a late return or check-in by the individuals designated on the Float Plan.						
	2. Determine if the person you are talking to, or anyone else at that location, has recently had contact with anyone on the vessel, and when and where that contact occurred.						
	3. Are you still concerned about the safety or welfare of any persons on board the vessel?						
	<table border="1"> <thead> <tr> <th>IF:</th> <th>THEN:</th> </tr> </thead> <tbody> <tr> <td>Yes</td> <td>Continue with Step 4.</td> </tr> <tr> <td>No</td> <td>Stop. No further action is necessary at this time.</td> </tr> </tbody> </table>	IF:	THEN:	Yes	Continue with Step 4 .	No	Stop. No further action is necessary at this time.
IF:	THEN:						
Yes	Continue with Step 4 .						
No	Stop. No further action is necessary at this time.						
Otherwise...	Continue with Step 4 .						

Step 4

Call the telephone number for Contact-2.

IF:	THEN:						
A person answered the phone...	Take notes during your conversation.						
	1. Let the person know that you are responding to a late return or check-in by the individuals designated on the Float Plan.						
	2. Determine if the person you are talking to, or anyone else at that location, has recently had contact with anyone on the vessel, and when and where that contact occurred.						
	3. Are you still concerned about the safety or welfare of any persons on board?						
	<table border="1"> <thead> <tr> <th>IF:</th> <th>THEN:</th> </tr> </thead> <tbody> <tr> <td>Yes</td> <td>Continue with Step 6.</td> </tr> <tr> <td>No</td> <td>Stop. No further action is necessary at this time.</td> </tr> </tbody> </table>	IF:	THEN:	Yes	Continue with Step 6 .	No	Stop. No further action is necessary at this time.
IF:	THEN:						
Yes	Continue with Step 6 .						
No	Stop. No further action is necessary at this time.						
Otherwise...	Continue with Step 6 .						

Step 5

Take a moment to jot down the facts you know about each item in the checklist below:

Do not speculate! Speculation of a fact may mislead search and rescue personnel and add to the overall search and rescue time, adversely affecting the outcome.

- Period of time the vessel has been overdue.
- Purpose of the trip or voyage.
- Description of vessel (color, size, shape, etc.)
- Vessel's departure point and destination.
- Places the vessel planned to stop during transit.
- Navigation equipment on board (such as GPS, Compass, Maps, Charts, LORAN C, etc.)
- Survival equipment on board (life jackets, EPIRB, flares, etc.)
- Number of people on board the vessel, as well as personal habits e.g. dependability, reliability, etc.
- Was the vessel already moored, or did a vehicle tow it to the location?
- License plate number and description of the vehicle of the towing and/or crew transport vehicle.
- Communications equipment on board including radio frequencies monitored, cellular telephone numbers of people aboard.
- Additional points of contact in the area.
- Were there any pending commitments (work, appointments, etc.)?

Continue with **Step 6**.

Step 6

1. Contact your local Law Enforcement agency.
2. Let the dispatcher know that you are responding to a late return or check-in by the persons on board.
 - a. The dispatcher will guide you from there. The dispatcher will provide you with the necessary contact or agency connection (if one was not given on the Float Plan) to get a Search And Rescue (SAR) mission started. This is usually handled this way because it puts you closest to the agency conducting the rescue mission, eliminating an unnecessary middleman.
 - b. The dispatcher will let you know if they would like a follow-up call from you on the outcome.
3. The dispatcher will instruct you from there.

Continue with **Step 7**.

Step 7

Be patient... you've done everything you can possibly do for now. Stay off of the phone, so emergency personnel can contact you with additional information and/or questions concerning the Search And Rescue (SAR) effort.

End of Guide

APPENDIX C
ACTIVITY HAZARD ANALYSIS TABLES

ACTIVITY HAZARD ANALYSIS TABLES

AHA 1.	MOBILIZATION AND DEMOBILIZATION
AHA 2.	STREAM GAUGING, STREAM WATER SAMPLING AND STREAM SEDIMENT SAMPLING
AHA 3.	LANDSIDE SURFACE SOIL SAMPLES
AHA 4.	GEOPROBE INSTALLATION AND SAMPLING
AHA 5.	RADIOLOGICAL SURVEY
AHA 6.	MARINE SURFACE SEDIMENT SAMPLING
AHA 7.	ENVIRONMENTAL SAMPLING
AHA 8.	XRF SURVEY
AHA 9.	ENGINEERING EVALUATION/ASSESSMENT/RISK ASSESSMENT ACTIVITES

AHA 1. Mobilization and Demobilization

Activity	Potential Hazards	Controls/Inspections	Training	PPE	Monitoring
Setting up Equipment	<ul style="list-style-type: none"> • Trips and falls/irregular surfaces • Back injuries/improper lifting and support 	<ul style="list-style-type: none"> – Barricades – Cover holes/openings 	<ul style="list-style-type: none"> – General site orientation 	<ul style="list-style-type: none"> – N/A 	<ul style="list-style-type: none"> – N/A
		<ul style="list-style-type: none"> – Use lifting aids – 2 or more persons if > 60 lbs – Proper equipment/material support 	<ul style="list-style-type: none"> – Lifting training if applicable 	<ul style="list-style-type: none"> – N/A 	<ul style="list-style-type: none"> – N/A
	<ul style="list-style-type: none"> • Head, eye, body, or foot injury/struck by objects 	<ul style="list-style-type: none"> – Barricades – Back up alarms – Remove unnecessary personnel – Machine guards 	<ul style="list-style-type: none"> – General site orientation – PPE 	<ul style="list-style-type: none"> – Hard hat, safety glasses – Steel-toed shoes – Leather gloves 	<ul style="list-style-type: none"> – N/A
Equipment Operations	<ul style="list-style-type: none"> • Equipment failure/injury • Spill during refueling 	<ul style="list-style-type: none"> – Daily inspections: backup alarms, fire extinguishers, and per manufacturer instructions – Machine guards to eliminate pinch points – Correct health and safety deficiencies or do not use equipment – Don't use modified equipment unless approved by manufacturer (follow SOP 7) – Spill control equipment 	<ul style="list-style-type: none"> – Equipment specific 	<ul style="list-style-type: none"> – Level D 	<ul style="list-style-type: none"> – Noise

ACTIVITY HAZARD ANALYSIS (AHA) 2

Stream Gauging, Stream Water Sampling and Stream Sediment Sampling

Job Steps	Possible Hazards	Protection Against Hazards
The purpose of this activity is to perform Stream Gauging.		
1. Drive vehicle to site.	Vehicle could hit someone or something.	Follow traffic rules and regulations within and around shipyard. Wear seatbelts in all vehicles at all times. Drive defensively, and be aware of police and fire emergency vehicles around shipyard.
2. Unload equipment and materials from vehicle.	Load could have shifted during transport or be poorly tied down, causing load to be unstable.	If load has shifted or tie-downs are poorly installed, do not stand near truck or load. If necessary, remove each tie-down carefully and position equipment on side where tie-down is being removed to prevent load from falling on that side.
	Lifting of equipment and materials from vehicle could cause strain to worker.	Use proper lifting techniques such as keeping the back straight, lifting with legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. Use hand truck if needed. For loads greater than 50 pounds, use two people to lift.
	Cuts and abrasions could occur while moving equipment and materials.	Use leather gloves when moving objects with sharp contact points.
	Slip, trip, and fall hazards could be present.	Visually inspect work areas and mark, barricade, or eliminate slip, trip, and fall hazards. Only work on walking/working surfaces that have the strength and integrity to support employees safely. Openings 18 inches or more in diameter must be covered and marked. All openings less than 18 inches in diameter and all holes must be marked or barricaded. Avoid walking on uneven or slippery surfaces.
3. Working in stream.	Slip, trip, and fall hazards could be present.	Move carefully and be aware that streams provide an uneven surface for walking. Be aware of potential for even small flows to create enough force to dislodge footing. A prolonged amount of time in a certain position may result in differential erosion around the feet making for unstable footing. Flow volumes may increase or decrease over short periods of time resulting in different forces upon legs and walking surfaces
	Hypothermia	Minimize time in the water. Use insulated boots that are tall enough for all work in the water.
	Drowning,	Buddy system in case of falls
	Biohazards-giardia, fecal coliform, viruses, etc.	Rubber boots, gloves. Do not allow contact with stream water.
4. Performing Stream Gauging	Using equipment in a stream	The unstable bed of the stream along with the force of the moving water should be taken into account when moving equipment through streams.
5. Collect surface water and stream sediment samples.	Worker could be exposed to chemical or radiological contaminants.	Avoid spills. Ensure that spill cleanup supplies are available. Wear required PPE as specified in the SHSP. Visual inspection will determine selection of PPE. Remove PPE properly and wash hands.

ACTIVITY HAZARD ANALYSIS (AHA) 2		
Stream Gauging, Stream Water Sampling and Stream Sediment Sampling		
Job Steps	Possible Hazards	Protection Against Hazards
6. Pack samples for shipment.	Manually moving materials and equipment could cause strains.	Use proper lifting techniques such as keeping the back straight, lifting with legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. Use hand truck when handling more than one box at a time. Try to pack shipping boxes so that each box does not exceed 50 pounds. For loads greater than 50 pounds, use two people to carry.
	Contents of sample containers could leak, causing exposure to worker and possibly to people handling shipping box.	Ensure that each container top is securely tightened. Pack each container in a manner to prevent damage to container during handling of shipping box and during transportation. Ensure that boxes meet required packaging standards based on mode of transportation used for shipping.
7. Decontaminate all reusable materials and equipment.	Lifting of equipment and materials could cause strain to worker.	Use proper lifting techniques such as keeping the back straight, lifting with legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. Use hand truck if needed. For loads greater than 50 pounds, use two people to lift.
	Worker could be exposed to chemical or radiological contaminants.	Avoid spills. Ensure that spill cleanup supplies are available. Wear required PPE as specified in the SHSP. Visual inspection will determine selection of PPE. Remove PPE properly and wash hands.
	Decontamination area may become slippery.	Visually inspect work areas and mark, barricade, or eliminate slip, trip, and fall hazards as feasible. Maintain proper illumination in all work areas. If decontaminating on plastic sheeting, use caution since plastic sheeting is extremely slippery. Wear boots with good traction.

Developed on 5/4/09

Abbreviations and Acronyms:

AHA – Activity Hazard Analysis
 EHS – Environmental Health and Safety
 NASA – National Aeronautics and Space Administration
 PESM – Project Environmental and Safety Manager
 PID – photoionization detector
 PPE – personal protective equipment
 PVC – polyvinyl chloride
 SHSP – Site-Specific Health and Safety Plan
 SHSS – Site Health and Safety Supervisor

ACTIVITY HAZARD ANALYSIS (AHA) 3

Landside Surface Soil Samples

Job Steps	Possible Hazards	Protection Against Hazards
The purpose of this activity is to collect landside soil samples potentially for visual logging, radiological screening, sample collection for chemistry and physical tests.		
1. Unload equipment and materials.	Load could have shifted during transport or be poorly tied down, causing load to be unstable.	If load has shifted or tie-downs are poorly installed, do not stand near truck or load. If necessary, remove each tie-down carefully and position equipment on side where tie-down is being removed to prevent load from falling on that side.
	Lifting of equipment and materials from vehicle could cause strain to worker.	Use proper lifting techniques such as keeping the back straight, lifting with legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. Use hand truck if needed. For loads greater than 50 pounds, use two people to lift.
	Cuts and abrasions could occur while moving equipment and materials.	Use leather gloves when moving objects with sharp contact points.
	Slip, trip, and fall hazards could be present.	Visually inspect work areas and mark, barricade, or eliminate slip, trip, and fall hazards. Only walk on surfaces that have the strength and integrity to support employees safely. Avoid walking on riprap or other uneven surfaces, if possible.
2. Screen area for radioactive materials.	Slip, trip, and fall hazards could be present.	Visually inspect work areas and mark, barricade, or eliminate slip, trip, and fall hazards. Only walk on surfaces that have the strength and integrity to support employees safely. Avoid walking on riprap or other uneven surfaces, if possible.
3. Collect soil samples.	Worker could be exposed to chemical or radiological contaminants.	Avoid spills. Ensure that spill cleanup supplies are available. Wear required PPE as specified in the SHSP. Visual inspection will determine selection of PPE. Remove PPE properly and wash hands.
4. Pack samples for shipment.	Manually moving materials and equipment could cause strains.	Use proper lifting techniques such as keeping the back straight, lifting with legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. Use hand truck when handling more than one box at a time. Try to pack shipping boxes so that each box does not exceed 50 pounds. For loads greater than 50 pounds, use two people to carry.
	Contents of sample containers could leak, causing exposure to worker and possibly to people handling shipping box.	Ensure that each container top is securely tightened. Pack each container in a manner to prevent damage to container during handling of shipping box and during transportation. Ensure that boxes meet required packaging standards based on mode of transportation used for shipping.
5. Decontaminate all reusable materials and equipment.	Lifting of equipment and materials could cause strain to worker.	Use proper lifting techniques such as keeping the back straight, lifting with legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. Use hand truck if needed. For loads greater than 50 pounds, use two people to lift.
	Worker could be exposed to chemical or radiological contaminants.	Avoid spills. Ensure that spill cleanup supplies are available. Wear required PPE as specified in the SHSP. Visual inspection will determine selection of PPE. Remove PPE properly and wash hands.

ACTIVITY HAZARD ANALYSIS (AHA) 3

Landside Surface Soil Samples

Job Steps	Possible Hazards	Protection Against Hazards
	Decontamination area may become slippery.	Visually inspect work areas and mark, barricade, or eliminate slip, trip, and fall hazards as feasible. Maintain proper illumination in all work areas. If decontaminating on plastic sheeting, use caution since plastic sheeting is extremely slippery. Wear boots with good traction.

Developed on 5/4/09

Abbreviations and Acronyms:

AHA – Activity Hazard Analysis
EHS – Environmental Health and Safety
PESM – Project Environmental and Safety Manager
PjM – project manager
PPE – personal protective equipment
PVC – polyvinyl chloride
SHSP – Site-Specific Health and Safety Plan
SHSS – Site Health and Safety Supervisor

ACTIVITY HAZARD ANALYSIS (AHA) 4
Geoprobe Installation and Sampling

Job Steps	Possible Hazards	Protection Against Hazards
1. Visually survey site prior to Geoprobe rig placement.	Failure to properly survey site could cause exposure and/or damage to underground and overhead utilities, and cause slips trips and falls from various agents.	Ensure that ground has no hazards such as unstable soil, unexploded ordnance, underground utilities (marked per utility survey), overhead utilities, or pre-existing slip trip and fall hazards. Mark or eliminate all hazards as feasible.
2. Verify operators have certification of OSHA HAZWOPER training and medical release records onsite.	Untrained workers or workers without annual physicals cannot work on potential hazardous waste sites.	Allow only trained personnel to operate and work on Geoprobe.
3. Inspection of Geoprobe	Improper inspection could cause workers to be exposed to hazards associated with failure of various mechanical devices including wire lines and hydraulic lines.	<p>The Geoprobe and all associated equipment will be inspected by a competent person before use and at the beginning of each day.</p> <p>Ensure that an operators manual is available.</p> <p>Verify that the emergency shutdown system is well marked to allow anyone involved in the operation to perform an emergency shutdown.</p> <p>Ensure that a first aid kit is readily available to treat injured workers, ensure that a 20-pound, dry-chemical, ABC fire extinguisher is readily available.</p>
4. Placement of Geoprobe.	Unstable soil or uneven conditions could cause probe to operate in a non-vertical position. Probe could hit someone as the unit is placed.	<p>Ensure vehicle carrying the Geoprobe is level and even before placement of probe.</p> <p>Ensure spotters are used to direct driver to proper position and driver does not hit objects, depressions, or people. Ensure brakes are set and wheel chocks are in place before placement of Geoprobe over selected sampling point.</p> <p>Ensure feet are positioned well away from unit when it is extended and placed on the ground.</p> <p>Ensure that workers are wearing high visibility vests or shirts.</p>

ACTIVITY HAZARD ANALYSIS (AHA) 4
Geoprobe Installation and Sampling

Job Steps	Possible Hazards	Protection Against Hazards
5. Start-up of Geoprobe	Air hoses or hydraulic lines under pressure could suddenly release whip and hit workers causing severe injury. Noise from operation.	Confirm visual inspection of all pressurized hose connections was completed. Acknowledge all personnel are ready. Wear hearing protection.
6. Handling of equipment and samples.	Back and muscle strains could result from manually moving heavy materials, equipment.	Do not lift more than 50 pounds without assistance. Personnel will be directed to use proper lifting techniques such as keeping back straight, lifting with legs, and limiting twisting. Use mechanical equipment, such as a wheel barrows, whenever possible.
7. Using Geoprobe	Workers could be exposed to atmospheric and contact hazards from chemical agents released. Noise from operation of Geoprobe.	Monitor breathing zone for potentially harmful volatile organic vapors with field instruments and wear required PPE pursuant to SHSP. Ensure workers are using hearing protection

ACTIVITY HAZARD ANALYSIS (AHA) 5
Radiological Survey

Job Steps	Possible Hazards	Protection Against Hazards
1. Perform Radiological Survey using instruments described in plan.	Potential exposure to chemical hazards.	Identify all chemical hazards and receive training (MSDS) regarding safe handling of chemicals. The SHSS will file copies of all MSDSs at the site.
	Noise exposure.	Hearing protection is required when sound levels exceed 84 dBA continuously.
	Biological hazards such as snakes, insects, or spiders could cause injury or bites.	Wear PPE. Look carefully for snakes before stepping into any area or before placing hands near the ground. Watch out for snakes when disturbing rubble or debris. Use insect repellent as necessary.
	Slip, trip, and fall hazards.	Work areas shall be visually inspected and slip, trip, and fall hazards shall be marked, barricaded, or eliminated, if feasible. Use care in work area; look for depressions and obstructions. Refer to EHS Procedure 3-8, Fall Protection. Open holes should be barricaded or marked.
	Sharp objects/punctures.	Wear cut-resistant work gloves when sharp edges or other objects may cause the possibility of lacerations or other injury. When possible, sharp edges will be blunted. Worker should wear steel toe boots with steel shanks. (Except those workers performing geophysical MEC survey)

ACTIVITY HAZARD ANALYSIS (AHA) 5
Radiological Survey

Job Steps	Possible Hazards	Protection Against Hazards
	Strains from manually moving materials and equipment.	Personnel shall be directed to use proper lifting techniques such as keeping the back straight, lifting with legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. Use of hand truck shall be encouraged. Employees will not lift more than 50 pounds. Refer to EHS Procedure 3-1, Ergonomics.
	Exposure to extreme temperatures.	Monitor for heat stress in accordance with EHS Procedure 4-6, Temperature Extremes. Provide fluids and rest breaks during warm weather and while wearing impermeable protective clothing.
	Eye hazards.	Safely glasses are the minimum required eye protection for all work areas.
	Lack of communication in widely dispersed areas.	Ensure each work team has a telephone or access to a telephone for communication. If more than one team at a time is working, ensure there is communication between the work teams and project management. Workers must work in teams of two or more. Each team must use the "buddy" system.
	Struck by or against vehicles.	Wear high-visibility reflective vests at all times in work area. Make eye contact with operators of vehicles. Understand and review posted hand signals.

ACTIVITY HAZARD ANALYSIS (AHA) 5
Radiological Survey

Job Steps	Possible Hazards	Protection Against Hazards
	Power and hand tools.	Inspect all tools before each use. Discard or tag out any tool that is not safe, has broken handles, patched handles, missing guards, and so forth. Personnel will be trained in the proper use of hand and power tools. If power tools are connected to power sources other than batteries, the tools will be grounded or double insulated and connected to a GFCI outlet.
	Material handling.	Identify and avoid pinch points. Maintain communication with others involved in material handling. Use appropriate PPE.
2. Finding radiological anomalies.	Exposure to radioactive point source.	Follow radiological protection plan. Do not pickup any debris unless directed by CHP or PESM. Remember — distance and protective barriers reduce potential exposure. Mark the location of the source.

ACTIVITY HAZARD ANALYSIS (AHA) 6
Marine Surface Sediment Sampling

Job Steps	Possible Hazards	Protection Against Hazards
<p>The purpose of this activity is to collect marine sediment samples potentially for visual logging, radiological screening, and sample collection for chemistry and physical tests. The samples will be collected using a van veen, petite ponar or equivalent sampling apparatus, depending on site conditions.</p>		
1. Drive vehicle to site.	Vehicle could hit someone or something.	Follow traffic rules and regulations within and around shipyard. Wear seatbelts in all vehicles at all times. Drive defensively, and be aware of police and fire emergency vehicles around shipyard.
2. Unload equipment and materials from vehicle.	Load could have shifted during transport or be poorly tied down, causing load to be unstable.	If load has shifted or tie-downs are poorly installed, do not stand near truck or load. If necessary, remove each tie-down carefully and position equipment on side where tie-down is being removed to prevent load from falling on that side.
	Lifting of equipment and materials from vehicle could cause strain to worker.	Use proper lifting techniques such as keeping the back straight, lifting with legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. Use hand truck if needed. For loads greater than 50 pounds, use two people to lift.
	Cuts and abrasions could occur while moving equipment and materials.	Use leather gloves when moving objects with sharp contact points.
	Slip, trip, and fall hazards could be present.	Visually inspect work areas and mark, barricade, or eliminate slip, trip, and fall hazards. Only work on walking/working surfaces that have the strength and integrity to support employees safely. Openings 18 inches or more in diameter must be covered and marked. All openings less than 18 inches in diameter and all holes must be marked or barricaded. Avoid walking on uneven or slippery surfaces.
3. If using Zodiaks, assemble vessels,	Worker could come into contact with electrical hazards during inflation of vessel,	Inspect equipment used to inflate vessel prior to use. Remove any broken or damaged equipment from service. Use tools for intended purposes only and in accordance with manufacturer's instructions.
4. Inspect vessels.	Improper inspection of vessel could cause workers to be exposed to hazards associated with operating vessel and working on water.	Ensure that a competent person inspects vessel and all associated equipment and that vessel is in safe operating condition. Inspect vessel, including emergency equipment and life preservers, before use and at start of each shift. Verify that vessel is equipped with kill switch, and location of switch is known by all site workers. Operator's manual must be available and reviewed prior to operation.
5. Carry vessels to water and put in water.	Workers could be struck by vessel.	When carrying vessel, clear area of all non-essential personnel.
	Lifting of vessel could cause strain to worker.	Ensure two or more personnel are used to carry vessel to water. Do not place any equipment in the vessel until the vessel is in the water. Use proper lifting techniques such as keeping the back straight, lifting with legs, and limiting twisting.
	Slip, trip, and fall hazards could be present.	Visually inspect path and mark, barricade, or eliminate slip, trip, and fall hazards. Only walk on surfaces that have the strength and integrity to support employees safely. Avoid walking on uneven or slippery surfaces.

