

ECOLOGY AND ENVIRONMENT, INC.

**SITE-SPECIFIC
HEALTH AND SAFETY PLAN**

Project: Red Devil Mine RI/FS

Project No.: 001096.OX70

Project Location: Red Devil, Alaska

Proposed Date of Field Activities: Summer 2011

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ACRONYMS/ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists,
ALARA	As low as reasonably achievable
ANSI	American National Safety Institute
dBA	Decibels made on A weighted network of a sound meter
CFR	Code of Federal Regulations
CHSP	<i>Corporate Health and Safety Program</i>
E & E	Ecology & Environment Inc.
FID	Flame ionizing detector
HAZWOPER	Hazardous Waste Operations and Emergency Response
LEL	Lower explosive limit
LOP	Levels of protection
mg/m ³	Milligram per cubic meter
mR/hr	Micro Rems per hour
MeV	Milli equivalency volt
NIOSH	National Institute for Occupational Safety and Health
NRC	National Research Council
OSHA	Occupational Safety and Health Administration
PEL	Permissible exposure level
PID	Photo ionization detector
PPE	Personal protective equipment
PPM	Parts per million
RDM	Red Devil Mine
RI/FS	Remedial Investigation/Feasibility Study
SCBA	Self contained breathing apparatus
SHASP	Site-specific health and safety plan
SOP	Standard operating procedure
SSO	Site Safety Officer
TLD	Thermoluminescent Dosimeter
TLV	Threshold limit value
TWA	Time weighted average

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1. INTRODUCTION

1.1 POLICY

It is E & E's policy to ensure the health and safety of its employees, the public, and the environment during the performance of work it conducts. This site-specific health and safety plan (SHASP) establishes the procedures and requirements to ensure the health and safety of E & E employees for the above-named project. E & E's overall safety and health program is described in *Corporate Health and Safety Program* (CHSP). After reading this plan, applicable E & E employees shall read and sign E & E's SHASP Acceptance form.

This SHASP has been developed for the sole use of E & E employees and is not intended for use by firms not participating in E & E's training and health and safety programs. Subcontractors are responsible for developing and providing their own safety plans.

This SHASP has been prepared to meet the following applicable regulatory requirements and guidance:

Applicable Regulation/Guidance
29 CFR 1910.120, Hazardous Waste Operations and Emergency Response
Other:

1.2 SCOPE OF WORK

Description of Work: E & E personnel will collect surface and subsurface soil samples using hand augers and truck-mounted drilling equipment. A backhoe may be used to re-construct old roads for drilling equipment access. The truck mounted drilling equipment and backhoe will be operated by subcontractors, not E & E personnel. E & E personnel will be responsible for decontaminating sampling tools, subcontractors will be responsible for decontaminating vehicles and equipment used for the sampling effort. Where possible, sampling tools will be dedicated and disposed along with personal protective equipment (PPE) in a refuse depository. E & E will collect groundwater samples from existing monitoring wells on-site with the use of a peristaltic pump and attached flow through cell. E & E will collect surface water and sediment samples from strategic locations along the banks of Red Devil Creek and the Kuskokwim River.

Equipment/Supplies: Attachment 1 contains a checklist of equipment and supplies that will be needed for this work.

The following is a description of each numbered task:

Task Number	Task Description
1	Collect subsurface soil samples from soil borings.
2	Collect surface soil samples.
3	Collect groundwater samples from existing monitoring wells
4	Collect surface water and sediment samples from Red Devil Creek and the Kuskokwim River

1.3 SITE DESCRIPTION

Site Map: See RI/FS Work Plan Figures 1-2 and 1-3.

Site History/Description (see project work plan for detailed description: The Red Devil Mine is a former mercury mine and retort facility that was in operation from the late 1940's through the early 1970's. The BLM began investigation and cleanup efforts at Red Devil Mine in the late 1980's to the present. Annual groundwater sampling has been conducted since the fall of 2005.

Is the site currently in operation? ☐ Yes ☒ No

Locations of Contaminants/Wastes: Please refer to the RI/FS Work Plan Figure 1-3 for specific locations of known and suspected areas of contamination.