ACTIVITY HAZARD ANALYSIS (AHA) 6
Marine Surface Sediment Sampling

Job Steps	Possible Hazards	Protection Against Hazards
6. Move equipment onto vessels and set up.	Handling of instruments could cause strain to worker.	Carry instruments as required by the manufacturer of the instrument. Use straps when provided and adjust for comfort. Use care when walking so that there are no sudden jerks or missteps that can cause the worker to strain to maintain control of the instrument. Get assistance from other workers if several instruments must be carried. For loads greater than 50 pounds, use two people to carry.
	Slip, trip, and fall hazards could be present	Visually inspect work areas and mark, barricade, or eliminate slip, trip, and fall hazards. Only walk on surfaces that have the strength and integrity to support employees safely. Avoid walking on uneven or slippery surfaces.
	Worker could fall off of dock or vessel into water.	Wear United States Coast Guard (USCG)-Approved Type I, III or V Life Preservers when on water. Securely anchor or dock vessels. Position docked vessels with minimum of 2 lines. Do not load vessel in adverse weather conditions or dangerous seas.
7. Start outboard motor and operate vessel to travel to sample location.	Worker could fall overboard.	Wear USCG-Approved Type I, III or V Life Preservers at all times when on water. Remain seated whenever vessel is moving. Do not operate vessel in adverse weather conditions or dangerous seas.
	Vessel could sink, tip, or get stranded.	Do not exceed maximum weight capacity for vessel. Operate vessel with a minimum of 2 personnel on board. Do not use vessel without shore support personnel and remain in constant radio contact with shore support personnel. Never pitchpole or broach any waves.
	Vessel could come into contact with other vessels.	Watch for other vessels in area and avoid close calls or collisions. Watch for wake from other vessels. Be familiar with the "Rules of the Road" that regulate movement of boat traffic. Verify that vessel has required Coast Guard-approved lighting and signaling devices.
	Sonar or vessel motor could contact debris or sediment surface.	Do not operate vessel near shoreline. Avoid sediment surface by turning sonar to an angle of 30 degrees. Watch for (know their locations or mark with buoys) objects hidden under water at higher tides (e.g., pilings, islands, anchor lines, etc.). Give wide berth to rocks, ledges and manmade subsurface obstructions. In the event vessel becomes grounded at times of low tide, do not move vessel until enough water returns to refloat it.
	Equipment could be crushed or fall overboard,	Do not place instruments near edge of vessel when not in use or not secured. Secure equipment to vessel or personnel when appropriate. Secure all radios and cell phones. Maintain good housekeeping.
	Slip, trip, and fall hazards could be present.	Visually inspect work areas and mark or eliminate slip, trip, and fall hazards. Only work on surfaces that have the strength and integrity to support employees safely. Maintain work areas and means of access safe and orderly. Ensure loads are properly distributed in vessel.

ACTIVITY HAZARD ANALYSIS (AHA) 6
Marine Surface Sediment Sampling

Job Steps	Possible Hazards	Protection Against Hazards
	Fire could occur.	Carry one 20-pound, ABC, dry chemical fire extinguisher on vessel. Evacuate vessel if fire cannot be contained with one fire extinguisher.
8. If using barge, inspect vessel,	Improper inspection of vessel could cause workers to be exposed to hazards associated with operating vessel and working on water.	Ensure that a competent person inspects vessel and all associated equipment and that vessel is in safe operating condition. Inspect vessel, including navigation lights, fuel supply hose, life preservers, hull, etc., before use and at start of each shift. Verify that inspection checklist has been completed. Verify that vessel is equipped with kill switch, and location of switch is known by all site workers. Operator's manual must be available and reviewed prior to operation.
9. Move equipment onto vessel and board vessel,	Handling of instruments could cause strain to worker.	Carry instruments as required by the manufacturer of the instrument. Use straps when provided and adjust for comfort. Use care when walking so that there are no sudden jerks or missteps that can cause the worker to strain to maintain control of the instrument. Get assistance from other workers if several instruments must be carried. For loads greater than 50 pounds, use two people to carry.
	Slip, trip, and fall hazards could be present.	Visually inspect work areas and mark, barricade, or eliminate slip, trip, and fall hazards. Only walk on surfaces that have the strength and integrity to support employees safely. Avoid walking on uneven or slippery surfaces.
	Worker could fall off of dock or vessel into water.	Wear United States Coast Guard (USCG)-Approved Type I, III or V Life Preservers when near water. Securely anchor or dock vessels. Position docked vessels with minimum of 2 lines. Do not load vessel in adverse weather conditions or dangerous seas.
10. Operate vessel to travel to sample location.	Worker could fall overboard.	Wear USCG-Approved Type I, III or V Life Preservers at all times when on water. Remain seated whenever vessel is moving. Do not operate vessel in adverse weather conditions or dangerous seas.
	Vessel could sink, tip, or get stranded.	Do not exceed maximum weight capacity for vessel. Operate vessel with a minimum of 2 personnel on board. Do not use vessel without shore support personnel and remain in constant radio contact with shore support personnel. Never pitchpole or broach any waves.
	Vessel could come into contact with other vessels.	Watch for other vessels in area and avoid close calls or collisions. Watch for wake from other vessels. Be familiar with the "Rules of the Road" that regulate movement of boat traffic. Verify that vessel has required Coast Guard-approved lighting and signaling devices.
	Equipment could be crushed or fall overboard.	Do not place instruments near edge of vessel when not in use or not secured. Secure equipment to vessel or personnel when appropriate. Secure all radios and cell phones. Maintain good housekeeping.

ACTIVITY HAZARD ANALYSIS (AHA) 6
Marine Surface Sediment Sampling

Job Steps	Possible Hazards	Protection Against Hazards
	Slip, trip, and fall hazards could be present.	Visually inspect work areas and mark, barricade, or eliminate slip, trip, and fall hazards. Only work on walking/working surfaces that have the strength and integrity to support employees safely. Wear high traction boots. Use non-slip surfaces for work area. Maintain work areas and means of access safe and orderly. Close all open deck hatches. Ensure decks and stairways have guardrails. Ensure loads are properly distributed in vessel. Do not allow oil and grease to build up on walking surfaces.
	Fire could occur.	Carry one 20-pound, ABC, dry chemical fire extinguisher on vessel. Evacuate vessel if fire cannot be contained with one fire extinguisher.
11. Collect surface water sample (if needed).	Worker or peristaltic pump could fall overboard.	Wear USCG-Approved Type I, III or V Life Preservers at all times when on water. Only collect water samples when vessel is stationary. Place peristaltic pump far enough away from the edge of the vessel so that it is not knocked overboard.
	Worker could be exposed to chemical or radiological contaminants.	Avoid spills. Ensure that spill cleanup supplies are available. Wear required PPE as specified in the SHSP. Visual inspection will determine selection of PPE. Remove PPE properly and wash hands.
12. Pack samples for shipment.	Manually moving materials and equipment could cause strains.	Use proper lifting techniques such as keeping the back straight, lifting with legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. Use hand truck when handling more than one box at a time. Try to pack shipping boxes so that each box does not exceed 50 pounds. For loads greater than 50 pounds, use two people to carry.
	Contents of sample containers could leak, causing exposure to worker and possibly to people handling shipping box.	Ensure that each container top is securely tightened. Pack each container in a manner to prevent damage to container during handling of shipping box and during transportation. Ensure that boxes meet required packaging standards based on mode of transportation used for shipping.
13. Decontaminate all reusable materials and equipment.	Lifting of equipment and materials could cause strain to worker.	Use proper lifting techniques such as keeping the back straight, lifting with legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. Use hand truck if needed. For loads greater than 50 pounds, use two people to lift.

ACTIVITY HAZARD ANALYSIS (AHA) 6
Marine Surface Sediment Sampling

Job Steps	Possible Hazards	Protection Against Hazards
	Worker could be exposed to chemical or radiological contaminants.	Avoid spills. Ensure that spill cleanup supplies are available. Wear required PPE as specified in the SHSP. Visual inspection will determine selection of PPE. Remove PPE properly and wash hands.
	Decontamination area may become slippery.	Visually inspect work areas and mark, barricade, or eliminate slip, trip, and fall hazards as feasible. Maintain proper illumination in all work areas. If decontaminating on plastic sheeting, use caution since plastic sheeting is extremely slippery. Wear boots with good traction.

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ACTIVITY HAZARD ANALYSIS (AHA) 7

Environmental Sampling

Job Steps	Possible Hazards	Protection Against Hazards
1. Unload equipment and materials.	Load could have shifted during transport or be poorly tied down, causing load to be unstable.	If load has shifted or tie-downs are poorly installed, do not stand near truck or load. If necessary, remove each tie-down carefully and position equipment on side where tie-down is being removed to prevent load from falling on that side.
	Lifting of equipment and materials from vehicle could cause strain to worker.	Use proper lifting techniques such as keeping the back straight, lifting with legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. Use hand truck if needed. For loads greater than 50 pounds, use two people to lift.
	Cuts and abrasions could occur while moving equipment and materials.	Use leather gloves when moving objects with sharp contact points.
	Slip, trip, and fall hazards could be present.	Visually inspect work areas and mark, barricade, or eliminate slip, trip, and fall hazards. Only walk on surfaces that have the strength and integrity to support employees safely. Avoid walking on riprap or other uneven surfaces, if possible.
2. Screen area for radioactive materials.	Slip, trip, and fall hazards could be present.	Visually inspect work areas and mark, barricade, or eliminate slip, trip, and fall hazards. Only walk on surfaces that have the strength and integrity to support employees safely. Avoid walking on riprap or other uneven surfaces, if possible.
3. Collect samples.	Worker could be exposed to chemical or radiological contaminants.	Avoid spills. Ensure that spill cleanup supplies are available. Wear required PPE as specified in the SHSP. Visual inspection will determine selection of PPE. Remove PPE properly and wash hands.
4. Pack samples for shipment.	Manually moving materials and equipment could cause strains.	Use proper lifting techniques such as keeping the back straight, lifting with legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. Use hand truck when handling more than one box at a time. Try to pack shipping boxes so that each box does not exceed 50 pounds. For loads greater than 50 pounds, use two people to carry.
	Contents of sample containers could leak, causing exposure to worker and possibly to people handling shipping box.	Ensure that each container top is securely tightened. Pack each container in a manner to prevent damage to container during handling of shipping box and during transportation. Ensure that boxes meet required packaging standards based on mode of transportation used for shipping.
	Worker could be exposed to chemical or radiological contaminants.	Avoid spills. Ensure that spill cleanup supplies are available. Wear required PPE as specified in the SHSP. Visual inspection will determine selection of PPE. Remove PPE properly and wash hands.
	Decontamination area may become slippery.	Visually inspect work areas and mark, barricade, or eliminate slip, trip, and fall hazards as feasible. Maintain proper illumination in all work areas. If decontaminating on plastic sheeting, use caution since plastic sheeting is extremely slippery. Wear boots with good traction.

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ACTIVITY HAZARD ANALYSIS (AHA) 8		
XRF Survey		
Job Steps	Possible Hazards	Protection Against Hazards
The purpose of this activity is to perform in-situ XRF analysis as a guide for soil sampling.		
1. Assess area to be sampled.	Slip, trip, and fall hazards could be present.	Visually inspect work areas and mark, barricade, or eliminate slip, trip, and fall hazards. Only walk on surfaces that have the strength and integrity to support employees safely. Avoid walking on riprap or other uneven surfaces, if possible.
2. Perform in-situ XRF measurements.	Slip, trip, and fall hazards could be present.	Visually inspect work areas and mark, barricade, or eliminate slip, trip, and fall hazards. Only walk on surfaces that have the strength and integrity to support employees safely. Avoid walking on riprap or other uneven surfaces, if possible.
	Biological hazards such as snakes, insects, or spiders could cause injury or bite.	Wear PPE. Look carefully for snakes before stepping into any area or before placing hands near the ground. Watch out for snakes when disturbing rubble or debris. Use insect repellent as necessary.
	Exposure to extreme temperatures.	Monitor for heat stress in accordance with EHS Procedure 4-6, Temperature Extremes. Provide fluids and rest breaks during warm weather and while wearing impermeable protective clothing.
	Lack of communication in widely dispersed areas.	Ensure each work team has a telephone or access to a telephone for communication. If more than one team at a time is working, ensure there is communication between the work teams and project management. Workers must work in teams of two or more. Each team must use the buddy system.
	Worker could be exposed to x-ray radiation.	Always keep XRF pointed at the ground and away from people. Open shutter only when kapton window is in contact with the ground.
	Exposure to radioactive point source.	Follow radiological protection plan. Dosimetry will be worn. Do not pickup any debris unless directed by CHP or PESM. Remember-distance and protective barriers reduce potential exposure. Mark the location of the source.
3. Decontaminate XRF Meter.	Worker could be exposed to chemical or radiological contaminants,	Avoid spills. Ensure that spill cleanup supplies are available. Wear required PPE as specified in the SHSP. Visual inspection will determine selection of PPE. Remove PPE properly and wash hands.
	Decontamination area may become slippery.	Visually inspect work areas and mark, barricade, or eliminate slip, trip, and fall hazards as feasible. Maintain proper illumination in all work areas. If decontaminating on plastic sheeting, use caution since plastic sheeting is extremely slippery. Wear boots with good traction.

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ACTIVITY HAZARD ANALYSIS (AHA) 9		
Engineering Evaluation/Assessment/Risk Assessment Activities		
Job Steps	Possible Hazards	Protection Against Hazards
The purpose of this activity is to perform an engineering assessment, topographical surveying, and a qualitative terrestrial, freshwater, and marine biota survey.		
1. Visual site assessment and collection of limited samples of potential sources of on-site borrow material. Topographical surveying to provide mine material and potential borrow volume estimates. Qualitative biota survey.	Slip, trip and fall, and falling rock hazards could be present.	Visually inspect work areas and mark, barricade, or eliminate slip, trip falling rock, and foot-puncture hazards. Only walk on surfaces that have the strength and integrity to support employees safely. Avoid walking on riprap or other uneven surfaces, if possible. Engineering assessments and biota survey at mine adit portals will be done visually at a safe distance from the portals. Topographical surveying at adit portals will likewise be terminated at a safe distance from the portal. In no case will entry into the portal or mine workings be permitted.
	Lack of communication in widely dispersed areas.	Ensure each work team has a telephone or access to a telephone for communication. If more than one team at a time is working, ensure there is communication between the work teams and project management. Workers must work in teams of two or more. Each team must use the “buddy” system.
	Biological hazards such as snakes, insects, or spiders could cause injury or bite.	Wear PPE. Look carefully for snakes before stepping into any area or before placing hands near the ground. Watch out for snakes when disturbing rubble or debris. Use insect repellent as necessary.

Abbreviations and Acronyms:

AHA — Activity Hazard Analysis

PPE — personal protective equipment

APPENDIX D
PHYSICAL AGENT DATA SHEETS

Labor Standards and Safety Division**Physical Agent Data Sheet (PADS) -
Ultraviolet Radiation****Other PADS:**

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[Hand-Arm Vibration](#)
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[Ionizing Radiation \(PDF\)](#)
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Description

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Description

Ultraviolet (UV) is the name for a band of energy on the electromagnetic spectrum that lies between visible light and x-rays. UV has some of the properties of visible light and other properties of the x-rays. Like visible light, some UV is actually visible but most is invisible like x-rays. UV, like light, cannot penetrate very far into most solids. Some UV, like x-rays, can ionize atoms or molecules which visible light cannot do.

Common sources of UV include the sun (especially when reflected by water, snow or ice), sun tanning lamps, mercury discharge lamps, welding arcs, plasma torches, and some lasers.

Health Hazards

The nature and seriousness of UV injuries depend on the length of exposure, the intensity of the UV, the type or wavelength of UV, the sensitivity of the individual, and the presence of certain chemicals (photosensitizers).

Skin

UV from the sun causes sunburns and skin cancer. UV from other sources can also cause skin burns varying in degree from mild reddening of the skin (first degree burns) to more severe and painful blistering (second degree burns). Long-term skin exposure to UV can cause actinic skin (a dry, brown, inelastic wrinkled skin) and skin cancer. Fair skinned individuals are more likely to develop both sunburns and skin cancer.

Some drugs, such as the antibiotic tetracycline, can cause skin burns from UV to happen faster and to be more severe. Products containing coal tar can also cause this reaction. These substances are called photosensitizers.

UV exposure may trigger cold sores (Herpes Simplex) in some individuals.

Eyes

When UV is absorbed by the eyes and eyelids, it can cause keratoconjunctivitis or "welders' flash." This is a very painful condition that feels like grit in the eyes and may make the eyes water and very sensitive to light. The condition usually occurs 6-12 hours after exposure and may last 6-24 hours. The painful injury may make a person unwilling or unable to open his/her eyes during this time period, but most discomfort is gone within 48 hours with no lasting injury. The maximum sensitivity of the eye occurs at a UV wavelength of 270 nanometers. Cataracts or clouding of the lens of the eye can occur during high exposures to wavelengths in the range of 295-300 nanometers.

Skin Safety and Health Precautions

Skin burns from high, short-term exposure to UV and skin cancer from long-term exposure can be prevented by covering exposed skin with clothing and protective equipment such as gloves and face shields.* Barrier creams or lotions with sun protection factors (SPF) of 15-18 will also help prevent skin burns.

* Welders' helmets should provide protection for the neck area as well as the face and eyes.

Eyes

Tinted goggles and/or face shields should be worn to prevent burns of the cornea and eyelids. Selection of the appropriate degree of tint should be based on the anticipated wavelength and intensity of the UV source. (see Table 1)

Table 1
Shade No. 3.0: is for glare of reflected sunlight from snow, water, sand, etc.; stray light from cutting and welding, metal pouring and work around furnaces and foundries; and soldering (for goggles or spectacles with side shields worn under helmets in arc welding operations, particularly gas-shielded arc welding operations).
Shade Nos. 4.0 and 5.0: are for light acetylene cutting and welding; light electric spot welding.
Shade Nos. 6.0 and 7.0: are for gas cutting, medium gas welding, and non-gas-shielded arc welding using current values up to 30 amperes.
Shade Nos. 8.0 and 9.0: are for heavy gas cutting and nongas-shielded arc welding and cutting using current values from 30 to

75 amperes.
Shade Nos. 10.0 and 11.0: are for arc welding and cutting using current values from 75 to 200 amperes.
Shade Nos. 12.0 and 13.0: are for arc welding and cutting using current values from 200 to 400 amperes.
Shade No. 14.0: is for arc welding and cutting using current values over 400 amperes (including carbon arc welding and cutting), and for atomic hydrogen welding.
<i>NOTE: ordinary window glass, 1/8" in thickness, is sufficient protection for the eyes and skin against the ultraviolet radiation from ordinary sources such as sunlight. In cases of extremely intense sources of ultraviolet and visible radiation, it is not adequate.</i>

In sunny conditions on water, snow and ice, extra precautions should be taken to protect against reflected sunlight. Sunglasses with side shields should be worn. When applying protective ointments or lotions, special attention should be paid to the nose, lips, underside of the chin, and tops of the ears.

In workplaces, operations such as welding which produce high levels of UV should be performed behind enclosures or barriers to absorb the radiation and shield nearby workers.

UV sources like mercury discharge lamps should be operated only with all safety devices in place and in accordance with manufacturer's instructions.

First Aid Procedures

Skin burns: immediate application of cold (cold water, ice, cold clean cloths) to the affected area will reduce the severity and relieve pain associated with first and second degree burns. Do not apply any burn ointments, creams, or butter to skin burns.

Eyes: place sterile dressings over the eyes of a person suffering from UV burns of the eyes and seek medical attention.

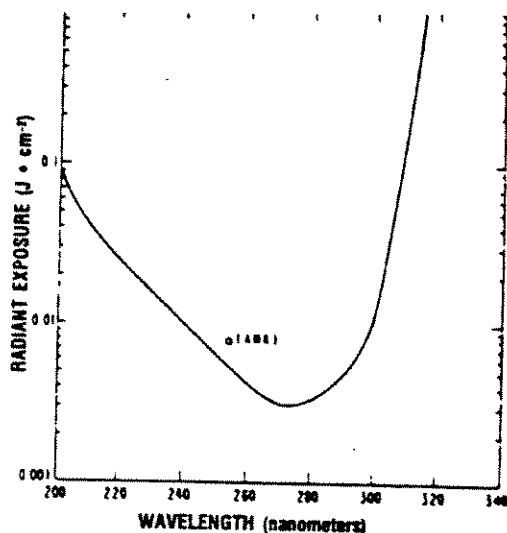
Recommended Exposure Limits²

The following section is very technical and is included for the use of safety and health professionals who have the skills and equipment to measure UV levels.

These threshold limit values (TLVS) refer to ultraviolet radiation in the spectral region between 200 and 400 nm and represent conditions under which it is believed that nearly all workers may be repeatedly exposed without adverse

effect. These values for exposure of the eye or skin apply to ultraviolet radiation from arcs, gas and vapor discharges, fluorescent and incandescent sources, and solar radiation, but do not apply to ultraviolet lasers. These values do not apply to ultraviolet radiation exposure of photosensitive individuals or of individuals concomitantly exposed to photosensitizing agents. These values should be used as guides in the control of exposure to continuous sources where the exposure duration shall not be less than 0.1 sec (Figure 1).

Figure 1



These values should be used as guides in the control of exposure to ultraviolet sources and should not be regarded as a fine line between safe and dangerous levels.

Recommended Values

The threshold limit value for occupational exposure to ultraviolet radiation incident upon skin or eye where irradiance values are known and exposure time is controlled are as follows:

1. For the near ultraviolet spectral region (320 to 400 nm), total radiance incident upon the unprotected skin or eye should not exceed 1 mW/cm for periods greater than 110 seconds (approximately 16 minutes) and for exposure times less than 10 seconds should not exceed one J/cm.
2. For the actinic ultraviolet spectral region (200 to 315 nm), radiant exposure incident upon the unprotected skin or eye should not exceed the values given in Table 2 within an 8-hour period.