Types and Characteristics of Contaminants/Wastes:

☒ Liquid ☒ Solid ☐ Sludge ☐ Gas/Vapor
☐ Flammable/Ignitable ☐ Volatile ☐ Corrosive ☐ Acutely Toxic
☐ Explosive ☐ Reactive ☒ Carcinogenic ☐ Radioactive
☐ Medical/Pathogenic Other: fine grain size allows for easy wind transportation and inhalation hazard

2. ORGANIZATION AND RESPONSIBILITIES

E & E team personnel shall have on-site responsibilities as described in E & E's standard operating procedure (SOP) for Site Entry Procedures (GENTECH 2.2). The project team, including qualified alternates, is identified below.

Name	Site Role/Responsibility
Mark Longtine	RI Task Manager/Field Team Leader
Jennifer Schmitz	Site Safety Officer/Field Team Member
Rebecca Jarvis	Field Team Member
Andy Uhrig	Field Team Member
Bryan Cieccko	Field Team Member

3. TRAINING

Prior to work, E & E team personnel shall have received training as indicated below. As applicable, personnel shall have read the project work plan, sampling and analysis plan, and/or quality assurance project plan prior to project work.

Training	Required
40-Hour OSHA HAZWOPER Initial Training and Annual Refresher (29 CFR 1910.120)	X
Annual First Aid/CPR	X
Hazard Communication (29 CFR 1910.1200)	X

Training	Required
Other: _____	

4. MEDICAL SURVEILLANCE

4.1 MEDICAL SURVEILLANCE PROGRAM

E & E field personnel shall actively participate in E & E's medical surveillance program as described in the CHSP and shall have received, within the past year, an appropriate physical examination and health rating.

E & E's health and safety record form will be maintained on site by each E & E employee for the duration of his or her work. E & E employees should inform the site safety officer (SSO) of any allergies, medical conditions, or similar situations that are relevant to the safe conduct of the work to which this SHASP applies.

Is there a concern regarding radiation at the site? ☐ Yes ☒ No

If no, go to 5.1.

4.2 RADIATION EXPOSURE

4.2.1 External Dosimetry

Thermoluminescent Dosimeter (TLD) Badges: TLD badges are to be worn by all E & E field personnel on certain required sites.

Pocket Dosimeters: _____

Other: Innovex XRF instrument is a potential source of exposure when the x-ray is energized and the shutter is open. E & E field personnel should stand as far away as possible from the instrument when measuring samples. This includes propping the XRF with a foot or leg. Field personnel should never expose head, abdomen, eyes or any sensitive areas to potential exposure from the XRF. _____

4.2.2 Internal Dosimetry

☐ Whole body count ☐ Bioassay ☐ Other

Requirements: _____

4.2.3 Radiation Dose

Dose Limits: E & E's radiation dose limits are stated in the CHSP. Implementation of these dose limits may be designated on a site specific basis.

Site-Specific Dose Limits: _____

ALARA Policy: Radiation doses to E & E personnel shall be maintained at levels as low as reasonably achievable (ALARA), taking into account the work objective, state of technology available, economics of improvements in dose reduction with respect to overall health and safety, and other societal and socioeconomic considerations.

5. SITE CONTROL

5.1 SITE LAYOUT AND WORK ZONES

Site Work Zones: The site work zone will include all areas within the Red Devil Creek drainage. All equipment and vehicles leaving this area shall be decontaminated prior to exiting the creek drainage area.

Site Access Requirements and Special Considerations: There are no roads into RDM. Site access will require the use of all terrain vehicles.

Illumination Requirements: Work will be performed outdoors during daylight hours.

Sanitary Facilities (e.g., toilet, shower, potable water): To be determined on-site.

On-Site Communications: Cell Phones will be used to communicate where cell transmission is unobstructed. A satellite phone will be available for use if cell phone signal is unattainable.

Other Site-Control Requirements: None

5.2 SAFE WORK PRACTICES

Daily Safety Meeting: A daily safety meeting will be conducted for all E & E personnel and documented on the Daily Safety Meeting Record form or in the field logbook. The information and data obtained from applicable site characterization and analysis will be addressed in the safety meetings and also used to update this SHASP, as necessary.