Wavelength (nm)	TLV (mJ/cm ²)	Relative Special Effectiveness S _λ
200	100	0.03
210	40	0.075
220	25	0.12
230	16	0.19
240	10	0.30
250	7	0.43
254	6	0.5
260	4.6	0.65
270	3.0	1.0
280	3.4	0.88
290	4.7	0.64
300	10	0.30
305	50	0.60
310	200	0.015
315	1000	0.003

* See Laser TLVS.

3. To determine the effective irradiance of a broadband source weighted against the peak of the spectral effectiveness curve (270 nm), the following weighting formula should be used:

$$E_{\text{eff}} = \sum E_{\lambda} S_{\lambda} \Delta \lambda$$

where:

E_{eff} = effective irradiance relative to a monochromatic source at 270 nm in W/cm² [J/ (s cm²)]

$E\lambda$ = spectral irradiance in $W/(cm\ nm)$

$S\lambda$ = relative spectral effectiveness (unitless)

$\Delta\lambda$ = band width in manometers

4. Permissible exposure time in seconds for exposure to actinic ultraviolet radiation incident upon the unprotected skin or eye may be computed by dividing $0.003\ J/cm^2$ by E_{eff} in W/cm^2 . The exposure time may also be determined using Table 3 which provides exposure times corresponding to effective irradiances in $\mu\ W/cm^2$.

Table 3 Permissible Ultraviolet Exposures	
Duration of Exposure Per Day	Effective Irradiance E_{eff} ($\mu\ W/cm^2$)
8 hrs	0.1
4 hrs	0.2
2 hrs	0.4
1 hr	0.8
30 min	1.7
15 min	3.3
10 min	5.0
5 min	10.0
1 min	50.0
30 sec	100.0
10 sec	300.0
1 sec	3,000.0
0.5 sec	6,000.0
0.1 sec	30,000.0

5. All the preceding TLVs for ultraviolet energy apply to sources which subtend an angle less than 80 degrees. Sources which subtend a greater angle need to be measured only over an angle of 80 degrees.

Conditioned (tanned) individuals can tolerate skin exposure in excess of the TLV without erythematous effects. However, such conditioning may not protect persons against cancer.

Reference

1. Sunlight and Man. Fitzpatrick et al Eds. University of Tokyo Press, Tokyo, Japan (1974).
2. Threshold Limit Values and Biological Exposure Indices for 1986 - 1987. American Conference of Governmental Industrial Hygienists, 6500 Glenway Avenue, Building D-7, Cincinnati, Ohio 45211-4438.

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Labor Standards and Safety Division

Physical Agent Data Sheet (PADS) - Noise

Other PADS:

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[Health Effects](#)
[Hearing](#)
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Description

Sound is created when a vibrating source (like a bell, motor or a stereo speaker) sends sound waves through the air to your ear. Every sound has two aspects: its pitch (frequency) and its loudness (intensity). On a stereo, frequency is determined by the bass/treble control. Intensity is determined by the volume control. Noise (unwanted sound) is usually made up of many frequencies. The disturbing and harmful effects of noise depend both on the loudness and the frequency of the tones making up noise.

Loudness is measured in units called decibels (dB). A conversational voice is about 65 dB. A shout is 90 dB or greater.

Frequency is measured in units called Hertz (Hz). The frequency of a locomotive horn is about 250 Hz. The frequency of a table saw is about 4,000 Hz.

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Health Effects

Excessive noise can destroy the ability to hear, and may also put stress on other parts of the body, including the heart.

For most effects of noise, there is no cure, so that prevention of excessive noise exposure is the only way to avoid health damage.

Hearing

The damage done by noise depends mainly on how loud it is and

on the length of exposure. The frequency or pitch can also have some effect, since high-pitched sounds are more damaging than low-pitched sounds.

Noise may tire out the inner ear, causing temporary hearing loss. After a period of time away from the noise hearing may be restored. Some workers who suffer temporary hearing loss may find that by the time their hearing returns to normal, it is time for another work shift so, in that sense, the problem is "permanent."

With continual noise exposure, the ear will lose its ability to recover from temporary hearing loss, and the damage will become permanent. Permanent hearing loss results from the destruction of cells in the inner ear, cells which can never be replaced or repaired. Such damage can be caused by long-term exposure to loud noise or, in some cases" by brief exposures to very loud noises.

Normally, workplace noise first affects the ability to hear high frequency (high-pitched) sounds. This means that even though a person can still hear some noise, speech or other sounds may be unclear or distorted.

Workers suffering from noise-induced hearing loss may also experience continual ringing in their ears, called "tinnitus." At this time, there is no cure for tinnitus, although some doctors are experimenting with treatment.

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Other Effects

Although research on the effects of noise is not complete, it appears that noise can cause quickened pulse rate, increased blood pressure and a narrowing of the blood vessels over a long period of time, these may place an added burden on the heart.

Noise may also put stress on other parts of the body by causing the abnormal secretion of hormones and tensing of the muscles.

Workers exposed to noise sometimes complain of nervousness, sleeplessness and fatigue. Excessive noise exposure also can reduce job performance and may cause high rates of absenteeism.

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Permissible Exposure Limit

The Action level for noise is an average noise level of 85 dB for an eight-hour day. When employees are exposed to noise levels, which exceed the Permissible Exposure Limit, the employer must install or use engineering or administrative controls to lower the noise levels. While these controls are being designed or installed employees must wear hearing protection. If the controls still do not reduce noise exposures to below 90 dB, hearing protection must continue to be worn.

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Protective Measures

Suitable hearing protectors (earplugs or muffs) must be made available at no cost to employees who are exposed to an average of 85 dB or greater for an eight-hour day. Employees must be given the opportunity to select from three different types of appropriate hearing protectors.

Hearing tests (audiometric exams) must be given to employees who are exposed to an average of 85 dB or greater for an eight-hour day. Hearing tests will show whether employees are experiencing any hearing losses. Hearing tests are also useful in showing how well the earplugs and earmuffs are working. Hearing tests must be given annually.

Employees should also receive training in the effects of noise on hearing, an explanation of the hearing tests, and instruction on the proper fitting and care of earplugs or muffs.

Noise away from work can also cause hearing loss. Hearing protectors should be worn when operating noisy equipment or tools such as chain saws, brush cutters, power lawn mowers, or when using firearms.

Refer to Alaska Administrative Code, Occupational Health and Environmental Control 04.0104 for specific regulations on Noise Exposure and Hearing Conservation Programs.

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Physical Agent Data Sheet

HYPOTHERMIA

Hypothermia is a temperature-related disorder. Therefore it is necessary to understand human physiology as it pertains to temperature stress.

Man is considered a tropical animal. Normal functioning of the human animal requires a body temperature of 37 degrees Celsius (98.6 degrees Fahrenheit). The body can self-compensate for small upward or downward variations in temperature through the activation of built-in thermoregulatory system, controlled by temperature sensors in the skin. The response to an upward variation in body temperature is the initiation of perspiration, which moves moisture from the body tissues to the body surface. When the moisture reaches the surface it evaporates, carrying with it a quantity of heat. The response to downward variation in body temperature is shivering, which is the body's attempt to generate heat. Shivering is an involuntary contraction and expansion of muscle tissue occurring on a large scale. This muscle action creates heat through friction.

THE DISORDER

Hypothermia is defined as a core temperature of the body less than 35 degrees Celsius (95 degrees Fahrenheit). Hypothermia is also considered the clinical state of sub-normal temperature when the body is unable to generate sufficient heat to efficiently maintain functions.

Many variables contribute to the development of hypothermia. Age, health, nutrition, body size, exhaustion, exposure, duration of exposure, wind, temperature, and wetness of body or clothes, medication and intoxicants (alcohol) may decrease heat production or increase heat loss.

The healthy individual's compensatory responses to heat loss via conduction, convection, radiation, evaporation and respiration may be overwhelmed by exposure. Medication may also interfere with heat generation or regulation. Children will have different symptoms than adults depending on the severity of the cold.

Definitions:

Conduction: Direct transfer of heat by contact with a cooler object

Convection: Cool air moving across the surface of the body, heat is transferred to the cool air warming the air.

Radiation: Heat radiated outward from the warm body to the cooler environment.

Evaporation: The process of losing heat from the body by vaporization of water from the body surface.

Respiration: Inspired air raised to body temperature that is then exhaled.

Each of these causes of heat loss can play a large or small role in the development of hypothermia, depending on clothing, head cover, wind, weather, etc.

Once hypothermia develops, two body compartments, the shell (skin) and the core (the remainder of the body) share the heat deficit. The skin constitutes about 10% of a 150 pound mass.

Hypothermia can be recognized as impending, mild, moderate and severe. Below is a brief description of the various stages:

Impending: Person's core temperature has decreased to 96.8 degrees Fahrenheit (36 degrees C). Individual will increase exercise in an attempt to warm up. The skin may become pale, numb and waxy. Muscles can become tense and shivering may begin. Fatigue and weakness may begin to show.

Mild: Core temperature has dropped to 93.2 degrees Fahrenheit (34 degrees C). Intense, uncontrolled shivering has begun. The individual may still be alert and able to help self; however, movements become less coordinated and the coldness is causing some pain and discomfort.

Moderate: Core temperature has dropped to 87.7 degrees Fahrenheit (31 degrees C). Shivering slows or stops completely, mental confusion and apathy set in. Speech is slow and slurred. Breathing becomes slow and shallow followed by with drowsiness.

Severe: Core temperature is below 87.7 degrees Fahrenheit (31 degrees C). Skin may have a blue-gray color; iris of the eyes may be dilated, may appear drunk, denies problems and may refuse help. This leads to a gradual loss of consciousness. There may be little or no breathing, lack of response to verbal or painful stimuli and may appear dead.

(Temperatures used in above descriptions are approximate. Symptoms may start at different temperatures depending on the individual and circumstances.)

Treatment Preface

Always act on the fact that **"no one is dead until warm and dead."**

Think ABCD – Airway, Breathing, Circulation and Degrees.

In sudden exposure to cold water there is a greater chance for resuscitation with sudden submersion and with prolonged exposure to cold water. Quick onset of hypothermia, easy to reverse. Slow onset, the harder to reverse the process.

The sole consensus regarding prehospital treatment is that all patients at some point should be rewarmed. Core first then extremities. The best way to rewarm the core is by warm air and warm IV solutions.

Initial management principles emphasize prevention of further heat loss, rewarming as soon as is safely possible at a "successful" rate and rewarming the core before the shell, in an attempt to avoid inducing lethal side effects during rewarming. This treatment goal is important, since hypothermia itself may not be fatal above 77 degrees Fahrenheit (25 degrees C) core temperature.

The person must be handled very carefully and gently and not be allowed to exercise, as muscular action can pump cold blood to the heart.

Cold blood going to the heart can cause ventricular fibrillation

Hypothermia causes several reactions within the body as it tries to protect itself and retain its heat. The most important of these is vasoconstriction, which halts blood flow to the extremities in order to conserve heat in the core of the body.

Treatment of Hypothermia

Be able to recognize the symptoms of hypothermia in yourself and others. The victim may deny he/she is in trouble. Even mild symptoms demand attention:

Impending: Seek or build a shelter to get the person out of the cold, windy, wet environment.

Start a fire or get a cookstove going to provide warmth. Provide the person with a hot drink (no alcohol, coffee or tea). Insulate the person with extra clothes.

Mild: Remove or insulate the patient from the cold ground, protect from the wind, eliminate evaporative heat loss with a vapor barrier. Keep the head and neck covered, remove to a warm environment. Consider covering patient's mouth and nose with a light fabric to reduce heat loss through breathing. Provide the person with a warm, sweetened drink (no alcohol, coffee or tea) and some high-energy food. Limited exercise may help to generate some internal heat, but it depletes energy reserves.

Moderate: Remove the person from the cold environment, keeping the head and neck covered. Apply mild heat (comfortable to your elbow) to the head, neck, chest, armpits and groin of the patient. Use hot water bottles, wrapped Thermo-pads, or warm moist towels. Do not place the hot water bottles next to the skin, wrap in cloth first. Offer sips of warm, sweetened liquids (no alcohol, coffee or tea) if the patient is fully conscious, beginning to rewarm and is able to swallow. Patient should be seen by a physician ASAP.

Severe: Place person in a prewarmed sleeping bag with one or two other people. Skin to skin contact in the areas of the chest (ribs) and neck is effective. Exhale warm air near the patient's nose and mouth, or introduce steam into the area. Keep the patient awake. Apply mild heat, with the aim of stopping temperature drop, not rewarming. If patient has lost consciousness be very gentle, as the heart is extremely sensitive. Check for pulse at the carotid artery. If there is any breathing or pulse, no matter how faint, do not give CPR but keep a very close watch for changes in breathing and heart beat (vital signs). If no pulse can be found begin CPR immediately, stopping only when the heart begins to beat or the person applying CPR cannot carry on any longer without endangering themselves.

In all of the above, it is imperative that the victim be removed out of the wet and windy weather, remove all wet clothing, and put the victim into dry clothing and a warm sleeping bag.

Recent research has concluded that the safest and most effective method of treating hypothermia is through inhalation rewarming. Equipment is available; however, out in the field, alternative methods which have been described must be used where equipment is lacking.

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Physical Agent Data Sheet

FROSTBITE

GENERAL INFORMATION

Frostbite is the freezing of some part of the body. Fingers, toes, and even whole arms and legs can be lost as a result of frostbite. Injuries can happen at home, in the cities and also in more isolated areas of the State.

In extreme cold it is important to prevent heat loss from as many areas of the body as possible. Exposed limbs and head are major areas of heat loss, but keeping enough blood flowing to the hands and feet is the key to preventing frostbite. The trunk and the head should be warm enough so that the brain is able to command the blood vessels in the hands and feet to open up and keep the extremities warm.

ESSENTIAL CLOTHING

This includes thermal underwear, insulated footwear or mukluks with liners; double mittens and a parka, preferably down-filled with a good ruff. A parka that can be opened at the neck to allow heat to escape will prevent overheating and sweating. Quilted or skin pants are necessary if no warm shelter is immediately available. Tight cloths, especially tight gloves or tight boots should not be worn. The tightness interferes with good circulation in the hands and feet. If there is a reduction in blood flow to these areas, then the possibility of frostbite increases as the extremity cools down.

FACTORS LEADING TO FROSTBITE

Tall thin persons are more likely to get frostbite than those of stocky build.

People in poor physical condition are more susceptible than those in good health.

Certain diseases slow down the blood flow in the hands and feet especially in elderly people.

Heavy smokers often have poor circulation in the vital organs and decreased circulation in the arms and legs.

Children and elderly people who cannot produce large amounts of body heat for long periods of time can experience a lowering of deep body temperature and frostbite.

Alcohol causes the blood vessels to dilate (become larger). This leads to a false sense of warmth. This also leads to faster loss of heat from the body because of dilation of blood vessels. More important, people act with poor judgment after drinking.

Don't touch cold metal with bare or wet hands. You will freeze to the metal and tear the skin if pulled away without proper thawing with warm water, heat or urine.

Be careful when handling gasoline, kerosene or liquids other than water. Contact with bare skin in cold temperatures can cause instant frostbite.

Frostbite is more likely to occur when you are injured, frightened or careless.

HOW TO RECOGNIZE FROSTBITE

Exposed parts of the body should be inspected routinely. This is done best with a partner. Just before freezing, the skin, especially the face with its many blood vessels, becomes bright red. Then small patches of white appear, as freezing actually occurs.

The loss of the sensations of touch, pressure and pain may occur without awareness of any numbness or other sensations. Therefore, it is important to test these sensations often. Wear clothing that is not restrictive but loose.

There may be no pain associated with frostbite if the freezing or temperature change is slow. Only if there is a rapid change in temperature does the body register pain.

The skin becomes less elastic. This is best noted in the finger pads. If touched or squeezed the pads will remain pitted. Any further cooling will result in frostbite.

Serious freezing is most common in the feet, followed by the hands and then the head (nose, ears). This is because of the poorer circulation in the feet and hands. Also with the poorer circulation there is in conjunction less sensation to these areas. Exposed head areas are less likely to freeze because of a better blood supply.

EARLY TREATMENT OF FROSTBITE

Early rewarming.

Thawing and refreezing should always be avoided.

Limbs should be rewarmed in stirred water just above normal body temperature (100 – 105 degrees Fahrenheit). Always use a thermometer to get accurate temperatures. Never try to thaw in cold water or snow. Since feeling is lost, fires, stoves, exhaust pipes, etc., should never be used. Serious damage to the skin could result.

Rewarming is an acutely painful experience and medication to alleviate pain should be given if available. After thawing, a deep aching pain may persist for several days, depending upon severity of the injury. Pain is a good sign; this tells us that the nerves are still alive and functioning.

A dull purple color, swelling and/or blistering of the extremity after thawing indicate a more serious injury and require medical attention.

SUMMARY

Poor circulation and poor production of body heat will lower resistance to frostbite.

Most cases of frostbite occur as a result of lack of knowledge, careless preparation, unavoidable accident, or the effects of alcohol on judgment. Forethought can prevent injury.

If freezing does occur, proper rewarming in warm water will give maximum benefit. The injured limb should be handled gently and a medical judgment made of the extent of injury and the need for further treatment.

Labor Standards and Safety Division

Physical Agent Data Sheet (PADS)

- Heat Stress

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<u>Cold Stress</u>		
<u>Hand-Arm Vibration</u>	<u>Health Effects—Heat Disorders</u>	<u>Lessening Stressful Conditions</u>
<u>Heat</u>		
<u>Ionizing Radiation (PDF)</u>		
<u>Lasers</u>	<u>Medical Conditions Aggravated By Exposure to Heat</u>	<u>Thermal Conditions in the Workplace</u>
<u>Noise</u>		
<u>Radio Waves</u>		
<u>Ultraviolet Radiation</u>	<u>Preventing Heat Disorders</u>	<u>Rest Areas</u>
		<u>Drinking Water</u>

Description

Heat stress is caused by working in hot environments like laundries, bakeries, or around boilers or incinerators. Four environmental factors affect the amount of heat stress felt by employees in hot work areas: temperature, humidity, radiant heat (such as from the sun or a furnace), and air velocity. How well or how poorly an individual reacts to heat stress is dependent on personal characteristics such as age, weight, fitness, medical condition, and acclimatization.

The body has several methods of maintaining the proper internal body temperature. When internal body temperature increases, the circulatory system reacts by increasing the amount of blood flow to the skin so the extra heat can be given off.

Sweating is another means the body uses to maintain stable internal temperatures. When sweat evaporates, cooling results. However, sweating is effective only if the humidity level is low enough to permit evaporation and if the fluids and salts lost are replaced.

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Health Effects—Heat Disorders

Heat stroke, the most serious health problem for workers in hot environments is caused by the failure of the body's internal mechanism to regulate its core temperature. Sweating stops and the body can no longer rid itself of excess

heat. Signs include: mental confusion, delirium, loss of consciousness, convulsions or coma; a body temperature of 106 degrees Fahrenheit or higher; and hot dry skin which may be red, mottled or bluish. Victims of heat stroke will die unless treated promptly. While medical help should be called, the victim must be removed immediately to a cool area and his/her clothing soaked with cool water. He/she should be fanned vigorously to increase cooling. Prompt first aid can prevent permanent injury to the brain and other vital organs.

Heat exhaustion develops as a result of loss of fluid through sweating when a worker has failed to drink enough fluids or take in enough salt, or both. The worker with heat exhaustion still sweats, but experiences extreme weakness or fatigue, giddiness, nausea, or headache. The skin is clammy and moist, the complexion pale or flushed, and the body temperature normal or slightly higher. Treatment is usually simple: the victim should rest in a cool place and drink salted liquids. Salt tablets are not recommended. Severe cases involving victims who vomit or lose consciousness may require longer treatment under medical supervision.

Heat cramps, painful spasms of the bone muscles, are caused when workers drink large quantities of water but fail to replace their bodies' salt loss. Tired muscles, those used for performing the work, are usually the ones most susceptible to cramps. Cramps may occur during or after working hours and may be relieved by taking salted liquids by mouth or saline solutions intravenously for quicker relief, if medically determined to be required.

Fainting may be a problem for the worker unacclimatized to a hot environment who simply stands still in the heat. Victims usually recover quickly after a brief period of lying down. Moving around, rather than standing still, will usually reduce the possibility of fainting.

Heat rash, also known as prickly heat, may occur in hot and humid environments where sweat is not easily removed from the surface of the skin by evaporation. When extensive or complicated by infection, heat rash can be so uncomfortable that it inhibits sleep and impairs a worker's performance or even results in temporary total disability. It can be prevented by showering, resting in a cool place, and allowing the skin to dry.

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Medical Conditions Aggravated By Exposure to Heat

Persons with heart or circulatory diseases or those who are on "low salt" diets should consult with their physicians prior to working in hot environments.

Preventing Heat Disorders

One of the best ways to reduce heat stress on workers is to minimize heat in the workplace. However, there are some work environments where heat production is difficult to control, such as when furnaces or sources of steam or

water are present in the work area, or when the workplace itself is outdoors and exposed to varying warm weather conditions.

Acclimatization

Humans are, to a large extent, capable of adjusting to the heat. This adjustment to heat, under normal circumstances, usually takes about 5 to 7 days, during which time the body will undergo a series of changes that will make continued exposure to heat more endurable.

On the first day of work in a hot environment, the body temperature, pulse rate, and general discomfort will be higher. With each succeeding daily exposure, all of these responses will gradually decrease, while the sweat rate will increase. When the body becomes acclimated to the heat, the worker will find it possible to perform work with less strain and distress.

Gradual exposure to heat gives the body time to become accustomed to higher environmental temperatures. Heat disorders in general are more likely to occur among workers who have not been given time to adjust to working in the heat or among workers who have been away from hot environments and who have gotten accustomed to lower temperatures. Hot weather conditions of the summer are likely to affect the worker who is not acclimatized to heat. Likewise, workers who return to work after a leisurely vacation or extended illness may be affected by the heat in the work environment. Whenever such circumstances occur, the worker should be gradually reacclimatized to the hot environment.

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Lessening Stressful Conditions

Many industries have attempted to reduce the hazards of heat stress by introducing engineering controls, training workers in the recognition and prevention of heat stress, and implementing work-rest cycles. Heat stress depends, in part, on the amount of heat the worker's body produces while a job is being performed. The amount of heat produced during hard, steady work is much higher than that produced during intermittent or light work. Therefore, one way of reducing the potential for heat stress is to make the job easier or lessen its duration by providing adequate rest time. Mechanization of work procedures can often make it possible to isolate workers from the heat source (perhaps in an air-conditioned booth) and increase overall productivity by decreasing the time needed for rest. Another approach to reducing the level of heat stress is the use of engineering controls which include ventilation and heat shielding.

Number and Duration of Exposures

Rather than be exposed to heat for extended periods of time during the course

of a job, workers should, wherever possible, be permitted to distribute the workload evenly over the day and incorporate work-rest cycles. Work-rest cycles give the body an opportunity to get rid of excess heat, slow down the production of internal body heat, and provide greater blood flow to the skin.

Workers employed outdoors are especially subject to weather changes. A hot spell or a rise in humidity can create overly stressful conditions. The following practices can help to reduce heat stress:

Postponement of nonessential tasks

Permit only those workers acclimatized to heat to perform the more strenuous tasks, or

Provide additional workers to perform the task keeping in mind that all workers should have the physical capacity to perform the task and that they should be accustomed to the heat.

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Thermal Conditions in the Workplace

A variety of engineering controls can be introduced to minimize exposure to heat. For instance, improving the insulation on a furnace wall can reduce its surface temperature and the temperature of the area around it. In a laundry room, exhaust hoods installed over those sources releasing moisture will lower the humidity in the work area. In general, the simplest and least expensive methods of reducing heat and humidity can be accomplished by:

Opening windows in hot work areas,

Using fans, or

Using other methods of creating airflow such as exhaust ventilation or air blowers.

Rest Areas

Providing cool rest areas in hot work environments considerably reduces the stress of working in those environments. There is no conclusive information available on the ideal temperature for a rest area. However, a rest area with a temperature near 76 degrees Fahrenheit appears to be adequate and may even feel chilly to a hot, sweating worker, until acclimated to the cooler environment. The rest area should be as close to the workplace as possible. Individual work periods should not be lengthened in favor of prolonged rest periods. Shorter but frequent work-rest cycles are the greatest benefit to the worker.

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Drinking Water

In the course of a day's work in the heat, a worker may produce as much as 2 to 3 gallons of sweat. Because so many heat disorders involve excessive dehydration of the body, it is essential that water intake during the workday be about equal to the amount of sweat produced.

Most workers exposed to hot conditions drink less fluids than needed because of an insufficient thirst drive. A worker, therefore, should not depend on thirst to signal when and how much to drink. Instead, the worker should drink 5 to 7 ounces of fluids every 15 or 20 minutes to replenish the necessary fluids in the body. There is no optimum temperature of drinking water, but most people tend not to drink warm or very cold fluids as readily as they will cool ones. whatever the temperature of the water, it must be palatable and readily available to the worker. Individual drinking cups should be provided, never use a common drinking cup.

Heat acclimatized workers lose much less salt in their sweat than do workers who are not adjusted to the heat. The average American diet contains sufficient salt for acclimatized workers even when sweat production is high. If, for some reason, salt replacement is required, the best way to compensate for the loss is to add a little extra salt to the food. Salt tablets should not be used. CAUTION: PERSONS WITH HEART PROBLEMS OR THOSE ON A "LOW SODIUM" DIET WHO WORK IN HOT ENVIRONMENTS SHOULD CONSULT A PHYSICIAN ABOUT WHAT TO DO UNDER THESE CONDITIONS.

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Protective Clothing

Clothing inhibits the transfer of heat between the body and the surrounding environment. Therefore, in hot jobs where the air temperature is lower than skin temperature, wearing clothing reduces the body's ability to lose heat into the air.

When air temperature is higher than skin temperature, clothing helps to prevent the transfer of heat from the air to the body. The advantage of wearing clothing, however, may be nullified if the clothes interfere with the evaporation of sweat.

In dry climates, adequate evaporation of sweat is seldom a problem. In a dry work environment with very high air temperatures, the wearing of clothing could be an advantage to the worker. The proper type of clothing depends on the specific circumstance. Certain work in hot environments may require insulated gloves, insulated suits, reflective clothing, or infrared reflecting face shields. For extremely hot conditions, thermally-conditioned clothing is available. One such garment carries a self-contained air conditioner in a backpack, while another is connected to a compressed air source which feeds cool air into the jacket or coveralls through a vortex tube. Another type of

garment is a plastic jacket which has pockets that can be filled with dry ice or containers of ice.

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Recommended Exposure Limits

These Threshold Limit Values (TLVS) refer to heat stress conditions under which it is believed that nearly all workers may be repeatedly exposed without adverse health effects. The TLVs shown in Table I are based on the assumption that nearly all acclimatized, fully clothed workers with adequate water and salt intake should be able to function effectively under the given working conditions without exceeding a deep body temperature of 38 degrees Celsius (100.4 degrees Fahrenheit).

Since measurement of deep body temperature is impractical for monitoring the workers' heat load, the measurement of environmental factors is required which most nearly correlate with deep body temperature and other physiological responses to heat. At the present time, Wet Bulb Globe Temperature Index (WBGT) is the simplest and most suitable technique to measure the environmental factors. WBGT values are calculated by the following equations:

Outdoors with solar load: $WBGT = 0.7\text{ NWB} + 0.2\text{ GT} + 0.1\text{ DB}$

Indoors or Outdoors with no solar load: $WBGT = 0.7\text{ NWB} + 0.3\text{ GT}$

Where: WBGT = Wet Bulb Globe Temperature Index
 NWB = Natural Wet Bulb Temperature
 DB = Dry Bulb Temperature
 GT = Globe Temperature

The determination of WBGT requires the use of a black globe thermometer, a natural (static) wet-bulb thermometer, and a dry bulb thermometer.

Higher heat exposures that shown in Table I are permissible if the workers have been undergoing medical surveillance and it has been established that they are more tolerant at work in heat than the average worker. Workers should not be permitted to continue their work when their deep body temperature exceeds 38.0 degrees Celsius (100.4 degrees Fahrenheit).

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Table 1 Permissible Heat Exposure Threshold Limit Values (Values are given in degrees Centigrade WBGT (Fahrenheit))			
Work Load			

Work- Rest Regimen	Light	Moderate	Heavy
Continuous work	30.0 (86.0)	26.7 (80.1)	25.0 (77.0)
75% Work, 25% Rest/Hour	30.6 (87.1)	28.0 (82.4)	25.9 (78.6)
50% Work, 50% Rest/Hour	31.4 (88.5)	29.4 (85.0)	27.9 (82.2)
25% Work, 75% Rest/Hour	32.2 (90.0)	31.1 (88.0)	30.0 (86.0)

References

1. "Working in Hot Environments," US Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health, 1986.
2. "Threshold Limit Values and Biological Exposure Indices for 1986 - 1987," American Conference of Governmental Industrial Hygienists, 6500 Glenway Avenue, Building D-7, Cincinnati, OH 45211-4438.

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APPENDIX E
SELECTED SAFETY PROCEDURES

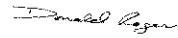
EHS 1-7: Event Reporting and Investigation

Last Revision By: **Linda LaMonico** on
12/01/2008

Created By: **Cindy Leong** on **09/09/2008**

Purpose: The purpose of this program is to: (a) specify the types of events to be reported and investigated, including both safety and quality-related events; (b) define internal Tetra Tech EC, Inc. (TtEC) and external event notification requirements; (c) ensure proper management and follow-up of each event; (d) meet regulatory notification and investigation requirements; (e) provide a mechanism to identify Environmental, Safety and Quality (ESQ) issues and areas for improvement and recognize job well done through the Zero Incident Performance® (ZIP) Slip.

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Preventive Action

Document Philip Bartley
Owner

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1.0 PURPOSE

The purpose of this program is to:

- a. Specify the types of events to be reported and investigated, including both safety and quality-related events.
- b. Define internal Tetra Tech EC, Inc. (TtEC) and external event notification requirements.
- c. Ensure proper management and follow-up of each event.
- d. Meet regulatory notification and investigation requirements.

- e. Provide a mechanism to identify Environmental, Safety and Quality (ESQ) issues and areas for improvement and recognize job well done through the Zero Incident Performance® (ZIP) Slip.

2.0 SCOPE

Event reporting requirements apply to all operations of TtEC and its subsidiaries (the "Company"), including subcontractor activities. The term "Event Reports" in this procedure encompasses Quality Event Reports (QERs), Near Miss, and EHS Event Reports.

3.0 MINIMUM REQUIREMENTS

3.1 Responsibilities

3.1.1 All Personnel

All personnel shall immediately report any event (see Section 4.1.1) to their supervisor. The report can be verbal or in writing.

Employees, including subcontractors, are required to participate in the investigation process as directed, and comply with corrective actions identified. Employees are also made aware of trends and may be asked to help develop lessons learned to prevent similar events from occurring.

3.1.2 Line Management

Line Management, including the Office Manager for office events and the Project Manager (PM) for project events shall:

- a. Be responsible for all client notifications - (Prior to initiation of project field activities, the Project Manager shall coordinate with the client to determine the appropriate agency notification responsibilities and procedures).
- b. Implement the appropriate internal notifications (see Table 1) as required by this program as soon as an event becomes known.
- c. The supervisor responsible for directly overseeing the work shall ensure completion of the Event Report. The supervisor shall directly participate in the causal analysis investigation.
- d. Ensure that corrective actions have been completed and properly documented.

3.1.3 Environmental Safety and Quality Personnel

Environmental Safety and Quality Personnel (Environmental Safety Coordinator, Environmental Safety Specialist, and Project Quality Control personnel) shall:

- a. Ensure that all notifications are made promptly.
- b. Ensure that all reports are fully completed.
- c. Ensure that all insurance and workers compensation forms are completed and submitted as

necessary.

- d. Participate in event investigations of all Occupational Safety and Health Administration (OSHA) recordable injuries/illnesses, spills, releases, and other investigations.
- e. Communicate information about the event to applicable site and/or office employees.

3.1.4 Project Quality Control Manager

The Project Quality Control Manager shall review and approve QER investigation results, proposed remedial actions, determine the Event Risk in accordance with CRL Guideline HSG 2-7, Risk Prioritization, and identify the need to verify the effectiveness of corrective actions taken based on severity of Event Risk. The Project Quality Control Manager's evaluation of corrective action effectiveness should be summarized in the Comments section. Ineffective corrective actions should be elevated to the Director, Quality Programs for further evaluation and potential additional programmatic corrective actions.

3.1.5 Project Environmental and Safety Manager (PESM)

The PESH shall review and approve event investigation results, proposed remedial actions, determine the Event Risk in accordance with CRL Guideline HSG 2-7, Risk Prioritization, and identify the need to verify the effectiveness of corrective actions taken based on severity of Event Risk. The PESH's evaluation of corrective action effectiveness should be summarized in the Comments section. Ineffective correction actions should be elevated to the Director, EHS Services for further evaluation and potential additional programmatic corrective actions.

3.1.6 Director, EHS Services

The Director, EHS Services shall:

- a. Notify OSHA of any injuries or illnesses occurring within OSHA jurisdiction as required.
- b. Review/maintain log - which includes information on basis causes, immediate causes, and management control issues - of all investigations.
- c. Distribute summaries of events with periodic management reports.
- d. Communicate significant events to key personnel within the Company.
- e. Review basic causes of Company events to identify trends.
- f. Recommend EHS program modifications as necessary.
- g. Immediately notify the Tetra Tech Health and Safety Manager of any serious accident and provide follow-up information on serious accidents.
- h. Provide Monthly Injury Reports to the Tetra Tech Health and Safety Director.

3.2 Notifications

In addition to the reporting responsibilities specified in Section 3.1, the responsible supervisor is required to notify Work Care at 800-455-6155 (available 24 hours) of employee illness or injuries. Work Care's main office must be notified promptly of all injuries and illnesses so the affected

employee receives prompt and appropriate medical advice. The call to Work Care must be made in addition to taking the affected employee to the local clinic. EHS 2-1, Emergency Preparedness, provides guidance for medical response and actions.

The responsible supervisor is also required to ensure notifications are made as outlined in Table 1

The phone numbers and other means of contact for Company personnel shall be posted with the emergency notification list and/or integrated into the site-specific emergency notification list.

3.3 Event Report Generation

The information portion of the Event Report should be generated by the end of the supervisor's work shift on the day of the event, if possible, but no later than 24 hours after the event was reported by the supervisor and employee(s) involved in the event. The investigation completion time is provided in Section 3.4.

The Event Report and Investigation may be completed electronically in the Company Incident Database located on Lotus Notes or by hardcopy using Attachment A, Event Report and Investigation Form, or Attachment B, Quality Event Report Form. (Attachment C, Event Sketch, may be used to graphically depict events).

The forms are intended to be self-explanatory. If the supervisor or the employee has any questions regarding completion of the report, an ESQ representative should be contacted for support.

Both the employee(s) and the employee's supervisor must sign the Event Report.

For low loss-potential near misses, the ZIP Slip may be substituted for the standard Event Report. (See CRL Procedure PP-10, Employee Recognition).

3.4 Event Investigations

Event investigations are to be initiated and completed as soon as possible, but should be completed no later than 10 working days after the event has been reported.

Guidance for conducting investigations and cause analysis may be found in Section 4.3.

Table 1. Internal Notifications By Supervisor

<u>EVENT TYPE</u>	<u>SUPERVISOR NOTIFIES...</u>	<u>TIMING¹</u>	<u>... WHO NOTIFIES</u>	<u>TIMING¹</u>
Spill/release or Permit Exceedence	ESS	Immediately	PESM and Director, EHS Services	Immediately if external reporting required
	Project Manager	Immediately	Client and Area/Program Manager Government agency if required by contract/plan and Director, EHS Services not available (See 3.5.2)	Immediately if external reporting required
Fatality, Hospitalization of 1 or more persons, Fire, or Explosion	ESS	Immediately	PESM and Director, EHS Services OSHA reporting (See 3.5.1) Insurance ESIS @ 800-867-3747 (Company personnel only) (Not required inside Washington State)	Immediately Immediately Immediately
	Project Manager	Immediately	Area/Program Manager VP Construction	Immediately Immediately

			Client	Immediately
Confirmed or Potential OSHA Recordable	ESS	Immediately	PESM and Director, EHS Services Insurance ESIS @ 800-867-3747 (Not required in Washington State)	Same day Same day Same day
	Project Manager	Immediately	Area/Program Manager VP Construction, VP Remediation, VP C&E, COO Client, if required	Same day Same day 24 hours or as specified by contract
Equipment/Property/Vehicle Damage	ESS	Immediately	PESM and Director, EHS Services	24 hours
	Project Manager	Immediately	Client (client property) Client (other property, if required) Equipment Manager Area/Program Manager VP Construction	Immediately 24 hours 24 hours 24 hours 24 hours
Potential Insurance Claim, other than Worker's Compensation	Project Manager	Immediately	Law Department and Procurement	24 hours
Office Events	ESC	Immediately	Operations Manager Director, EHS Services	24 hours
Quality Events	Project Manager	Immediately	Program or Operations Manager	24 hours
	Project QC Manager	Same Day	Director of Quality Programs	24 hours

¹Timing - Immediately - Real time verbal discussion or notification in writing

Same Day

24 hours - written event report copy; Client notification, or as specified in contract or project specification

ESS Environmental Safety Specialist

ESC

Environmental Safety Coordinator

PESM Project Environmental and Safety Manager

QC

Quality Control

VP Vice-President

Investigations that fall within the scope of the OSHA Process Safety Management Standard must meet the requirements of 29 Code of Federal Regulations (CFR) 1910.119(m). Projects that must meet this standard shall include the appropriate reporting requirements in project specific procedures or plans.

Project QC personnel should participate in the QER Cause Analysis and in determining an appropriate Action Plan.

Completed investigation reports should be submitted within 10 working days to:

- Project Manager or Office Manager for review and signature
- PESM or Project QC Manager (for QERS) for review and signature
- ESS (for projects) or ESC (for offices) for review and signature
- Director, EHS Services/Quality Services as applicable

Electronic submittal within 10 working days meets these reporting requirements. Additional reporting requirements are listed in Table 1.

The Project or Office Manager and the PESM, or Project Quality Manager must sign the report indicating their satisfaction with thoroughness of the investigation and the report and their concurrence that the action items address the identified causes. This constitutes the peer review, and the report, particularly the description, should be clear to readers not familiar with the project

or incident.

3.5 External Notifications

3.5.1 OSHA Notification

Notification to OSHA is required within 8 hours if the event resulted in one or more fatalities and/or three or more hospitalized individuals. The 8-hour notification of OSHA is also required if a fatality or hospitalization of three individuals occurs within 30 days after the event.

The Director, EHS Services, has the responsibility for making the OSHA notification. The senior site EHS representative shall make the notification if the Director, EHS Services is unavailable.

The Project Manager is responsible for notifying the client of any required OSHA notifications.

3.5.2 Agency Notifications for Spills, Releases, and Permit Exceedences

It is the Company's policy that *if a spill, release, or permit exceedence is determined to be reportable, the Company or the client shall perform the reporting in a timely fashion as defined by federal, state, or local laws and regulations*. Notifications shall be made per contract requirements or the project Communications Plan. Prior to initiation of project field activities, the Project Manager shall coordinate with the client to determine the appropriate agency notification responsibilities and procedures. During the conduct of project activities, the client shall be notified regarding the spill, release, or permit exceedence and the Company's notification determination.

The Project Manager, in conjunction with the PESM must determine whether a spill, release, or permit exceedence exceeds reportable quantities to a regulatory agency under federal, state, and/or local laws and regulations or permit conditions. This determination must be made quickly because many laws and regulations require that notifications be made within short time frames (immediately upon knowledge, but no later than 24 hours).

If a spill or release is determined not to exceed reportable quantities, the PESM shall evaluate whether the spill or release poses a threat to human health (for example, has or may release into known drinking water sources, has or may cause contamination of surface soils/materials/air accessible to the public, and so forth). If a spill or release is determined to pose a threat to human health, the Project Manager, with the assistance of the Director, EHS Services, as necessary, shall consult with the client to determine whether the spill or release should be reported to a regulatory agency.

3.6 Documentation

A copy of each Event Report shall be retrievable for the project or office files. The Event Report database may serve this purpose.

3.6.1 Documentation of Agency and Client Notifications

All agency and client notifications shall be documented on the **Event** Report form. Other documentation generated regarding verbal or written agency notifications (if required), including agency response to such notification, shall either be maintained in the project file or preferably, attached to the Event Report.

In instances where the client conducts the reporting, documentation shall be obtained from the client indicating that the agency was notified in accordance with federal, state, or local regulations and maintained in the project files. If the client verbally notifies the Company that the notification was made, the Project Manager shall document the conversation. In these cases, communications shall be recorded internally in accordance with EHS 1-10, External Regulatory

Inspections and Notifications, for Environmental Management System reporting requirements.

If the spill, release, or permit exceedance is determined not to be reportable, the Event Report and Investigation shall include the rationale for not reporting the spill, release, or permit exceedance to a regulatory agency.

3.7 Training

The Director, EHS Services, and the Director, Quality Services, have the responsibility for ensuring that site and office supervisory personnel have the appropriate training to conduct event investigations.

ESSs shall be trained on a project-specific basis by the PESM to implement the spill/release and permit exceedance reporting requirements in conjunction with training on the requirements of the project-specific EHS Plans per Corporate Reference Library procedure EHS 3-2, Procedures—Environmental, Health & Safety Plan(s).

Personnel serving in a project or office supervision, or office supervision, ESQ position shall have completed and passed the Company provided self-study course entitled "Practical Loss Control Leadership within 3 months of initial assignment."

4.0 GUIDANCE

4.1 Definitions

4.1.1 Event

For the purposes of this program, an event is:

- a. An injury or illness that meets the OSHA recordability criteria
- b. Ergonomic-related pain complaints
- c. An exposure to a hazardous substance above the allowable exposure unit.
- d. A property/vehicle/equipment/heavy equipment/truck/passenger damage case that results in damage greater than \$500.
- e. A fire or explosion.
- f. A spill or release resulting from the Company, or subcontractor activities, including spills or releases from operations at a client facility of which Company employees have become aware.
- g. Discovery of chemicals or waste products in an office.
- h. A permit exceedance.
- i. Safety-related events reported by an enforcing authority (ISO 14001 Registrar requirement).
- j. Customer, or enforcing authority, complaints regarding the implementation of the Company's EMS or Quality Management System (QMS).

- k. External regulatory inspections that result in findings or citations.
- l. Quality events as defined in Section 4.1.3.
- m. Near-miss occurrences, as defined in Section 4.1.2 below¹

4.1.2 Near Miss

A “near miss” is an event, that has a reasonable probability in resulting in one of the outcomes described above if the circumstances were different and for which modifications to management programs will reduce the probability of occurrence or the severity of the outcome (see examples of Immediate and Basic causes in Attachment A.

4.1.3 Quality Event

QERs should be generated for the following two situations:

- a. When project quality deficiency reports identify a **significant condition adverse to quality**. A significant condition adverse to quality is one that, if uncorrected, could have a serious adverse effect on operability, level of quality, or presents a high loss potential.
- b. When an event reveals an opportunity for improved performance through modification of our management system.

4.1.4 Recognition and EMS Communication

ZIP Slips (See PP-10, Employee Recognition Programs) may be used to document employee recognition for a job well done, suggestions for improvement, or minor safety issues that should be resolved.

ZIP Slips may be used to document external inquires or complaints regarding the Company's EMS or project-specific environmental aspects.

4.2 Continuous Improvement

TtEC's event investigation procedure and event report database is a tool used by the (ESQ) organization for continuous improvement by:

- Identifying the root causes of each event
- Tracking and trending
- Selecting appropriate corrective action(s), and person(s) responsible for corrections
- Providing Lessons Learned
- Identifying additional EHS orientation and training topics
- Identifying future health and safety goals and objectives

Corporate ESQ management periodically disseminates valuable information contained in the event/investigation program, company wide to employees in the form of ZIP Bulletins, Flash Reports, and Lessons Learned.

The EMS Coordinator should also review the Event Report database to identify trends and incorporate results into the continuous improvement of the EMS.

4.3 Cause Analysis

4.3.1 Immediate Cause

Determine the immediate causes, using the examples on the form. If one or more of the examples fits the circumstance, use those words in the cause description. Explain, e.g., Improper Lifting – employee attempted to lift box by bending at the waist and twisting while lifting. Be sure that the event description is sufficiently detailed to support the causal analysis in this section. An assumption of cause (e.g., improper lifting) from the injury (low back pain) is not acceptable.

4.3.2 Basic Cause

Like the Immediate Causes, use the guidewords on the form whenever appropriate and explain. For example, improper motivation may be because the correct way takes more time or effort; short cutting standard procedure is tolerated or positively reinforced; or the person thinks there is no personal benefit to always doing the job correctly.

Investigators should determine if a change in the work conditions, scope, methods or personnel contributed to the event. This may occur due to inadequate assessment of hazard potential or inadequate application of hazard controls. If “Change” was contributing, it will most likely be identified in combination with other basic causes.