Work Limitations: Work shall be limited to a maximum of 12 hours per day. If 12 consecutive days are worked, at least one day off shall be provided before work is resumed. Work will be conducted in daylight hours unless prior approval is obtained and the illumination requirements in 29 CFR 1910.120(m) are satisfied.

Weather Limitations: Work shall not be conducted during electrical storms. Work conducted in other inclement weather (e.g., rain, or snow) will be approved by project management and the regional safety coordinator or designee.

Other Work Limitations: Work will not be conducted if wind speeds sustain above 20 miles per hour.

Buddy System: Field work will be conducted in pairs of team members according to the buddy system.

Line of Sight: Each field team member shall remain in the line of sight and within verbal communication of at least one other team member.

Eating, Drinking, and Smoking: Eating, drinking, smoking, and the use of tobacco products shall be prohibited in the exclusion and contamination reduction areas, at a minimum, and shall only be permitted in designated areas.

Contamination Avoidance: Field personnel shall avoid unnecessary contamination of personnel, equipment, and materials to the extent practicable.

Sample Handling: Protective gloves of a type designated in Section 7 will be worn when containerized samples are handled for labeling, packaging, transportation, and other purposes.

Other Safe Work Practices: Transportation to and from the site may involve ATV travel. E & E employees will adhere to corporate ATV use policy attached to the end of this SHASP.

6. HAZARD EVALUATION AND CONTROL

6.1 PHYSICAL HAZARD EVALUATION AND CONTROL

Potential physical hazards and their applicable control measures are described in the following table for each task.

Hazard	Task Number	Hazard Control Measures
Biological (flora, fauna, etc.)	1,2,3,4	<ul style="list-style-type: none"> ■ Potential hazard: Bears, moose, insect bites ■ Establish site-specific procedures for working around identified hazards. ■ Other: <u>Make noise while in the field.</u>
Cold Stress		<ul style="list-style-type: none"> ■ Provide warm break area and adequate breaks. ■ Provide warm, non-caffeinated beverages. ■ Promote cold stress awareness. ■ See <i>Cold Stress Prevention and Treatment</i> (attached at the end of this plan if cold stress is a potential hazard).
Compressed Gas Cylinders		<ul style="list-style-type: none"> ■ Use caution when moving or storing cylinders. ■ A cylinder is a projectile hazard if it is damaged or its neck is broken. ■ Store cylinders upright, and secure them by chains or other means. ■ Other:
Confined Space		<ul style="list-style-type: none"> ■ Ensure compliance with 29 CFR 1910.146. ■ See SOP for Confined Space Entry. Additional documentation is required. ■ Other:
Drilling	1,2,3	<ul style="list-style-type: none"> ■ See SOP for Health and Safety on Geoprobe Operations. Additional documentation may be required. ■ Landfill caps will not be penetrated without prior discussions with corporate health and safety staff. ■ Other:
Drums and Containers	1,2,3	<ul style="list-style-type: none"> ■ Ensure compliance with 29 CFR 1910.120(j). ■ Consider unlabeled drums or containers to contain hazardous substances and handle accordingly until the contents are identified. ■ Inspect drums or containers and assure integrity prior to handling. ■ Move drums or containers only as necessary; use caution and warn nearby personnel of potential hazards. ■ Open, sample, and/or move drums or containers in accordance with established procedures; use approved drum/container-handling equipment. ■ Other:

Hazard	Task Number	Hazard Control Measures
Electrical		<ul style="list-style-type: none"> ■ Ensure compliance with 29 CFR 1910 Subparts J and S. ■ Locate and mark energized lines. ■ De-energize lines as necessary. ■ Ground all electrical circuits. ■ Guard or isolate temporary wiring to prevent accidental contact. ■ Evaluate potential areas of high moisture or standing water and define special electrical needs. ■ Other:
Excavation and Trenching	1,2,3	<ul style="list-style-type: none"> ■ Ensure that excavations comply with, and personnel are informed of, the requirements of 29 CFR 1926 Subpart P. ■ Ensure that any required sloping or shoring systems are approved, as per 29 CFR 1926 Subpart P. ■ Identify special personal protective equipment (PPE) (see Section 7) and monitoring (see Section 8) needs if personnel are required to enter approved excavated areas or trenches. ■ Maintain line of sight between equipment operators and personnel in excavations/trenches. Such personnel are prohibited from working in close proximity to operating machinery. ■ Suspend or shut down operations at signs of cave in, excessive water, defective shoring, changing weather, or unacceptable monitoring results. ■ Other:
Fire and Explosion		<ul style="list-style-type: none"> ■ Inform personnel of the location(s) of potential fire/explosion hazards. ■ Establish site-specific procedures for working around flammables. ■ Ensure that appropriate fire suppression equipment and systems are available and in good working order. ■ Define requirements for intrinsically safe equipment. ■ Identify special monitoring needs (see Section 8). ■ Remove ignition sources from flammable atmospheres. ■ Coordinate with local fire-fighting groups regarding potential fire/explosion situations. ■ Establish contingency plans and review daily with team members. ■ Other:
Heat Stress		<ul style="list-style-type: none"> ■ Provide cool break area and adequate breaks. ■ Provide cool, non-caffeinated beverages. ■ Promote heat stress awareness. ■ Use active cooling devices (e.g., cooling vests) where specified. ■ See <i>Heat Stress Prevention and Treatment</i> (attached at the end of this plan if heat stress is a potential hazard).

Hazard	Task Number	Hazard Control Measures
Heavy Equipment Operation	1,2,3	<ul style="list-style-type: none"> ■ Define equipment routes, traffic patterns, and site-specific safety measures. ■ Ensure that operators are properly trained and equipment has been properly inspected and maintained. Verify back-up alarms. ■ Ensure that ground spotters are assigned and informed of proper hand signals and communication protocols. ■ Identify special PPE (Section 7) and monitoring (Section 8) needs. ■ Ensure that field personnel do not work in close proximity to operating equipment. ■ Ensure that lifting capacities, load limits, etc., are not exceeded. ■ Other:
Heights (Scaffolding, Ladders, etc.)		<ul style="list-style-type: none"> ■ Ensure compliance with applicable subparts of 29 CFR 1910. ■ Identify special PPE needs (e.g., lanyards, safety nets, etc.) ■ Other:
Noise	1,2,3,4	<ul style="list-style-type: none"> ■ Establish noise level standards for on-site equipment/operations. ■ Inform personnel of hearing protection requirements (Section 7). ■ Define site-specific requirements for noise monitoring (Section 8). ■ Other:
Overhead Obstructions		<ul style="list-style-type: none"> ■ Wear hard hat. ■ Other:
Power Tools		<ul style="list-style-type: none"> ■ Ensure compliance with 29 CFR 1910 Subpart P. ■ Other:
Sunburn	1,2,3,4	<ul style="list-style-type: none"> ■ Apply sunscreen. ■ Wear hats/caps and long sleeves. ■ Other:
Utility Lines		<ul style="list-style-type: none"> ■ Identify/locate existing utilities prior to work. ■ Ensure that overhead utility lines are at least 25 feet away from project activities. ■ Contact utilities to confirm locations, as necessary. ■ Other:
Weather Extremes	1,2,3,4	<ul style="list-style-type: none"> ■ Potential hazards: ■ Establish site-specific contingencies for severe weather situations. ■ Provide for frequent weather broadcasts. ■ Weatherize safety gear, as necessary (e.g., ensure that eye wash units cannot freeze, etc.). ■ Identify special PPE (Section 7) needs. ■ Discontinue work during severe weather. ■ Other:
Other:		<ul style="list-style-type: none"> ■ ■

6.2 CHEMICAL HAZARD EVALUATION AND CONTROL

6.2.1 Chemical Hazard Evaluation

Potential chemical hazards are described by task number in Table 6-1. Hazard Evaluation Sheets for major known contaminants are attached at the end of this plan.

6.2.2 Chemical Hazard Control

An appropriate combination of engineering/administrative controls, work practices, and PPE shall be used to reduce and maintain employee exposures to a level at or below published exposure levels (see Section 6.2.1).

Applicable Engineering/Administrative Control Measures: Spray water on ground to control airborne dust. Limit driving through areas of highest contamination and limit vehicle speeds to decrease generation of dust.

PPE: See Section 7.

6.3 RADIOLOGICAL HAZARD EVALUATION AND CONTROL

6.3.1 Radiological Hazard Evaluation

Potential radiological hazards are described below by task number. Hazard Evaluation Sheets for major known contaminants are attached at the end of this plan.

Task Number	Radionuclide	DAC (μCi/ml)	Route(s) of Exposure	Major Radiation(s)	Energy(s) (MeV)	Half-Life

6.3.2 Radiological Hazard Control

Engineering/administrative controls and work practices shall be instituted to reduce and maintain employee exposures to a level at or below the permissible exposure/dose limits (see sections 4.2.3 and 6.3.1). Whenever engineering/administrative controls and work practices are not feasible or effective, any reasonable combination of engineering/administrative controls, work practices, and PPE shall be used to reduce and maintain employee exposures to a level at or below permissible exposure/dose limits.

Applicable Engineering/Administrative Control Measures: _____

PPE: See Section 7.

Table 6-1
CHEMICAL HAZARD EVALUATION

Task Number	Compound	Exposure Limits (TWA)			Dermal Hazard (Y/N)	Route(s) of Exposure ^b	Acute Symptoms	Odor Threshold/Description	FID/PID	
		OSHA PEL	NIOSH REL ^a	ACGIH TLV					Relative Response	Ionization Potential (eV)
1,2, 3	PAHs *	0.2 mg/m ³	0.1 mg/m ³	NA	Y	DA, IH, IN, SC	Irritation to skin, warts	Solid		
1,2, 3	Antimony	0.5 mg/m ³	0.5 mg/m ³	0.5 mg/m ³	Y	E, IH, IN, SC	Irritation to eyes, skin, nose, throat, mouth; cough, dizziness, headache, nausea, vomiting, diarrhea, stomach cramps, loss of sense of smell	Silver-white, lustrous solid		
1,2, 3	Arsenic	0.01 mg/m ³	0.002 mg/m ³	0.01 mg/m ³	Y	DA, E, IH, IN, SC	Ulceration of nasal septum, respiratory irritation, dermatitis, gastrointestinal disturbances, peripheral neuropathy, hyperpigmentation	Garlic odor		9.8152
1,2,3	Chromium	1 mg/m ³	0.5 mg/m ³	0.5 mg/m ³	Y	E, IH, IN, SC	Irritation to the eyes, skin; lung fibrosis (histologic)	Blue white/ steel gray odorless solid		
1,2, 3	Cobalt	0.1 mg/m ³	0.05 mg/m ³	0.1 mg/m ³	Y	E, IH, IN, SC	Cough, difficulty breathing, wheezing decreased pulmonary function, weight loss, dermatitis, asthma	Odorless silvery-gray/black solid		
1,2, 3	Mercury	0.1 mg/m ³	0.1 mg/m ³	0.1 mg/m ³	Y	DA, E, IH, IN, SC	Eye and skin irritation; coughing, chest pain, dyspnea, bronchitis, irritability, indecision, headache, lassitude, stomatitis, and salivation,			
1,2	Nickel	1 mg/m ³	0.015 mg/m ³	0.5 mg/m ³	Y	E, IH, IN, SC	Irritation to skin, nasal cavities, lungs, allergic asthma.	Odorless Solid		
1,2	Thallium	0.1 mg/m ³	0.1 mg/m ³	0.1 mg/m ³	Y	E, IH, IN, SC	Nausea, diarrhea, abdominal pain, vomiting, tremor, chest pain, convulsions, green tongue	Varies		
1,2	Zinc	5 mg/m ³	5 mg/m ³	5 mg/m ³	N	IH	Chills; aches; nausea; fever; cough; dry throat; headache; blurred vision; vomit; fatigue	Odorless Solid		