Note: The investigator is encouraged to review the Practical Loss Control Leadership chapters on *Causes and Effects of Loss* and *Accident/Event Investigation* before doing the causal analysis. The investigation team should refer to the S.C.A.T. Chart available from the PESM when analyzing causes of high loss potential events, especially where motivation is suspected of being a Basic Cause.






4.3.3 Remedial Actions


Include all actions taken or those that should be taken to *prevent recurrence*. Be sure that actions address the causes. For example, training (safety meetings) may be a necessary response for lack of knowledge, but may be inadequate for improper motivation.

4.4 Loss Control Leadership for Non-Supervisory Personnel




All non-supervisory and non-ESQ positions (excluding craft workers) assigned to conduct field activities should complete the Practical Loss Control Leadership self-study course within one year of initial assignment.

5.0 REFERENCES

Please Describe your Reference Here	Place Your Link in this Column
1. OSHA 29 CFR 1910.119, Process Safety Management of Highly Hazardous Chemicals	
2. EHS 1-10, External Regulatory Inspections and Notifications	
3. EHS 2-1, Emergency Preparedness	
4. EHS 3-2, Procedures - Environmental, Health & Safety Plan(s)	
5. Environmental Management System	
6. HSG 2-7, Risk Prioritization	

7. PP-10, Employee Recognition	
8.	
9.	

6.0 ATTACHMENTS

Please Provide a Description of the Attachment	Place Your Attachments Here
1. Attachment A - Event/Near Miss Report and Investigation	 EHS 1-7, Att A, 2007.doc
2. Attachment B - Quality Event Report Form	 EHS 1-7, Att B, 2007.doc
3. Attachment C -Event Sketch	 EHS 1-7, Att C, 2007.doc

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Proprietary Information

Corporate ESQ Report # [Insert number here](#)

Project Name: [Insert name here](#)

EHS 1-7, Attachment A Event/Near Miss Report and Investigation

Checkboxes can be toggled on and off to show an "X" or not show an "X." Double-click on the box to activate a dialog box that shows possible selections. To preserve formatting when you cut and paste text, use the "paste special" command to paste: EDIT, PASTE SPECIAL, UNFORMATTED TEXT.

Guidance for filling out this form is provided in CRL Procedure EHS 1-7.

Section 1, General Information		
Short Description/Title Below: (limited to 125 characters). This is the description that will appear in the database listing.		
Type of Event/Near Miss (check all that apply):		
Was a person injured or made ill: <input type="checkbox"/> By something at work <input type="checkbox"/> By something outside the work environment <input type="checkbox"/> No injury or illness		
Did this event occur in one of our major offices? <input type="checkbox"/> Yes <input type="checkbox"/> No List Office:		
Did this event occur in a foreign country? <input type="checkbox"/> Yes <input type="checkbox"/> No		
Did this event involve:		
A strain?	<input type="checkbox"/> Yes <input type="checkbox"/> No	Fire? <input type="checkbox"/> Yes <input type="checkbox"/> No
A motor vehicle accident?	<input type="checkbox"/> Yes <input type="checkbox"/> No	Property damage (>\$500)? <input type="checkbox"/> Yes <input type="checkbox"/> No
A repetitive motion injury?	<input type="checkbox"/> Yes <input type="checkbox"/> No	Spill/release? <input type="checkbox"/> Yes <input type="checkbox"/> No
A fall?	<input type="checkbox"/> Yes <input type="checkbox"/> No	Permit exceedence? <input type="checkbox"/> Yes <input type="checkbox"/> No
Being struck by something?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Event Information		
Case #:	Site Case #:	Workers Comp #:
Where did the event occur?	Project # (4 digits):	
Site/Location Name:	Delivery Order #'s:	
Date of event:	Military time:	
TtEC Supervisor on duty:	Was Supervisor at event scene? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Event Location:		
What employee/employer category was involved in this event?		
<input type="checkbox"/> TtEC permanent <input type="checkbox"/> TtEC craft/temp service <input type="checkbox"/> Subcontractor <input type="checkbox"/> Other		
Employer of affected employee?		
Weather conditions:	Adequate Lighting at Scene? <input type="checkbox"/> Yes <input type="checkbox"/> No	
What was the employee doing, or what was happening, just before the event occurred? Describe the activity below, as well as the tools, equipment, or material the employee was using. Be specific. For example, "climbing a ladder while carrying roofing materials," "spraying chlorine from hand sprayer," or "daily computer key-entry."		

Corporate ESQ Report # [Insert number here](#)

Project Name: [Insert name here](#)

EHS 1-7, Attachment A Event/Near Miss Report and Investigation

What happened? What was the contact or event and how did it occur? Tell us below how the injury occurred. For example, "When the ladder slipped on the wet floor, the worker fell 20 feet," "worker was sprayed with chlorine when gasket broke during replacement," or worker developed soreness in wrist over time." Attach file if necessary.			
Section 2, Affected Employee Information			
Include injured person, driver/operator, or employee whose activities resulted in the event. A new event report must be created for each injured employee.			
Employee's name:		Sex <input type="checkbox"/> Male <input type="checkbox"/> Female	
Date of Hire:	Job classification:	Number of months at TtEC:	
Work hours on shift prior to event:		Years in job classification (##):	
Did event relate to routine task for job classification? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Section 3, Injury/Illness Information (If not applicable, check here <input type="checkbox"/> and go to Section 4)			
Nature of injury of illness: Describe body part affected and how it was affected below. Be more specific than "hurt," "pain," or "sore." For example, "strained back."			
What object or substance directly harmed the employee? For example, "concrete floor," "chlorine," "radial arm saw." If this question does not apply to the event, leave it blank.			
Was First Aid provided? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Did the injury/illness result in <input type="checkbox"/> Days away (with or without restricted days) <input type="checkbox"/> Restricted days only <input type="checkbox"/> No or unknown			
Did employee die? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Medical treatment does not include examination, diagnostic tests, or First Aid. See ZIP Bulletin 109 for OSHA definition of First Aid. Attach treatment report/doctor's note or send copies to Director, EHS Services.			
Was medical treatment provided? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Section 4, Vehicle and Property Damage Information (If not applicable, check here <input type="checkbox"/> and go to Section 5)			
Damaged vehicle make:		Damaged vehicle model:	
Damaged vehicle VIN:		Vehicle owner:	
Property damaged:			
Describe property damage:			

Corporate ESQ Report # **Insert number here**

Project Name: **Insert name here**

EHS 1-7, Attachment A Event/Near Miss Report and Investigation

Section 5, Environmental Release (If not applicable, check here <input type="checkbox"/> and go to Section 6)		
<i>Environmental Release</i>		
Substance spilled or released:		
From where:	To where:	
Estimated quantity/duration:	CERCLA Hazardous substance? <input type="checkbox"/> Yes <input type="checkbox"/> No	
RQ exceeded? <input type="checkbox"/> Yes <input type="checkbox"/> No	Specify RQ:	
Reportable to agency? <input type="checkbox"/> Yes <input type="checkbox"/> No	Specify (place telecom in project file):	
Responsibility to report: <input type="checkbox"/> TtEC <input type="checkbox"/> Client <input type="checkbox"/> Other	Time frame:	
Written report (place report in project file): <input type="checkbox"/> Yes <input type="checkbox"/> No		
Response action taken:		
<i>Permit Exceedence</i>		
Type of permit:	Permit #:	
Date of exceedence:	Parameter(s):	
Criteria:	Exceedence levels:	
Exceedence duration:	Reportable to agency: <input type="checkbox"/> Yes <input type="checkbox"/> No	
Specify (place telecom in project file):	Written report: <input type="checkbox"/> Yes <input type="checkbox"/> No	
Time frame:		
Response action taken:		
Section 6, Notifications		
Insert names of TtEC personnel notified below:		
Name:	Date:	Time:
Name:	Date:	Time:
Name:	Date:	Time:
Name:	Date:	Time:
Client rep notified:	Date:	Time:
By whom:		
Agency notified:	Date:	Time:
By whom:		
Agency Contact Name:		
Section 7, Persons Preparing Report		
Signature of this form verifies that all supplied information is accurate.		
Employee's name (print):	Sign:	
Employee's name (print):	Sign:	
Supervisor's name (print):	Sign:	
Supervisor's phone number:		
Date:		
<i>Note to supervisor:</i> Supervisor is to forward a copy of the Event Report to immediate supervisor, PESM, ESS or ESC, and other personnel as identified in Table 1 of this procedure ASAP, but no later than 24 hours.		

Corporate ESQ Report # **Insert number here**

Project Name: **Insert name here**

EHS 1-7, Attachment A Event/Near Miss Report and Investigation

Section 8, Attach Sketches or Photos		
<i>Report Number:</i>		
Send sketch by mail, fax, or attach an electronic file. EHS 1-7, Attachment C, contains a template that can be used for creating sketches of accidents.		
<i>Vehicle Events</i>		
Write in the street names and, if possible, the points of the compass. Attach black-and-white hard-copy photos or JPG or BMP files (JPG file sizes are typically smaller) as appropriate. If the sketch appears on a police report or insurance form, this need not be completed. Attach the other report or send a hard copy to the Director, EHS Services.		
Section 9, Investigative Report		
Date Information:		
Date of event:	Date of investigative report:	
<i>Event Cost:</i>		
Other event costs: \$	WC claim value: \$	Estimated loss: \$
Cause Analysis		
Was the activity addressed in an AHA? <input type="checkbox"/> Yes (attach applicable section) <input type="checkbox"/> No		
Immediate Causes		
What actions and conditions contributed to this event? Check all that apply:		
Substandard Acts		
<input type="checkbox"/> Operating equipment without authority	<input type="checkbox"/> Horseplay	
<input type="checkbox"/> Failure to warn	<input type="checkbox"/> Using equipment improperly	
<input type="checkbox"/> Failure to secure	<input type="checkbox"/> Failure to follow procedure	
<input type="checkbox"/> Operating at improper speed	<input type="checkbox"/> Personnel not properly qualified	
<input type="checkbox"/> Making safety devices inoperable	<input type="checkbox"/> Failure to communicate	
<input type="checkbox"/> Removing safety devices	<input type="checkbox"/> Operating equipment outside of specified parameters	
<input type="checkbox"/> Using defective equipment	<input type="checkbox"/> Failure to check equipment prior to acceptance	
<input type="checkbox"/> Failure to use PPE properly	<input type="checkbox"/> Acceptance of defective equipment	
<input type="checkbox"/> Improper loading	<input type="checkbox"/> Failure to provide proper equipment	
<input type="checkbox"/> Improper placement	<input type="checkbox"/> Improper servicing/maintenance of equipment	
<input type="checkbox"/> Improper lifting	<input type="checkbox"/> Other substandard acts	
<input type="checkbox"/> Improper position for task	<input type="checkbox"/> Servicing equipment in operation	
<input type="checkbox"/> Under influence of alcohol/drugs		
Substandard Conditions		
<input type="checkbox"/> Guards or barriers	<input type="checkbox"/> Exposure to hazardous materials	
<input type="checkbox"/> Protective equipment	<input type="checkbox"/> Extreme temperature exposure	
<input type="checkbox"/> Tools/equipment or materials	<input type="checkbox"/> Illumination	
<input type="checkbox"/> Congestion	<input type="checkbox"/> Ventilation	
<input type="checkbox"/> Warning system	<input type="checkbox"/> Visibility	
<input type="checkbox"/> Fire and explosion hazards	<input type="checkbox"/> Radiation	
<input type="checkbox"/> Poor housekeeping	<input type="checkbox"/> Hazardous environmental conditions	
<input type="checkbox"/> Noise exposure	<input type="checkbox"/> Other substandard conditions	

Corporate ESQ Report # [Insert number here](#)

Project Name: [Insert name here](#)

EHS 1-7, Attachment A Event/Near Miss Report and Investigation

Enter brief explanation of each *immediate cause* below:

Basic Causes

What specific personal or job factors contributed to this event? Check all that apply:

Personal Factors	Job Factors
<input type="checkbox"/> Inadequate physical/physiological capability	<input type="checkbox"/> Inadequate leadership and/or supervision
<input type="checkbox"/> Inadequate mental/psychological capability	<input type="checkbox"/> Inadequate engineering
<input type="checkbox"/> Physical or physiological stress	<input type="checkbox"/> Inadequate purchasing
<input type="checkbox"/> Lack of knowledge	<input type="checkbox"/> Inadequate maintenance
<input type="checkbox"/> Lack of skill	<input type="checkbox"/> Inadequate tools and equipment
<input type="checkbox"/> Improper motivation	<input type="checkbox"/> Inadequate work standards
<input type="checkbox"/> Other personal factors	<input type="checkbox"/> Excessive wear and tear
	<input type="checkbox"/> Abuse and misuse
	<input type="checkbox"/> Change
	<input type="checkbox"/> Other job factors

Enter brief explanation of each *basic cause* below:

Section 10, Action Plan

What has or should be done to control each of the causes listed? Consider the following Management Programs in developing remedial actions:

<input type="checkbox"/> Leadership and administration	<input type="checkbox"/> Health control
<input type="checkbox"/> Training	<input type="checkbox"/> System evaluation
<input type="checkbox"/> Planned inspections	<input type="checkbox"/> Engineering controls and change management
<input type="checkbox"/> Task analysis and procedures	<input type="checkbox"/> Personal communications
<input type="checkbox"/> Task observation	<input type="checkbox"/> Group meetings
<input type="checkbox"/> Emergency preparedness	<input type="checkbox"/> General promotion
<input type="checkbox"/> Rules and work permits	<input type="checkbox"/> Hiring and placement
<input type="checkbox"/> Accident/event analysis and corrective and preventive action	<input type="checkbox"/> Materials and services management
<input type="checkbox"/> Personal protective equipment	

Corporate ESQ Report # [Insert number here](#)

Project Name: [Insert name here](#)

**EHS 1-7, Attachment A
Event/Near Miss Report and Investigation**

Remedial Actions			
Actions	Person Responsible	Target Date	Completion Date
1.	1.		
2.	2.		
3.	3.		
4.	4.		
Section 11, Persons Performing Investigation			
Investigator's name:		Date:	
Investigator's name:		Date:	
Investigator's name:		Date:	
Management Review			
Note: Signature verifies that all supplied information is accurate; the description supports the causal analysis; and the Action Plan is sufficient to address the causes.			
Project/Office Manager Approval: <input type="checkbox"/> Yes <input type="checkbox"/> No			
Comments:			
Sign:		Date of Approval:	
ESQ (PESM) Approval: <input type="checkbox"/> Yes <input type="checkbox"/> No			
Comments:			
Sign:		Date of Approval:	
Note: Attach additional information as necessary. Supervisor to forward copy of Investigative Report to the PM or Office Manager or ESQ as soon as possible, but no later than 72 hours after the event. A copy shall be sent to the Director, EHS Services, within 24 hours of completion of the report. Attach here.			

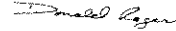
EHS 1-13: Vehicle Safety Program

Last Revision By: Linda LaMonico on
04/04/2008

Created By: Linda LaMonico on 08/28/2007

Purpose: This program describes how Tetra Tech EC, Inc. (TtEC) will implement the Tetra Tech, Inc. Vehicle Safety Program and the minimum requirements to participate in the program. The intent of the program is to assist associated employees to drive safe vehicles in a safe manner. If an employee, driving for the company is identified as a driver needing corrective action, such action may include training, mentoring, monitoring, driving restrictions, or even termination. Such actions will be undertaken based on the specific situations of each instance, as determined by the direct supervisor in consultation with Human Resources, Environmental Health and Safety, and Senior Management.

Status: Complete



Version Date - Type: 12/28/2007 - New

Original Issue Date:

Category: Company Procedures

Sections: ESQ - Environmental Health & Safety Programs

Sub-Category: Departmental/Discipline

Document Type: Procedure

Keyword Index:

Document Owner: Philip Bartley

Table of Contents:

See Below

1.0 PURPOSE

This program describes how Tetra Tech EC, Inc. (TtEC) will implement the Tetra Tech, Inc. Vehicle Safety Program and the minimum requirements to participate in the program. The intent of the program is to assist associated employees to drive safe vehicles in a safe manner.

If an employee, driving for the company is identified as a driver needing corrective action, such action may include training, mentoring, monitoring, driving restrictions, or even termination. Such actions will be undertaken based on the specific situations of each instance, as determined by the direct supervisor in consultation with Human Resources, Environmental Health and Safety, and Senior Management.

2.0 SCOPE

This Vehicle Safety Program applies to all TtEC associates considered qualified drivers. Training requirements, event reporting, Motor Vehicle Record (MVR) review, and inspection/maintenance requirements and guidance are also presented.

While this program applies to qualified drivers, TtEC expects all drivers associated with TtEC activities to drive in a legal and responsible manner always practicing defensive driving, and participate in training and Motor Vehicle Reviews upon request.

3.0 MINIMUM REQUIREMENTS

3.1 Definitions

Fleet Vehicle - A fleet vehicle is any company-owned, rented, or leased vehicle assigned to an

employee. Cars rented for short time periods directly by travelers are exempt from this definition.

Qualified Driver - A TtEC employee that is identified by their supervisor as either assigned, or likely to be assigned, a Fleet Vehicle.

3.2 Qualified Driver Responsibilities

3.2.1 Minimum Qualified Driver Qualifications

TtEC has established the following driver qualification criteria for qualified drivers driving Fleet Vehicles. It is the responsibility of the employee's direct supervisor to notify the Fleet Administrator if the employee fails to meet these criteria. Failure to notify may result in disciplinary action up to and including termination.

Any qualified driver driving a Fleet Vehicle must:

- Be 18 years of age;
- Have a valid driver's license that meets the requirements for the type of vehicle the employee will be required to operate.

Employees driving records must not indicate any of the following conditions:

- Punitive suspension, denial or revocation of license within a three year period from preceding the date of the review;
- Conviction for impaired or intoxicated driving (DWAI, DUI, DWI) within three years immediately preceding the date of the review;
- Conviction of reckless driving, conviction of driving with a suspended, denied, revoked license, conviction of hit and run, or conviction of leaving the scene;
- Three or more moving violation convictions within three years immediately preceding the date of review;
- Three or more at fault accidents within three years immediately preceding the date of review; and
- Combination of three or more at-fault accidents or moving violations immediately preceding the date of review.

The date of conviction will be the date utilized when evaluating driver qualification and probationary driver status.

In the event the employee has such records while meeting the requirements for a valid driver's license to operate a valid vehicle - additional training, supervision or other restrictions may be required.

3.2.2 Additional Driver Responsibilities

In addition to 3.2.1, each Driver shall:

- a. Complete a Defensive Driving Course approved by the safety department
- b. Comply with Motor Vehicle Record review requirements upon request
- c. Use assigned vehicles only for TtEC company business and comply with the requirements related to assigned vehicles.
- d. Ensure all passengers wear approved seat belts while the vehicle is moving.

- e. Use cell phones in accordance with the TtEC Cell Phone Use Policy.
- f. Report to direct supervisor or Fleet Administrator any event that may adversely impact the ability to perform assigned driving duties as soon as possible, but prior to operating any vehicle for company business. These events include, but are not limited to, driver's license revocation; suspension; moving violations; at-fault accidents; physical or medical limitations; and DWI, DWAI, or DUI convictions. Certain positions such as those requiring Government Security Clearances may have more detailed reporting requirements.
- g. Report company business related automobile accidents and incidents within 24 hours to management, the Fleet Administrator, and the Project Environmental Safety and Health Manager.
- h. If driving certain commercial vehicles - Meet the minimum Commercial Drivers License (CDL) driver qualifications, provided in Attachment A.
- i. Note that you will be personally responsible by pay any traffic fines, parking fines, or toll violations incurred while driving.
- j. Ensure other drivers of your fleet vehicle can legally drive and are not impaired.
- k. Ensure the vehicle is in a safe operating condition, including appropriate documentation (registration, proof of insurance, inspection, etc.) are in place.
- l. Maintain the vehicle maintenance log.
- m. Immediately advise the fleet vehicle administrator of any unsafe conditions concerning the vehicle, or any damage or loss to the vehicle.
- n. Obtain Fleet Administrator approval prior to using a fleet vehicle outside the U.S. Administrator.

3.3 Supervisor Responsibilities

The direct supervisor shall:

- a. Identify new hire and existing employees who require Qualified Driver status.
- b. Ensure these employees complete and sign MVR review forms (Example in Attachment B) or state required equivalent and provide the forms to the Human Resource department.

3.4 Human Resources Responsibilities

The Human Resources department shall be responsible for processing MVR review forms and communicating results to the employee's direct supervisor and Fleet Administrator.

3.5 Additional Craft Hire Requirements

The Field Accounting department shall provide MVR review forms to the Construction Site Superintendents in the Craft New Hire Package in accordance with TtEC Accounting/Finance Procedure AF-4: Field Accounting.

The Construction Site Superintendent shall:

- a. Identify new hire and existing craft employees who require Qualified Driver status.
- b. Ensure these employees complete and sign MVR review forms (Example in Attachment B); or state required equivalent; retain copies of the forms for the site files, and provide the original forms to the Human Resource department for processing and a copy kept in the employees record with Field Accounting.

3.6 Fleet Administrator Responsibilities

- a. Maintain a list of Qualified Drivers.
- b. Ensure Fleet Vehicles are kept in safe operating condition and are subject to regular maintenance service as required by applicable local laws and this program.
- c. Ensure Fleet Vehicles have proper registration, insurance, etc. documentation on board, as required by state laws.
- d. Ensure that CDL requirements outlined in Attachment A are implemented as appropriate.
- e. Provide periodic information as indicated in Section 4.2, Training below.

3.7 Director EHS Services Responsibilities

- a. Provide overall program guidance
- b. Coordinate and approve defensive driver training courses for affected employees.
- c. Maintain the training database .
- d. Monitor and communicate motor vehicle accident frequency, cost information, loss trends, and major loss sources to TtEC senior management.

3.8 Motor Vehicle Record Reviews

TtEC reserves the right to perform MVR reviews of any Driver. Criteria used to determine the need for MVR reviews include, but are not limited to:

- a. Assignment to a Fleet Vehicle
- b. Expected driving frequency for the company
- c. For-cause after a work or non-work related accident, incident, violation, or similar event

MVR review results are used to identify employees who may need additional driver safety training and to determine suitability for acceptance as a Qualified Driver, or the need for driving restrictions.

Prospective and existing employees enrolled in the MVR check process must provide driver license information to the HR Department either prior to hire or when requested by the employees supervisor to support MVR reviews.

Example consent forms and new employee notification letters are provided in Attachments B and C.

4.0 GUIDELINES

4.1 Training

In addition to the required initial defensive driving course for all qualified drivers, periodically, the fleet administrator makes information available. This information should include the following topics:

- a. TtEC Driver responsibilities
- b. This Vehicle Safety Program

- c. Vehicle familiarization and general operation
- d. Unsafe driving practices
- e. Defensive driving techniques
- f. Use of vehicle safety systems, including seat belts and air bags
- g. Effects of drugs, alcohol, and fatigue on driver performance

This information may be presented online, or via email communication or videotape, or may be included as a component in other health and safety training.

In the event a TtEC driver is involved in a preventable work-related accident, the employee may be required to attend additional company-approved defensive driving training.

4.2 Event Reporting

Event reporting is an obligation of all TtEC employees in accordance with Corporate Reference Library (CRL) Procedure EHS 1-7. Reporting incidents involving motor vehicles includes some special guidelines, as follows:

- a. Stop immediately after checking and ensuring the environmental conditions are safe.
- b. If safe to do so, check for life threatening conditions
- c. Call 911 for medical and law enforcement assistance if necessary.
- d. Render first aid, if certified to do so.
- e. If there are no injuries, protect the scene to prevent other vehicles from becoming involved. Put out emergency reflectors or flares if available and safe to do so.
- f. Be courteous to others at the scene, but avoid making statements that attribute blame to yourself or others.
- g. Do not discuss the details of the incident with anyone other than a licensed authority such as a police officer, our insurance company representative, or broker.
- h. Do not admit liability at the scene.
- i. Record the name, address, phone number, and insurance policy number of the owner of the other vehicle(s) involved.
- j. Record the name, addresses, and phone numbers of all passengers and witnesses.
- k. If police or medical personnel have responded to the scene, record the names, badge numbers, and precinct of the police officers and medical personnel involved.
- l. Take photographs of the scene, if a camera is available.
- m. If the company vehicle is damaged and requires towing, the direct supervisor should be notified with information regarding who towed the vehicle, where the vehicle will be located, and the extent of the damage to the vehicle. This information should be provided to TtEC's auto insurance carrier when the claim is filed.
- n. Complete the event report in accordance with EHS 1-7. Attach copies of police reports when available. Submit copies of all these documents to the appropriate supervisor and Health and Safety Representative within 24 hours of the incident.
- o. Do not authorize any accident-related repairs to Fleet Vehicles without fleet administrator approval.

4.3 Fleet Vehicle Inspection and Maintenance

In order to maintain a safe and operational fleet, TtEC has implemented the following inspection and maintenance guidelines.

Fleet vehicles are inspected at least annually by a regular mechanic. Regular mechanics are those approved by the fleet administrator, and may be identified through the TtEC auto insurance carrier. Inspection and maintenance at all locations must satisfy applicable local laws and should include the following minimum items:

- a. Road test after all maintenance activities
- b. Visual inspection of brake system (wheel removal required)
- c. Essential fluid levels including brake, power steering, radiator, and wiper fluids
- d. Brake pad wear
- e. Belts and hoses
- f. Steering control
- g. Battery condition
- h. Filter replacement
- i. Lubrication
- j. Oil change (based on mileage)
- k. Emission systems visual inspection
- l. Tire tread/wear patterns
- m. Wiper blades
- n. Required Documentation




The fleet administrator should evaluate specific maintenance requirements in accordance with the manufacturers' recommended service guidelines and adjust this schedule as appropriate.

4.4 General Inspection Guidelines




The following safety features should be included in the pre-use visual check on any vehicle:

- a. Horn
 - b. Back-up warning, if applicable
 - c. Head, tail, and signal lights
 - d. Brakes
 - e. Tire inflation
 - f. Mirrors
 - g. Windshield wipers
 - h. Fire extinguisher (light trucks and vans only)
 - i. Windshield and windows (should be free of broken glass that can obstruct the view or present a potential hazard)
 - j. Required Documentation is present
-

5.0 REFERENCES

Please Describe Your Reference Here	Place Your Link in this Column
1. CRL Procedure EHS 1-7, Event Reporting	
2. CRL Procedure AF-4, Field Accounting	
3. Tetra Tech, Inc. Vehicle Safety Program	 DCN2-10_Vehicle_Safety_Program - Rev9-07.doc

6.0 ATTACHMENTS

Please Provide a Description of the Attachment	Place Your Attachments Here
A. Commercial Motor Vehicle Requirements	 EHS 1-13 - Attachment A.doc
B. Example Regular Driver Designation and Motor Vehicle Record Review Form	 Attachment B - Motor Vehicle formrevised 1.28.08.doc
C. Example New Employee Letter and Approval Form	 Motor Vehicle memofromrevised 1.28.08.doc

NOTICE OF OWNERSHIP AND CONDITIONS OF USE

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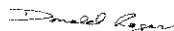
EHS 6-1: Confined Space Entry

Last Revision By: Linda LaMonico on
12/01/2008

Created By: Lisa Kaminski on 02/29/2000

Purpose: When required, this program provides the requirements to ensure a safe working environment within and around confined space operations by evaluating confined space hazards, implementing necessary controls, and regulating employee entry into confined spaces in accordance with 29 CFR 1910.146, Permit-Required Confined Spaces.

Status: Complete



Version Date - Type: 04/04/2000 - Revised

Original Issue Date: 02/01/95

Category: Company Procedures

Sections: ESQ - Environmental Health & Safety Programs

Sub-Category: Departmental/Discipline

Document Type: Procedure

Keyword Index: Monitoring, Training, Field Activities/Science, Operational Control

Document Owner: Philip Bartley

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 - 5.2.7 Client/Contractor Coordination
 - 5.2.8 Pre-Entry Briefing
 - 5.2.9 Confined Space Operations

- 5.2.10 Deviation From Program Requirements
- 5.2.11 Identification of Confined Spaces
- 5.2.12 Program Review
- 5.2.13 Training

6.0 REFERENCES

7.0 ATTACHMENTS

1.0 PURPOSE

When required, this program provides the requirements to ensure a safe working environment within and around confined space operations by evaluating confined space hazards, implementing necessary controls, and regulating employee entry into confined spaces in accordance with 29 CFR 1910.146, Permit-Required Confined Spaces.

Confined space entries should only be made if there is not a feasible method of performing the task from outside of the confined space.

2.0 SCOPE

This program applies to all Tetra Tech EC, Inc. (TtEC) employees, operations, and subcontractors.

3.0 MAINTENANCE

The Director, Environmental, Safety and Quality (ESQ) Programs is responsible for updating this procedure. Approval authority rests with TtEC's President and Chief Executive Officer. Suggestions for revision shall be submitted to both the department responsible for updating the procedure and the Executive Director Compliance and Corporate Counsel.

4.0 DEFINITIONS

4.1 Acceptable Entry Conditions

The conditions that must exist in a permit space to allow entry and to ensure that employees involved with a permit-required confined space entry can safely enter into and work within the space.

4.2 Attendant

An individual stationed outside one or more permit spaces who monitors the authorized entrants and who performs all attendant's duties assigned in the employer's permit space program.

4.3 Confined Space

An enclosed area which exhibits the following characteristics:

- Is large enough and so configured that an employee can bodily enter;
- Has limited or restricted means for entry or exit; and
- Is not designed for continuous occupancy.

4.4 Double Block and Bleed

The closure of a line, duct, or pipe by closing and locking or tagging two in-line valves and by opening and locking or tagging a drain or vent valve in the line between the two closed valves.

4.5 Engulfment

The surrounding and effective capture of a person by a liquid or finely divided solid substance that can be aspirated to cause death by filling or plugging the respiratory system or that can exert enough force on the body to cause death by strangulation, constriction, or crushing.

4.6 Confined Space Entry Permit

The completed document which specifies the hazards, controls, and procedures for a confined space entry.

4.7 Entry

The action by which a person passes through an opening into a confined space. Entry is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space.

4.8 Entry Supervisor

The person responsible for determining if acceptable entry conditions are present at a permit space where entry is planned, for authorizing entry and overseeing entry operations, and for terminating entry as required by this section.

4.9 Hazardous Atmosphere

An atmosphere which meets one or more of the following criteria:

- Flammable gas, vapor, or mist in excess of 10 percent of the lower explosive limit; or
- An airborne concentration of a dust at a concentration that meets or exceeds its lower explosive limit (rule of thumb - visibility obscured at a distance of 5 feet); or
- Atmospheric concentration of any substance which could result in employee exposure in

excess of its recommended exposure limit, i.e., Permissible Exposure Limit (PEL), Threshold Limit Value (TLV), or manufacturer's limit; or

- Immediately dangerous to life or health (IDLH).

4.10 Inerting

The displacement of the atmosphere in a permit space by a noncombustible gas to such an extent that the resulting atmosphere is noncombustible.

4.11 Isolation

A pre-entry requirement which assures that the confined space has been completely taken out of service and insures that accidental introduction of hazardous substances into the confined space may not take place. Isolation may include blinding, double blocking with bleed valves, capping, and/or lockout/tagout.

4.12 Line Breaking

The intentional opening of a pipe, line, or duct that is or has been carrying flammable, corrosive, or toxic material, an inert gas, or any fluid at a volume, pressure, or temperature capable of causing injury.

4.13 Non-permit Required Confined Space

A confined space that does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm.

4.14 Oxygen Deficient

An atmosphere containing less than 19.5 percent oxygen by volume.

4.15 Oxygen Enriched

An atmosphere containing 22.0 percent or more oxygen by volume. (Note: The 22% upper limit is an NFPA 306k, Certification of Hot Work, Consensus Standard.)

4.16 Permit Required Confined Space

A confined space which has one or more of the following characteristics:

- Contains or has the potential to contain a hazardous atmosphere;
- Contains a material that has the potential for engulfment of the entrant; or
- Has an internal configuration that could trap or asphyxiate an entrant.

4.17 Prohibited Conditions

Any condition in a permit space that is not allowed by the permit during the period when entry is authorized.

4.18 Retrieval System

The equipment used for non-entry rescue of persons from permit spaces.

5.0 DISCUSSION

5.1 Responsibilities

5.1.1 Authorized Entrants

Entrants are responsible for the following:

- Inspection of operability and integrity of all respiratory apparatus, safety equipment, and personal protective equipment (PPE) to be used/worn;
- Knowing hazards, mode of exposure, signs and symptoms, and consequences of hazardous exposure;
- Communicating with the attendant as necessary to enable the attendant to monitor entrant status and to enable the attendant to alert entrants of the need to evacuate the space;
- Notifying the attendant of undetected / unnoticed hazards which could cause harm or injury to team personnel, warning signs and symptoms of exposure, and prohibited conditions;
- Wearing the designated respiratory apparatus, safety equipment, and PPE in accordance with EHS 5-2, Respiratory Protection and EHS 5-1, Personal Protective Equipment;
- Knowing the emergency procedures; and
- Exiting from the permit space when evacuation is ordered, warning signs or symptoms of exposure are noted, a prohibited condition is noted, or an alarm is activated.

5.1.2 Attendants

Attendants are required to assume the following duties and responsibilities:

- Inspection of operability and integrity of all respiratory apparatus, safety equipment, and PPE to be used/work in accordance with EHS 5-2, Respiratory Protection and EHS 5-1, Personal Protective Equipment;

- Know the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure;
- Be aware of possible behavioral effects of hazard exposure in authorized entrants;
- Communicate with authorized entrants as necessary to monitor entrant status and to alert entrants of the need to evacuate the space;
- Leave their position only after being physically replaced by another attendant. If required to leave their post and no replacement is available, they must evacuate all personnel from within the confined space before leaving;
- Monitor activities inside and outside the space to determine if it is safe for entrants to remain in the space and order the authorized entrants to evacuate the permit space immediately if a prohibited condition is noted, if an authorized entrant shows behavioral effects of a hazard exposure, if a saturation develops outside the confined space that may endanger the entrants, or if the attendant cannot effectively and safely perform his or her required duties;
- Summon rescue and emergency services;
- Warn unauthorized persons that they must stay away from the permit space, advise them to exit immediately if they enter the permit space, and inform the entry supervisor if they enter the space;
- Perform non-entry rescues;
- Perform no duties that interfere with the attendant's primary duty to monitor and protect the authorized entrants;
- Remain in constant communication with the entrant at all times; and
- Perform atmospheric monitoring per the confined space permit under the direction of the entry supervisor, if trained to perform the monitoring.

5.1.3 Entry Supervisors

Entry supervisors have the following responsibilities:

- Knows the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposures;
- Verifies by checking that the appropriate entries have been made on the permit, that all tests specified by the permit have been conducted and that all procedures and equipment specified by the permit are in place before endorsing the permit and allowing entry to begin;
- Verifies that rescue services are available and that the means for summoning them are operable;
- Removes unauthorized individual who enter or who attempt to enter the permit space during entry operations;
- Determines, whenever responsibility for a permit space entry operation is transferred and

at intervals dictated by the hazards and operations performed within the space, that entry operations remain consistent with terms of the entry permit and that acceptable entry conditions are maintained;

- Ensures full compliance with TtEC and customer permit requirements;
- Ensures that all confined space pre-entry precautions have been taken;
- Ensures that atmosphere/personnel monitoring is performed at adequate frequencies to protect the safety and well being of the entry personnel;
- Ensures that emergency procedures and individual assignments are clearly defined, and to coordinate rescue procedures if necessary; and
- Terminates the entry and cancels the permit.

The entry supervisor may also serve as attendant.

5.1.4 Line Management

The Project Manager (PM) has the responsibility for:

- Ensuring implementation of the confined space entry program
- Ensuring that only trained, qualified, and medically fit personnel participate in confined space entry operations; and
- Ensuring that adequate, appropriate, and properly maintained equipment required to safely enter a confined space and successfully complete the task.

5.2 Procedure

The following sections provide the requirements for pre-entry activities, pre-entry briefings, confined space operations, and program review requirements. Complete implementation of these requirements is necessary to ensure the health and safety of personnel during confined space operations.

No entries shall be made into confined spaces with:

- IDLH atmospheres;
- LEL readings in excess of 10% or a combustible dust atmosphere in excess of the LEL;
or
- An oxygen content of less than 19.5% or greater than 22.0%.

5.2.1 Hazard Evaluation

Prior to the initiation of a confined space entry, a hazard evaluation of the space shall be conducted by the entry supervisor to determine what chemical and physical hazards are present. This review shall be documented on the entry permit and include, but not be limited to the following:

- Potential for oxygen deficient or enriched atmosphere;
- Presence of a flammable atmosphere;
- Presence of toxic air contaminants;
- Presence of physical hazards;
- Sources of hazardous energy that must be de-energized to effectively isolate the confined space;
- Other permits, such as hot-work or lockout/tagout, required to control hazards; and
- Acceptable entry conditions.

Various sources of information for hazard identification that may be used include blueprints, as-builts, client employee knowledge, past entry information, air monitoring data, and physical inspection. For each hazard identified, an effective means of control shall be documented on the confined space entry permit.

5.2.2 Atmospheric Testing

The atmosphere of the confined space shall be tested to determine the initial concentrations of the following:

- Oxygen content;
- Flammable or combustible gases or vapors; and
- Toxic air contaminants.

Testing for the initial concentrations shall be conducted in the order given and documented on the entry permit. LEL, oxygen, and toxicity readings must be taken at least every 15 minutes. If isolation of the space is unfeasible because the space is large or part of a continuous system, the monitoring shall be continuous. Frequency for periodic monitoring during the confined space entry shall be specified and documented on the permit.

5.2.3 Ventilation

Mechanical ventilation shall be initiated where necessary to prevent exposure of employees to hazardous atmospheres. The ventilation shall meet the following requirements:

- It shall be continuous;
- It shall be directed into the immediate area authorized entrants shall work in;
- The air supply shall be from a clean source and shall not increase the hazards in the area; and
- Employees shall not enter the space until the ventilation clears the hazardous atmosphere.

When ventilation practices cannot be used, a supplied air respirator must be utilized. Exceptions may be made by the Project Environmental and Safety Manager (PESM).

Ventilation equipment must be bonded and grounded prior to operation. Ventilator exhausts must be directed down wind from personnel and/or areas that contain buildings, equipment, etc.

5.2.4 Isolation

All permitted spaces shall be removed from service and completely protected against the release of energy and material into the space. Means used to isolate the space include but are not limited to the following:

- Lockout/tagout in accordance with EHS 6-4;
- Disconnection of mechanical linkages and hazards;
- Blanking, blinding, or misaligning piping; or
- Double blocking and bleeding.

5.2.5 Equipment Staging

The following equipment shall be available as necessary and inspected prior to use:

- Testing and monitoring equipment;
- Ventilation equipment
- Communications equipment;
- Personal protective equipment;
- Lighting equipment (caged, waterproof, and low voltage);
- Barriers and shields;
- Ingress and egress equipment;
- Rescue and emergency equipment; and
- Any other equipment required to make safe entry into the space.

In spaces where the potential for flammable or combustible atmospheres exists, equipment shall be non-sparking and intrinsically safe. Electrical systems shall be GFCI protected.

5.2.6 Emergency and Rescue Procedures

Based upon the location, hazards, and configuration of the confined space, the entry supervisor shall ensure that the following items are addressed:

- Rescue and emergency services to be used and means of summoning;
- Means of rescuing entrants;
- Rescue and emergency to be used at the site;
- Duties of personnel during emergencies; and
- Prevention of unauthorized entry during rescues.

5.2.7 Client/Contractor Coordination

To ensure safe and efficient operations when TtEC personnel and client or subcontractor employees will make entry together into the same confined space, the following shall be completed by the entry supervisor:

- Inform TtEC contractors of existing confined spaces;
- Provide TtEC contractors with a copy of this program;
- Inform the contractor of known hazards in the space;
- Provide a list of controls implemented previously;
- Coordinate the entry of the personnel; and
- Debrief the contractor regarding this program and any hazards encountered.

When TtEC personnel are required to perform confined space entry in support of client work, the entry supervisor shall complete the following in addition to the above requirements:

- Obtain any available information on the space from the client;
- Coordinate the entry operations with client personnel; and
- Inform the client of entry hazards encountered.

5.2.8 Pre-Entry Briefing

Prior to initiating a confined space entry, the entry supervisor shall conduct a safety briefing with the authorized entrants, attendants, and other relevant personnel. The briefing shall cover the following at a minimum:

- Hazard Communication (including the signs, symptoms, and modalities of chemical over exposure) in accordance with EHS 4-2, Hazard Communications;
- Physical hazards present;

- All hazard controls;
- Acceptable entry conditions;
- Emergency procedures;
- Rescue procedures;
- Duties of entrants and attendants during routine and emergency operations;
- Frequency and Types of air monitoring;
- Communications system and backup to be used;
- Review of work to be accomplished during entry;
- Decontamination procedures (if necessary);
- PPE disposal; and
- Potential emergencies that may occur outside the confined space.

Attachment A or an equivalent checklist shall be used to document pre-entry briefing.

At the end of the briefing, all personnel shall be given opportunity to ask questions and review the permit. After review, each authorized entrant and attendant shall print and sign his/her name on the permit. The completed permit shall be posted at the entry site and serve as a roster for monitoring entry and exit of personnel from the space.

5.2.9 Confined Space Operations

The following practices shall be adhered to during actual confined space entries:

- All confined spaces will be treated as permit-required confined spaces unless the PESM specifically provides an exemption in the EHS Plan, or by a field change request to the Plan. Prior to entry, a properly executed permit shall be in place and signed by the Entry Supervisor, Attendant, and each Entrant. Attachment B, or an equivalent form that is approved for use by the PESM, shall be used.
- The Entry Supervisor shall certify that all equipment is in place and operable, acceptable entry conditions are present, all personnel have been fully briefed and all personnel have signed the permit prior to initiating entry.
- The work area outside the space shall be barricaded to prevent unauthorized personnel from interrupting the attendants or entering the space. Unauthorized personnel shall be asked to leave the barricaded area. If unauthorized personnel refuse to leave the area, operations shall be terminated.
- Atmospheric monitoring for oxygen, LEL, and toxic air contaminants shall be conducted at the frequency noted on the permit. Results shall be logged on the permit.
- No confined space shall be entered without:

- A full body harness;
- A 6' lanyard attached to the harness "D" ring; and
- A lifeline attached to the lanyard with the opposite end secured outside the confined space. The lanyard and lifeline must have double locking rings.

Note: Wristlets may be used in lieu of a full body harness if the body harness is infeasible or creates a greater hazard.

- Top entries with a fall potential greater than 5 feet shall be made with fall protection. Fall protection shall meet the criteria specified in 29 CFR 1926.502(d).
- At least one attendant is required for permit-required entries. The attendant shall maintain visual or voice communications with entrants at all times. Attendants shall not leave their post unless formally relieved by another authorized attendant. The replacement shall be fully briefed by the entry supervisor on all information covered in the pre-entry briefing. Entry supervisors may also serve as attendants.
- When any confined space is entered where the noise level or respirator used prevents voice communication, visual contact between the standby and workers must be maintained.
- Metal ladders, hand tools or other instruments which may spark or cause a source of ignition, are not to be used within confined spaces where any detectable amounts of LEL's are present.
- No burning, grinding, chipping, or other operation which produces heat, sparks, or ignition sources are to be performed without a hot work permit.
- One attendant shall be dressed in the same PPE as the authorized entrants, except for respiratory protection. Attendant supplied air shall be from a different source than that of authorized entrants.
- The entry supervisor shall terminate operations when the work is completed, an unacceptable entry condition is detected, or another emergency inside or outside the space is detected. Authorized entrants shall immediately evacuate upon notification of the termination.
- Attendants may monitor multiple sites only if they are able to maintain continuous visual or voice communications with entrants. If continuous communications cannot be maintained, additional attendants shall be used.
- Attendants shall perform non-entry rescues in emergencies using rescue equipment staged at the site.
- Upon completion of work and exit of the entrants, the permit shall be canceled by the entry supervisor and forwarded to the ESS. Permits shall be maintained as a part of the project file.

5.2.10 Deviation From Program Requirements

- Any deviation from this procedure requires the approval of the PESM.

- Approval for entry into permit-required confined spaces with air purifying respirators will be given if:
 - The composition of the hazardous substance(s) in the confined space is well defined;
 - The hazardous substance(s) have good warning properties;
 - Short-term exposure to the hazardous substance(s) in excess of the recommended exposure limit will not result in serious physical harm;
 - The efficiency of the cartridge versus the hazardous substance(s) is known;
 - Forced air ventilation is utilized;
 - Reliable monitoring methods are available; and
 - Monitoring shows airborne concentrations to be less than the recommended exposure level for the contaminants.

5.2.11 Identification of Confined Spaces

A survey of the sites shall be performed prior to the start of work and documented to identify permit-required confined spaces. All permit-required confined spaces shall be identified with a sign. The sign shall contain the following wording of equivalent:

DANGER - PERMIT REQUIRED CONFINED SPACE

DO NOT ENTER

5.2.12 Program Review

The effectiveness of program implementation shall be reviewed by the PESM during site EHS inspections pursuant to EHS 3-3, Inspections, using the canceled permits and relevant incident information. The program will be modified, as necessary, on the basis of the PESM program reviews.

5.2.13 Training

Authorized entrants, attendants, and entry supervisors shall be trained in accordance with 29 CFR 1910.146 (g) including the following topics as appropriate:

- The contents of this procedure;
- Their respective duties;
- CPR /First Aid (attendants and entry supervisors if they are serving as rescue personnel);
- Hazards commonly found in confined spaces;
- Lockout/tagout procedures;


- Isolation practices;
- Ventilation of confined spaces;
- Supplied air respiratory protection and SCBAs;
- Self rescue;
- Methods of communication;
- Atmospheric monitoring; and
- Rescues.


Training shall establish employee proficiency in the skills required for confined space entry and the understanding and knowledge for the safe performance of all duties required by this procedure. Training records shall be maintained in accordance with EHS 1-9, Recordkeeping.


6.0 REFERENCES


29 CFR 1910.146, Permit-Required Confined Spaces

29 CFR 1926.502(d), Fall Protection.


Environmental, Health & Safety - Programs Procedure EHS 1-9, Recordkeeping 

Environmental, Health & Safety - Programs Procedure EHS 3-3, Inspections 

Environmental, Health & Safety - Programs Procedure EHS 4-2, Hazard Communication 

Environmental, Health & Safety - Programs Procedure EHS 5-1, Personal Protective Equipment 

Environmental, Health & Safety - Programs Procedure EHS 5-2, Respiratory Protection 

Environmental, Health & Safety - Programs Procedure EHS 6-4, Lockout/Tagout 

OSHA (U.S. Department of Labor, Occupational Safety and Health Administration)

7.0 ATTACHMENTS

Attachment A - Pre-Entry Briefing Checklist

Attachment B - Confined Space Entry Permit

EHS 6-1 ATTACHMENT A
PRE-ENTRY BRIEFING CHECKLIST

Click the icon below to launch or download.



EHS 6-1 Attachment A.doc

Select the "Detach" button in the pop-up window to save a copy to a disk or hard drive.

EHS 6-1 ATTACHMENT A



CONFINED SPACE ENTRY PRE-ENTRY BRIEFING CHECKLIST

Project Name: _____ **Project Location:** _____

Date: _____ **Time:** _____

Completed By: _____

Attendee(s): _____

- Hazard Communication (including the signs, symptoms, and modalities of chemical overexposure).
- Physical hazards present.
- All hazard controls.
- Acceptable entry conditions.
- Emergency procedures.
- Rescue procedures.
- Duties of entrants and attendants during routine and emergency operations.
- Frequency and Types of Monitoring.
- Communications system backup to be used.
- Review of work to be accomplished during entry.
- Decontamination procedures (if necessary).
- PPE disposal
- Potential emergencies that may occur outside the confined space.

EHS 6-1 ATTACHMENT B
CONFINED SPACE ENTRY PERMIT

Click the icon below to launch or download.



EHS 6-1 Attachment B rev 3.doc

Select the "Detach" button in the pop-up window to save a copy to a disk or hard drive.

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PRELIMINARY EHS 6-1 ATTACHMENT B



CONFINED SPACE ENTRY PERMIT

PERMIT VALID FOR ONE SHIFT ONLY. ALL PERMIT COPIES REMAIN AT SITE UNTIL JOB COMPLETED.

DATE: _____ SITE LOCATION/DESCRIPTION: _____

PURPOSE OF ENTRY: _____

SUPERVISOR(S) IN CHARGE OF CREWS/TYPE OF CREW/PHONE #: _____

COMMUNICATION PROCEDURES: _____

RESCUE PROCEDURES AND PHONE NUMBERS: _____

Name of Emergency Service (ES)	Phone# of ES	Date/Time ES contacted	ES Available ? Y or N	Date/Time ES Response Made		Comments/Problems with Service
				Before Confined Space	After Confined Space	

REQUIREMENTS COMPLETED	DATE	TIME	REQUIREMENTS COMPLETED	DATE	TIME
Breathing Apparatus	_____	_____	Line(s) Broken-Cappe Blank	_____	_____
Emergency Escape/Fall Retrieval Equipment	_____	_____	Protective Clothing	_____	_____
Fire Extinguishers	_____	_____	Purge-Flush and Vent	_____	_____
Full Body Harness w/ "D" Ring	_____	_____	Respiratory Protection	_____	_____
Lifelines	_____	_____	Secure Area (Post and Flag)	_____	_____
Lighting (Explosive Proof)	_____	_____	Standby Safety Personnel	_____	_____
			Ventilation	_____	_____

Note: For items that do not apply, enter N/A in the blank. See page 2 to add any special requirements.

RECORD MONITORING RESULTS EVERY 1/4 HOUR

TEST(S) TO BE TAKEN	Permissible Entry Level	Time(s)
PERCENT OF OXYGEN	19.5% to 22.0%	_____
LOWER FLAMMABLE LIMIT	Under 10 %	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

REMARKS: _____

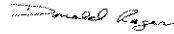
EHS 6-4: Lockout/Tagout

Last Revision By: Linda LaMonico on
12/01/2008

Created By: Lisa Kaminski on 12/28/1999

Purpose: The purpose of this program is to establish the minimum requirements and procedures for performing lockout/tagout on machines and equipment in accordance with 29 CFR 1910.147, Control of Hazardous Energy (Lockout/Tagout).

Status: Complete



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1.0 PURPOSE

The purpose of this program is to establish the minimum requirements and procedures for performing lockout/tagout on machines and equipment in accordance with 29 CFR 1910.147, Control of Hazardous Energy (Lockout/Tagout).

2.0 SCOPE

This program applies to all Tetra Tech EC, Inc. (TtEC) operations, except as follows:

- Work on cord and plug connected electrical equipment where the plug is under the control of the employee performing the work;
- Hot tap operations; and
- Work involving minor changes and adjustments to equipment during routine operations (such as small tooling adjustments).

3.0 MAINTENANCE

The Director, Environmental, Safety and Quality (ESQ) Programs is responsible for updating this procedure. Approval authority rests with TtEC's President and Chief Executive Officer. Suggestions for revision shall be submitted to both the department responsible for updating the procedure and the Executive Director Compliance and Corporate Counsel.

4.0 DEFINITIONS

4.1 Affected Employee

An employee whose job requires them to operate or use a machine or equipment on which servicing, maintenance, or other work is performed under lockout/tagout or whose job requires them to work in an area in which equipment is locked out.

4.2 Authorized Employee

A person who locks out or implements a lockout/tagout system procedure on machines or equipment. Authorized and affected employees may be the same person when the authorized employee's duties also include performing work on a machine or equipment upon which lockout/tagout is implemented.

4.3 Energized

Connected to an energy source or containing residual or stored energy.

4.4 Energy Isolating Device

(Isolation Points) - A mechanical device that may be used to physically prevent the transmission, flow, or release of energy, including but not limited to the following:

- electrical circuit breakers;
- slide gate;
- disconnect switches;
- piping flanges;
- control switches; and
- other similar devices.

4.5 Energy Source

Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, potential, or other energy.

4.6 Lockout

The placement of a lockout device and tag on a lockout device ensuring that the energy isolation device and equipment cannot be operated until the device is removed.

4.7 Lockout Device

A device that physically controls the configuration of an energy isolation point. Lockout devices include but are not limited to the following:

- locks
- chains
- valve covers
- circuit breaker hasps
- blind flanges
- slip blinds, and
- multiple lock hasps

4.8 Supervisor Lock

A lock installed by an authorized supervisor for the purpose of maintaining control of a machine or piece of equipment for a period greater than one work shift.

5.0 DISCUSSION

5.1 Responsibilities

5.1.1 Authorized Employees

Authorized employees shall lockout and tag all energy isolation devices which are required to be locked out by this procedure. The employee shall complete all permits and tags in accordance with instructions and shall remove their locks and tags and return them at the end of their shift or the end of the procedure.

5.1.2 Line Management

Supervisors shall ensure proper implementation of the lockout/tagout procedure including approval of permits and maintenance of personal locks and a log of lock assignments. In group lockout procedures the supervisor shall lock and tag all the appropriate energy isolation devices and deposit his/ her key in the lockbox.

5.1.3 Environmental, Health and Safety Personnel

The Environmental and Safety Supervisor (ESS) is responsible for providing the training required in this procedure to supervisors and craft employees, and conducting periodic inspections to ensure this procedure is effectively implemented. The ESS shall also implement lockout/tagout procedures as required.

5.2 General Requirements

Following are the steps to be followed in preparing for, applying, and releasing a machine or piece of equipment from lockout. These steps shall be completed, in order, using the corresponding permit included as Attachment A. While work is being performed under the lockout, a copy of the completed permit shall be posted at the equipment controls or work area as appropriate.

1. Complete the general information in Section A of the permit
2. Identify Isolation Points

The first step required to isolate a piece of equipment is to identify the sources of hazardous energy present. To identify the sources, the authorized employee shall complete the following steps:

- Survey the equipment and related schematics, blueprints, or as-builts, if available, for hazardous energy sources;
- Identify the isolation points and device positions for controlling each source of hazardous energy; and
- Identify the isolation method to be used on each source.

The above information shall be documented in Section B of the Lockout/Tagout Permit as each point is identified.

3. Notifications

Prior to applying a lockout, the authorized employee shall notify affected employees of the equipment to be locked out and sign Section C of the Lockout/Tagout Permit on the "Notifier" line.

4. Equipment Shutdown

Shut down the equipment or place into the desired configuration using normal operating procedures. The authorized employee shall sign Section C of the Lockout/Tagout Permit on the "Shutdown by" line.

5. Equipment Isolation

To apply a lockout to a piece of equipment, complete the following steps:

- Place each energy isolation device into a position that will prevent the transmission of hazardous energy; and
- The authorized employee shall lockout devices to each isolation point and control the key for each lock at all times. Only one key is permitted per lock.

Complete Section D of the permit as each device is placed and sign the "Isolator" line in Section C.

Notes:

- Any lockout device not containing an integral locking mechanism must be used in conjunction with a keyed lock.
- Any energy isolation point not capable of being locked out must be controlled physically through such means as removal of handles and disconnecting.

6. Release of Stored Energy

After the equipment has been locked and tagged as required in Section D all remaining stored energy must be released. Methods for the release of stored energy include, but are not limited to the following:

- Discharge and grounding of capacitors,
- Bleeding pressure from vessels and lines, and
- Releasing mechanical sources of energy to engage blocks.

If stored energy has the potential to re-accumulate; therefore, verification of isolation shall continue until work is complete. After releasing stored energy complete Section E of the permit.

7. Lockout/Tagout Verification

After completing the lockout of the desired piece of equipment the effectiveness of the lockout must be verified by the authorized employee by attempting to operate the machine. After attempting to operate the machine, sign Section C of the permit on the "Verifier" line.

8. Performance of Work

After verifying and receiving the supervisor's approval signature, work may be performed on the equipment which was locked/tagged.

9. Lockout/Tagout Removal

After work has been completed the following steps shall be followed to release equipment

from lockout tagout:

- The area affected by the lockout shall be inspected to ensure that releasing the machine does not present a hazard to people and property,
- Lockout devices and tags shall be removed,
- Isolation devices returned to their operating positions,
- The equipment started, and
- Affected employees shall be notified of the release.

Section F of the permit shall be completed as the equipment is returned to service.

5.3 Testing/Positioning

When necessary to interrupt lockout/tagout for testing or repositioning, the steps contained in Section 5.2 shall be followed.

5.4 Group Lockouts

When multiple people are scheduled to work on a system, the following group lockout procedure should be implemented as follows:

- The Site Supervisor shall place their lock on the energy isolation device(s) using a multilock hasp.
- Authorized employees shall place their individual locks on the multilock hasp.
- When the group has completed their work, the supervisor shall verify all employee locks have been removed before the supervisor removes his/her lock.

5.5 Tagout

The use of tags without locks is prohibited, except in those cases where it is physically impossible to attach a locking device to an isolation point. When it is necessary to use tags without locks the following shall be completed.

- The isolation point shall be placed in the correct position to prevent the flow of energy;
- The device shall be physically disconnected;
- A tag shall be placed on the disconnected device; and
- Employees shall be warned not to tamper with the tag or isolation point.

5.6 Equipment-Specific Lockout/Tagout Procedures

As TtEC does not normally perform lockouts of machinery on a repetitive basis the LO/TO permit contained in Attachment A is designed for initial and one-of-a-kind lockouts. Should it become necessary to repetitively lockout the same piece of equipment, specific procedures and permits for the equipment shall be developed.

Information contained in the equipment-specific procedure and permit should be the same as the information in the Attachment A permit. The procedures shall be generated by trained and knowledgeable project personnel and be reviewed and approved by the Project Environmental and Safety Manager (PESM).

Equipment-specific procedures are not required when all of the following conditions are present:

- The machine has no potential for stored energy or the reaccumulation of energy after shutdown; and
- The equipment has a single, readily identifiable, and isolated source of energy; and
- Isolation and lockout of the source will completely deenergize and deactivate the equipment; and
- The machine is locked out and isolated from that energy source during servicing and maintenance; and
- A single lockout device will achieve a locked-out condition; and
- The servicing or maintenance does not create a hazard to other employees.

5.7 Shift Changes

When necessary to maintain the status of a locked out machine or device past the end of the shift when the lockout was initially installed the following procedures shall be adhered to:

- The incoming authorized employee shall place their lock hasp on the lockout point and complete a new permit.

- The outgoing employees shall remove their lock(s) after the new lock(s) are applied.
- If multiple shifts are not used, the initial locks may be left in place until the following day or until the equipment is released from lockout/tagout.
- The new shift supervisor shall sign the permit before work is begun on the new shift. The last supervisor whose name is on the lockout/tagout tags permit is responsible for all activities related to the work activity.

5.8 Failure to Clear Locks

If a person should fail to clear a lockout and their lock remains in place, the supervisor will attempt to contact the person who applied the lock and resolve the issue.

If the person cannot be contacted, the supervisor will investigate the situation and determine that removal of the lock will not create a hazard in the work zone. The supervisor will then verify that the work zone is clear, and blocking devices have been removed and the system has been restored to the normal configuration. The supervisor will then cut the lock off and restore energy to the system.

A written incident and investigation report per EHS 1-7, Incident Reporting and Investigating, shall be prepared by the supervisor stating the reason for cutting the lock, why the lock was not removed, and the procedure used to ensure the safety of personnel in the area. The individual whose lock was cut off must be notified ASAP.

5.9 Subcontractors

The supervisor shall be familiar with the nature of any subcontractor work on-site that may involve hazardous energy and assure that they follow work practices that are at least as strict as this procedure.

For any lockout/tagout requirements, the supervisor shall review and approve all subcontractor work set up, apply his locks to the scheme, and sign the appropriate lockout/tagout procedure checklist.

5.10 Periodic Inspections

Periodic inspections pursuant to EHS 3-3, Inspections, shall be completed during the monthly inspections by the ESS, PESM or other qualified personnel to ensure that the lockout tagout program is being effectively implemented. As a minimum the following shall be done:

- Existing lockouts will be reviewed for effectiveness;
- Permits for each existing lockouts shall be reviewed for adequacy;
- Incident reports and past permits shall be reviewed to determine if deficiencies in the program exist;
- Corrections to the system will be made as warranted; and
- Results will be logged in the health and safety logbook.

5.11 Training

Following are the training requirements for various personnel involved with or affected by lockout/tagout.




- Authorized Employees shall receive training in the following prior to being allowed to use lockout/tagout procedures:
 - Recognition of hazardous energy sources;
 - Types and magnitudes of energies available at the site;
 - Methods and means needed for energy isolation and control; and
 - The requirements of this procedure and 29 CFR 1910.147.

- Affected Employees shall be instructed in the following:
 - Purpose of the lockout tagout program;
 - Use and requirements of this procedure and 29 CFR 1910.147;
 - Prohibitions of restarting or tampering with equipment that has been locked out; and
 - Prohibitions of tampering with locks and tags installed on equipment.

Personnel not employed by TtEC shall be briefed in the requirements of this program during site-specific orientations, when applicable.

Training records shall be maintained in accordance with EHS1-9, Recordkeeping.

6.0 REFERENCES

29 CFR 1910.147, The Control of Hazardous Energy (Lockout/Tagout).
Environmental, Health & Safety - Programs Procedure EHS 1-7, Incident Reporting and Investigation 
Environmental, Health & Safety - Programs Procedure EHS 1-9, Recordkeeping 
Environmental, Health & Safety - Programs Procedure EHS 3-3, Inspections 
OSHA (U.S. Department of Labor, Occupational Safety and Health Administration)

7.0 ATTACHMENTS

Attachment A - Lockout Tagout Permit

EHS 6-4 ATTACHMENT A LOCKOUT TAGOUT PERMIT

Click the icon below to download and complete.



EHS 6-4 Attachment A.doc

Select the "Detach" button in the pop-up window to save a copy to a disk or hard drive.

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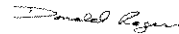
EHS 6-6: Boating

Last Revision By: **Linda LaMonico** on
12/01/2008

Created By: **Lisa Kaminski** on 07/06/2007

Purpose: The purpose of this program is to establish minimum requirements for boating safety.

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1.0 PURPOSE

The purpose of this program is to establish minimum requirements for boating safety.

2.0 SCOPE

This procedure applies to all Tetra Tech EC, Inc. (TtEC) projects.

3.0 MAINTENANCE

The Director, Environmental, Safety and Quality (ESQ) Programs is responsible for updating this procedure. Approval authority rests with TtEC's President and Chief Executive Officer. Suggestions for revision shall be submitted to both the department responsible for updating the procedure and the Executive Director Compliance and Corporate Counsel.

4.0 DEFINITIONS

4.1 Boat

Any powered or nonpowered watercraft utilized for the transport of personnel on a body of water.

5.0 DISCUSSION

5.1 Responsibilities

5.1.1 Line Management

The Project Manager (PM) is responsible for coordinating with the appropriate TtEC Project Environmental and Safety Manager (PESM) to implement the requirements of this procedure. The PM shall provide the necessary management support and allocate sufficient project resources to permit project personnel to operate boats in a safe manner.

Site managers and supervisors are responsible for implementation of this boating safety program in the field.

5.1.2 Environmental, Health and Safety Personnel

The PESM shall ensure that the requirements of this program are incorporated into site Environmental Health and Safety (EHS) plans.

5.2 General Requirements

5.2.1 Boat Operators

TtEC personnel who will operate a boat during the course of a project shall first demonstrate to the site manager that they are experienced in operating boats similar to those used for the project and that they are knowledgeable of the U.S. Coast Guard Boating Safety requirements (33 CFR Subchapter S). **Project boats shall be operated by experienced boat operators only.** Boat operators shall also possess basic mechanical knowledge necessary to troubleshoot common mechanical problems that can and do occur. The boat operator shall be responsible for the safety of all personnel on board the boat he or she is operating and for the integrity of all boat and safety equipment.

Each designated boat operator shall give a safety briefing to all occupants of the boat prior to leaving the shore. **Boats are to be occupied during use by not less than one qualified operator plus one additional person.**

5.2.2 Boat Passengers

Project personnel riding as passengers in a boat shall comply with U.S. Coast Guard requirements presented below.

5.3 Float Plan

The Environmental and Safety Supervisor (ESS) or SM/FOL shall be aware of the location of all project boats and personnel using them at all times. If several boats and crews are involved or are traveling to remote areas, each designated boat operator shall file a written float plan with the ESS or SM/FOL. The float plan shall include the following:

- The names of the boat operator and passengers;
- A description and registration numbers of the boat;
- Radio call sign or cellular telephone number if boat is so equipped;
- A trip itinerary with expected time of return; and
- Steps the ESS or SM/FOL will take to initiate a search response if the expected time of return is exceeded.

5.4 Boat Registration and Numbering

The ESS or SM/FOL shall ensure that all project boats meet U.S. Coast Guard or state boat registration and numbering requirements. The US Coast Guard requires that all motorized boats be numbered in the state of principal use. Many states also require that certain non-motorized boats be numbered (sailboats, rafts, and dinghies). A valid certificate of number showing the numbers issued to the boat is required to be on board the boat whenever the boat is in use. Boat registration numbers are required to be painted or permanently attached to each side of the forward half of the boat. Boat registration must be updated annually.

5.5 U.S. Coast Guard-Approved Equipment

All TtEC project boats will meet or exceed U.S. Coast Guard requirements for safety

equipment. These requirements are summarized below for small craft (less than 12 meters in length). The ESS or SM/FOL shall consult with the PESM if larger craft are required.

5.5.1 Flame Arresters

All gasoline engines, except outboard motors, installed in a boat must have an approved flame arrestor (backfire preventer) fitted to the carburetor.

5.5.2 Sound Signaling Devices

Although not required for small craft, all TtEC boats shall carry at least one air horn or similar sound-signaling device.

5.5.3 Personal Flotation Devices

All TtEC personnel and passengers shall wear an approved personal flotation device (PFD) at all times when operating or being transported in a boat. A positively buoyant wet suit or dry suit may be substituted for a PFD. PFDs shall be Type II or higher (capable of turning its wearer in a vertical or slightly backward position in the water) unless Project Environmental Safety Manager approves Type III based on conditions. Automatic inflating PFDs can be used providing that an AHA addresses its use, the PFD is not used by persons less than 90 pounds and, it is inspected, maintained and stored in accordance with the manufacturer's instruction. In addition, each boat shall be equipped with at least one Type IV PFD, designed to be thrown to a person in the water and grasped and held by the user until rescued. A buoyant boat cushion equipped with straps and a float ring are two common examples of a Type IV PFD.

5.5.4 Fire Extinguishers

Each boat used by TtEC personnel shall carry at least one Type B-I or B-II fire extinguisher (for use in gasoline, oil and grease fires) approved by Underwriters Laboratories (UL). Each fire extinguisher shall be inspected by the ESS or SM/FOL at least every 6 months to ensure that it is sufficiently charged and that the nozzles are free and clear. Discharged fire extinguishers shall be replaced or recharged immediately.

5.5.5 Navigation Lights

Each boat operated at night shall be equipped with navigation lights and these lights shall be utilized at all times when operating between sunset and sunrise. Navigational lighting shall be in compliance with U.S. Coast Guard requirements. Boats shall be operated at reduced speeds at night and when visibility is reduced.

5.5.6 Visual Distress Signals

All TtEC boats shall carry a selection of pyrotechnic and nonpyrotechnic visual distress signals. Pyrotechnic visual distress signals include red flares, orange smoke, and aerial red meteor or parachute flares. Nonpyrotechnic visual distress signals include an orange distress flag and a flashlight or other electric distress light. No single signaling device is ideal under all conditions and for all purposes. Pyrotechnic visual distress signals shall not be used past the expiration date stamped on them.

5.5.7 Pollution Control

The Refuse Act of 1989 prohibits the throwing, discharging, or depositing of any refuse matter of any kind (including trash, garbage, oil, and other liquid pollutants) into the waters of the United States. The Federal Water Pollution Control Act prohibits the discharge of oil or hazardous substances in quantities that may be harmful into U.S. navigable waters. No person may intentionally drain oil or oily wastes from any source into the bilge of any vessel. Larger vessels equipped with toilet facilities must be equipped with a U.S. Coast Guard-approved marine sanitation device.

TtEC employees shall report any significant oil spills to water to the PESM who must report the spill to the U.S. Coast Guard or other applicable regulatory agency. The procedure for incident reporting and investigation shall be followed when reporting the spill. (See EHS 1-7, Incident Reporting and Investigation).

5.6 Load Capacity

Boats shall not be loaded (passengers and gear) beyond the weight capacity printed on the U.S. Coast Guard information plate attached to the stern. In addition, several factors must be considered when loading a boat: distribute the load evenly, keep the load low, do not stand up in a small boat or canoe, and do not overload the boat.

5.7 Tool Kit

All TtEC motorized boats shall carry a tool kit sufficient for the boat operator to troubleshoot common mechanical problems such as fouled spark plugs, flooded carburetor, electrical shorts, etc. Boats operated in remote areas shall also carry appropriate spare parts (propellers, shear pins, patch kits, air pumps, etc). The tool kit shall be maintained by the boat operator and supplies used up shall be replaced immediately.

5.8 Survival Kit

All TtEC boats utilized in remote areas shall carry a survival kit. The survival kit shall contain, at a minimum, a first aid kit, high-energy canned or preserved foods, drinking water, blankets, a heat source, signaling devices, waterproof matches, and other items as necessary to ensure survival for a minimum of 24 hours for the entire crew. Survival suits may be required by the EHS plans for operations in cold environments.

5.9 Communications

All TtEC boats operated in remote areas shall carry a two-way radio or cellular telephone that enables communication back to the field camp or other pre-established location. Exceptions to this requirement must be negotiated with the PESM.

5.10 Boating Accident Report

The U.S. Coast Guard requires filing of a boating accident report within 24 hours of an accident. TtEC personnel involved in a boating accident shall follow the procedure outlined in EHS plans and EHS 1-7, Incident Reporting and Investigating for accident and injury reporting. This procedure will provide for proper notification of the U.S. Coast Guard.

5.11 Good Housekeeping

TtEC personnel using a boat shall properly stow and secure all gear and equipment

against unexpected shifts when underway. Decks and open spaces must be kept clear and free from clutter and trash to minimize slip, trip, and fall hazards.

5.12 Fuel Management



TtEC personnel shall utilize the "one-third rule" in boating fuel management. Use one-third of the fuel to get to the destination, one-third to return, and keep one-third in reserve.

5.13 Training


Boat operators shall be trained on and knowledgeable of U.S. Coast Guard boating safety requirements.

All operators and passengers shall be trained on the requirements of this program. Training records shall be maintained in accordance with EHS 1-9, Recordkeeping.

6.0 REFERENCES

Please Describe Your Reference Here	Place Your Link in this Column
1. 33 CFR Subchapter S, Boating Safety	
2. Environmental, Health & Safety Programs, Procedure EHS 1-7 Event Reporting & Investigation	
3. Environmental, Health & Safety Programs, Procedure EHS 1-9 Recordkeeping	
4. U.S. Department of Transportation, U.S. Coast Guard	
5. http://www.floatplancentral.org	http://www.floatplancentral.org
6.	
7.	

7.0 ATTACHMENTS

Please Provide a Description of the Attachment	Place Your Attachments Here
1. Attachment 1, U.S. Coast Guard Float Plan	 USCG Float Plan.pdf
2.	

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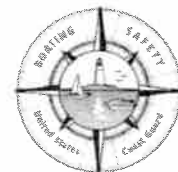


www.uscgauk.org

FLOAT PLAN

INSTRUCTIONS: Complete this plan before you go boating and leave it with a reliable person who can be depended upon to notify the Coast Guard or other rescue organization should you not return or check-in as scheduled. If you have a **change of plans** after leaving, be sure to notify the person holding your Float Plan.

Do NOT file this plan with the Coast Guard.



www.uscgboating.org

VESSEL

IDENTIFICATION:

Name & Home Port _____
 Doc. / Registration No. _____
 Year & Make _____
 Length _____ Type **PWR** Draft _____ Hull Mat **Fiber**
 Hull Color(s) _____
 Prominent Feature(s) _____

TELECOMMUNICATIONS:

Radio Call Sign _____
 DSC MMSI Number _____
 Radio-1: Type **VHF-FM** Ch / Freq Monitored _____
 Radio-2: Type _____ Ch / Freq Monitored _____
 Cell Phone _____
 Pager _____

PROPULSION:

Primary - Type **Gas IO** No. Eng. _____ Fuel Capacity _____
 Auxiliary - Type **none** No. Eng. _____ Fuel Capacity _____

NAVIGATION: (Check all on board)

Maps Charts Compass GPS / DGPS
 Radar Loran C Sounder

SAFETY & SURVIVAL

VISUAL DISTRESS SIGNALS:

Day Only type _____
 Night Only type _____
 Day & Night type _____

AUDIBLE DISTRESS SIGNALS:

Horn / Whistle _____
 Bell _____

OTHER GEAR / SUPPLIES:

Lifeboat / Life Raft Flashlight / Searchlight
 Dinghy / Skiff Signal Mirror
 Food / Water Drogue / Sea Anchor
 EPIRB **none** _____
 Foul Weather Gear

PFDs: (Do not count Type IV devices)

Quantity on board _____

GROUND TACKLE:

Anchor - line length _____ ft.

PERSONS ON BOARD

OPERATOR:

Name _____
 Address _____
 City _____ State _____ Zip code _____
 Vehicle (Year, Make & Model) _____
 Where will trailer be parked? _____

Age M/F Notes (Special medical conditions, Cert. swim, etc.)

Experience: w/Boat w/Area

Home Phone _____

Vehicle License No. _____

Trailer License No. _____

PASSENGERS:

Name & Home Phone

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

Age M/F Notes (Special medical conditions, Cert. swim, etc.)

Agree to file this Float Plan with the U.S. Coast Guard Auxiliary if additional persons are on board.

ITINERARY

	DATE	TIME	LOCATION	MODE OF TRAVEL	REASON FOR STOP	CHECK-IN TIME
Depart						
Arrive						
Depart						
Arrive						
Depart						
Arrive						
Depart						
Arrive						
Depart						
Arrive						
Depart						
Arrive						

Attach Supplemental Itinerary if additional stops are required.

Contact 1 _____

Phone Number _____

Contact 2 _____

Phone Number _____

If you have a genuine concern for the safety or welfare of any persons on board this vessel, who have not returned or checked-in within a reasonable amount of time, then follow the step-by-step instructions on the Boating Emergency Guide included with this plan, or on the World Wide Web at:

<http://www.uscgauk.org/~floatplan/BoatingEmergencyGuide.htm>

BOATING EMERGENCY GUIDE

You will need the following items before you begin: 1) The Float Plan, if one was given to you; 2) Pen or Pencil; 3) Clean sheet of paper or writing tablet, and 4) Telephone Directory

Step 1

Is there a genuine concern for the safety or welfare of any persons on board the vessel, who have not returned or checked-in within a reasonable amount of time?

If YES, continue with **Step 2**. If NO, then Stop. No further action is required at this time.

Step 2

Were you given a prepared Float Plan by anyone onboard the vessel?

If YES, continue with **Step 3**. If NO, then go to **Step 5**.

Step 3

On the Float Plan, locate the two contact lines, below the "Itinerary" at the bottom of the Float Plan. Call the telephone number of Contact-1.

IF:	THEN:						
A person answered the phone...	Take notes during your conversation.						
	1. Let the person know that you are responding to a late return or check-in by the individuals designated on the Float Plan.						
	2. Determine if the person you are talking to, or anyone else at that location, has recently had contact with anyone on the vessel, and when and where that contact occurred.						
	3. Are you still concerned about the safety or welfare of any persons on board the vessel?						
	<table border="1"> <thead> <tr> <th>IF:</th> <th>THEN:</th> </tr> </thead> <tbody> <tr> <td>Yes</td> <td>Continue with Step 4.</td> </tr> <tr> <td>No</td> <td>Stop. No further action is necessary at this time.</td> </tr> </tbody> </table>	IF:	THEN:	Yes	Continue with Step 4 .	No	Stop. No further action is necessary at this time.
IF:	THEN:						
Yes	Continue with Step 4 .						
No	Stop. No further action is necessary at this time.						
Otherwise...	Continue with Step 4 .						

Step 4

Call the telephone number for Contact-2.

IF:	THEN:						
A person answered the phone...	Take notes during your conversation.						
	1. Let the person know that you are responding to a late return or check-in by the individuals designated on the Float Plan.						
	2. Determine if the person you are talking to, or anyone else at that location, has recently had contact with anyone on the vessel, and when and where that contact occurred.						
	3. Are you still concerned about the safety or welfare of any persons on board?						
	<table border="1"> <thead> <tr> <th>IF:</th> <th>THEN:</th> </tr> </thead> <tbody> <tr> <td>Yes</td> <td>Continue with Step 6.</td> </tr> <tr> <td>No</td> <td>Stop. No further action is necessary at this time.</td> </tr> </tbody> </table>	IF:	THEN:	Yes	Continue with Step 6 .	No	Stop. No further action is necessary at this time.
IF:	THEN:						
Yes	Continue with Step 6 .						
No	Stop. No further action is necessary at this time.						
Otherwise...	Continue with Step 6 .						

Step 5

Take a moment to jot down the facts you know about each item in the checklist below:

Do not speculate! Speculation of a fact may mislead search and rescue personnel and add to the overall search and rescue time, adversely affecting the outcome.

- Period of time the vessel has been overdue.
- Purpose of the trip or voyage.
- Description of vessel (color, size, shape, etc.)
- Vessel's departure point and destination.
- Places the vessel planned to stop during transit.
- Navigation equipment on board (such as GPS, Compass, Maps, Charts, LORAN C, etc.)
- Survival equipment on board (life jackets, EPIRB, flares, etc.)
- Number of people on board the vessel, as well as personal habits e.g. dependability, reliability, etc.
- Was the vessel already moored, or did a vehicle tow it to the location?
- License plate number and description of the vehicle of the towing and/or crew transport vehicle.
- Communications equipment on board including radio frequencies monitored, cellular telephone numbers of people aboard.
- Additional points of contact in the area.
- Were there any pending commitments (work, appointments, etc.)?

Continue with **Step 6**.

Step 6

1. Contact your local Law Enforcement agency.
2. Let the dispatcher know that you are responding to a late return or check-in by the persons on board.
 - a. The dispatcher will guide you from there. The dispatcher will provide you with the necessary contact or agency connection (if one was not given on the Float Plan) to get a Search And Rescue (SAR) mission started. This is usually handled this way because it puts you closest to the agency conducting the rescue mission, eliminating an unnecessary middleman.
 - b. The dispatcher will let you know if they would like a follow-up call from you on the outcome.
3. The dispatcher will instruct you from there.

Continue with **Step 7**.

Step 7

Be patient... you've done everything you can possibly do for now. Stay off of the phone, so emergency personnel can contact you with additional information and/or questions concerning the Search And Rescue (SAR) effort.

End of Guide



H&S SWP-5.21

SWP Date: August 2008

HAND TOOLS

1.0 INTRODUCTION

Hand tools are used routinely in many Tetra Tech MM (TtMM) Operations. In order to prevent accidents associated with their use, our employees must be aware of the dangers associated with the different types of tools and the safety precautions necessary to prevent accidents. The following safe work practices must be followed when using hand tools.

2.0 GENERAL SAFETY RULES

All tools, regardless of ownership, shall be of an approved type and maintained in good condition. Tools not meeting the requirements detailed in this safe work practice are prohibited. Tools are subject to inspection at any time. The supervisor has the authority and responsibility to condemn unserviceable tools, regardless of ownership.

1. Defective tools shall be tagged to prevent their use and shall be removed from the job site.
2. Employees shall always use the proper tool for the job performed.
3. Hammers with metal handles, screwdrivers, knives with metal continuing through the handle and metallic measuring tapes shall not be used on or near energized electrical circuits or equipment.
4. Tools shall not be thrown from place to place or from person to person; tools that must be raised or lowered from one elevation to another shall be placed in tool buckets or firmly attached to hand lines.
5. Tools shall never be placed unsecured on elevated places.
6. Employees using hand and power tools and exposed to the hazard of falling, flying, abrasive, and splashing objects, or exposed to harmful dust, fumes, mists vapors, or gases shall be provided with the designated PPE necessary to protect them from the hazard. The designated PPE should be determined on a case by case basis.



3.0 HAND TOOLS

1. All impact tools such as chisels, punches, drift pins, etc., that become mushroomed or cracked shall be dressed, repaired, or replaced before further use.
2. Chisels, drills, punches, ground rods, and pipes shall be held with suitable holders or tongs (not with the hands) while being struck by another employee.
3. Shims shall not be used to make a wrench fit.
4. Wrenches with sprung or damaged jaws shall not be used.
5. Pipe shall not be used to extend a wrench handle for added leverage unless the wrench was designed for such use.
6. Tools shall be used only for the purposes for which they have been approved.
7. Tools with sharp edges shall be stored and handled so that they will not cause injury or damage. They shall not be carried in pockets.
8. Wooden handles that are loose, cracked, or splintered shall be replaced. The handle shall not be taped or lashed with wire.
9. All cutting tools such as saws, wood chisels, drawknives, or axes shall be kept in suitable guards or in special compartments.
10. Tools shall not be left lying around where they may cause a person to trip or stumble.
11. When working on or above open grating, a canvas or other suitable covering shall be used to cover the grating to prevent tools or parts from dropping to a lower level where others are present or the danger area shall be barricaded or guarded.
12. The insulation on hand tools shall not be depended upon to protect users from shock.



4.0 PORTABLE ELECTRIC TOOLS

1. The non-current carrying metal parts of portable electric tools such as drills, saws, and grinders shall be effectively grounded when connected to a power source unless the tool is an approved double-insulated type and the tool is connected to the power supply by means of an isolating transformer or other isolated power supply, such as a 24-volt DC system.
2. All powered tools shall be examined prior to use to ensure general serviceability and the presence of all applicable safety devices. The electric cord and electric components shall be given an especially thorough examination.
3. Powered tools shall be used only within their capability and shall be operated in accordance with the instructions of the manufacturer.
4. All tools shall be kept in good repair and shall be disconnected from the power source while repairs are being made.
5. Electrical tools shall not be used where there is a hazard of flammable vapors, gases, or dusts.
6. All power tools and cord sets shall be protected by ground fault circuit interrupters (GFCI).
7. When using any power source, ensure that GFCI is functional. Otherwise, external GFCI must be used.



5.0 PNEUMATIC TOOLS

1. Compressed air and compressed air tools shall be used with caution.
2. Pneumatic tools shall never be pointed at another person.
3. Pneumatic power tools shall be secured to the hose or whip by some positive means to prevent the tool from becoming accidentally disconnected.
4. Safety clips or retainers shall be securely installed and maintained on pneumatic impact (percussion) tools to prevent attachments from being accidentally expelled.
5. Compressed air shall not be used for cleaning purposes except when reduced to less than 30 psi and then only with effective chip guarding and personal protective equipment.
6. Compressed air shall not be used to blow dust or dirt from clothing.
7. The manufacturer's safe operating pressure for hoses, pipes, valves, filters, and other fittings shall not be exceeded.
8. The use of hoses for hoisting or lowering tools shall not be permitted.
9. All hoses exceeding ½ inch inside diameter shall have a safety device at the source of supply or branch line to reduce pressure in case of hose failure or disengagement of a connection.
10. Before making adjustments or changing air tools, unless equipped with quick change connectors, the air shall be shut off at the air supply valve ahead of the hose. The hose shall be bled at the tool before breaking the connection.
11. Eye, foot and hearing protection devices shall be worn during pneumatic tool use.
12. Pneumatic tools shall be operated only by competent persons who have been trained in their use.
13. A pneumatic tool used where it may contact exposed live electrical parts shall have a nonconductive hose and an accumulator to collect moisture.
14. Employees shall not use any part of their bodies to locate or attempt to stop an air leak.



6.0 POWDER ACTUATED TOOLS

A powder actuated tool must always be treated the same as a loaded firearm. **ALWAYS ASSUME THE TOOL IS LOADED.** These tools come in both low and high velocity models, and both should have built-in safeguards; however, extreme caution must be used when working with this tool. Powder actuated tools can be used only by employees who have been trained in their operation. The user must have a current operator's card.

The following checklist, which may not be complete for all scenarios, is required at a minimum before each use of a powder actuated tool. (Project Managers are responsible for identifying other site specific requirements.)

1. Check the safety for proper operation and make sure the bore is clear.
2. Select the proper cartridge for the job to be done; never use a higher charge than is necessary.
3. Make sure that the drive part of the tool will not penetrate the mounting surface and fly out the other side. The work area must be backed up by a plank or beam.
4. Do not use this tool on hard steel, cast iron, rock, or other extremely hard materials.
5. Make sure no one else is in the immediate area; concrete chips, metal spalls or rebounding studs could injure bystanders. Insure protective shield is in place to confine flying fragments or particles when the tool is fired.
6. Make sure the tool is at the correct angle to the work surface, and maintain pressure against the surface.
7. Always wear proper eye and hearing protection.
8. Do not use in an explosive or flammable atmosphere.
9. Never point the tool at anyone.
10. Do not load until ready for use and never leave a loaded tool unattended.
11. If the tool develops a defect during use, it should be tagged and removed from service until it is properly repaired.



7.0 GUARDS

Hazardous moving parts - belts, gears, shafts, pulleys or other reciprocating, rotating or moving parts of equipment must be guarded if such parts are exposed. Guards must be provided as necessary to protect the operator and others from point of operation hazards, in-running nip point hazards, rotating parts, flying chips, and sparks etc. All guards shall meet the requirements set forth by ANSI.

SAFETY GUARDS SHALL NEVER BE REMOVED OR TAMPERED WITH



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Truck-mounted heavy equipment and field trucks are among the types of equipment that may be used during field work. Heavy equipment can present a substantial hazard to workers. General requirements for motor vehicles and material-handling equipment are provided in the Occupational Safety and Health Administration (OSHA) Construction Industry Standards, 29 CFR 1926, Subpart O. The following precautions will be followed when heavy equipment (such as drill rigs, front-end loaders, and backhoes) is in use:

- Heavy equipment will be inspected by the operator before each work shift. The site safety coordinator (SSC) will ensure compliance with these precautions.
- Equipment operators will be instructed to report any abnormalities, such as equipment failure, oozing liquids, and unusual odors, to their supervisors or the SSC.
- Only qualified and licensed personnel will operate heavy equipment.
- Hard hats, steel-toed boots, and safety glasses or goggles will be worn at all times around heavy equipment. Other personal protective equipment (PPE) may be required as specified in the site health and safety plan (HASP); construction site health and safety plan (C-HASP); Job Hazard Analysis (JHA), Job Safety Analysis (JSA) or other site-specific health and safety documentation.
- Workers will not assume that the equipment operator is keeping track of the exact location of operating equipment. Workers will never walk directly behind or to the side of heavy equipment without the operator's knowledge.
- Workers in close proximity to heavy equipment will maintain visual contact with equipment operators at all times.
- When an operator must maneuver equipment in tight quarters, the presence of a second person will be required to ensure adequate clearance. If backing is required, two ground guides will be used: one in the direction the equipment is moving, and the other in the operator's normal field of vision to relay signals.
- All heavy equipment used at a contaminated work site will be kept in the exclusion



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zone until the work has been completed. Such equipment will then be decontaminated within the designated decontamination area.

- Hand-signal communications will be established when verbal communication is difficult. One person per work team will be designated to give hand signals to equipment operators.
- Equipment with an obstructed rear view must have an audible alarm that sounds when the equipment is moving in reverse (unless a spotter guides the operator).
- Parking brakes will be kept engaged when equipment is not in use.
- Blades, buckets, dump bodies, and other hydraulic systems will be kept fully lowered when equipment is not in use.
- Equipment cabs will be kept free of all nonessential and loose items.
- Seat belts must be present in all vehicles having a rollover protective structure (ROPS).
- With certain exceptions, all material-handling equipment must be equipped with ROPS.
- Material-handling equipment that lacks a ROPS will not be operated on a grade unless the grade can safely accommodate the equipment involved.
- Drilling auger sections and other equipment are extremely heavy. All precautions must be taken before moving heavy equipment. Appropriate equipment must be used to transport heavy equipment.
- Only chains, hoists, straps, and other equipment that safely aids transport of heavy materials will be used.
- Proper personal lifting techniques will be used. Workers will lift using their legs, not their backs.
- A safety barrier will be used to protect workers when tires are inflated, removed, or



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installed on split rims.

- An ongoing maintenance program for all tools and equipment must be in place. All tools and moving equipment will be inspected regularly to ensure that parts are secured, are intact, and have no cracks or areas of weakness. The equipment must turn smoothly without wobbling and must operate according to manufacturer specifications. Defective items will be promptly repaired or replaced. Maintenance and repair logs will be kept.
- Tools will be stored in clean, secure areas to prevent damage, loss, or theft.
- Workers will not use equipment with which they are not familiar. This precaution applies all equipment and tools.
- Loose-fitting clothing and loose, long hair will be prohibited around moving machinery.
- Workers will make sure that no underground or overhead power lines, sewer lines, gas lines, or telephone lines present a hazard in the work area.
- All personnel who are not essential to work activities will be kept out of the work area.
- Workers will be aware of their footing at all times.
- Workers will remain alert at all times.

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	Name	Approval Date	
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	Rick Lemmon		

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