7. LEVEL OF PROTECTION AND PERSONAL PROTECTIVE EQUIPMENT

7.1 LEVEL OF PROTECTION

The following levels of protection (LOPs) have been selected for each work task based on an evaluation of the potential or known hazards, the routes of potential hazard, and the performance specifications of the PPE. On-site monitoring results and other information obtained from on-site activities will be used to modify these LOPs and the PPE, as necessary, to ensure sufficient personnel protection. The authorized LOP and PPE shall only be changed with the approval of the regional safety coordinator or designee. Level A is not included below because Level A activities, which are performed infrequently, will require special planning and addenda to this SHASP.

Task Number	B	C	D	Modifications Allowed
1		(X)	X	
2		(X)	X	
3		(X)	X	
4		(X)	X	
5		(X)	X	
6		(X)	X	

Note: Use "X" for initial levels of protection. Use "(X)" to indicate levels of protection that may be used as site conditions warrant.

7.2 PERSONAL PROTECTIVE EQUIPMENT

The PPE selected for each task is indicated below. E & E's PPE program complies with 29 CFR 1910.120 and 29 CFR 1910 Subpart I and is described in detail in the CHSP. Refer to 29 CFR 1910 for the minimum PPE required for each LOP.

PPE	1/D	2/D	3/D	4/D
Full-face APR	(X)	(X)	(X)	(X)
PAPR				
Cartridges:				
P100	(X)	(X)	(X)	(X)
GMC-P100				
GME-P100				
Other: Mersorb/Particulate combo cartridge	(X)	(X)	(X)	(X)
Positive-pressure, full-face SCBA				
Spare air tanks (Grade D air)				
Positive-pressure, full-face, supplied-air system				
Cascade system (Grade D air)				

PPE	1/D	2/D	3/D	4/D
Manifold system				
5-Minute escape mask				
Safety glasses	X	X	X	X
Monogoggles				
Coveralls/clothing	X	X	X	X
Protective clothing:				
Tyvek	(X)	(X)	(X)	(X)
Saranex				
Other:				
Splash apron				
Inner gloves:				
Cotton				
Nitrile	X	X	X	X
Latex				
Other:				
Outer gloves:				
Viton				
Rubber				
Neoprene				
Nitrile				
Other:				
Work gloves	X	X	X	X
Safety boots (as per ANSI Z41)	X	X	X	X
Neoprene safety boots (as per ANSI Z41)				
Boot covers (type: _____)	(X)	(X)	(X)	(X)
Hearing protection (type: _____)		X		
Hard hat		X		
Face shield				
Other:				
Other:				

8. HEALTH AND SAFETY MONITORING

Health and safety monitoring will be conducted to ensure proper selection of engineering/administrative controls, work practices, and/or PPE so that employees are not exposed to hazardous substances at levels that exceed permissible exposure/dose limits or published exposure levels. Health and safety monitoring will be conducted using the instruments, frequency, and action levels described in Table 8-1. Health and safety monitoring instruments shall have been appropriately calibrated and/or performance-checked prior to use.

9. DECONTAMINATION PROCEDURES

All equipment, materials, and personnel will be evaluated for contamination upon leaving the exclusion area. Equipment and materials will be decontaminated and/or disposed of, and personnel will be decontaminated, as necessary. Decontamination will be performed in the contamination reduction area or any designated area such that the exposure of uncontaminated employees, equipment, and materials will be minimized. Specific procedures are described below.

Equipment/Material Decontamination Procedures (specified by work plan): Where possible, dedicated sampling equipment will be used. Other non-dedicated sampling equipment will be decontaminated with a water/Alconox wash and then rinsed with distilled water. Subcontractors will use a heavy bristle broom or brush to knock soil particles from cars and equipment. A high pressure washer will be used to decontaminate Geoprobe tools and backhoe equipment that comes into contact with subsurface soil.

Ventilation: All decontamination procedures will be conducted in a well-ventilated area.

Personnel Decontamination Procedures: Remove and discard all disposable PPE, wipe down safety goggles and hard hats with alcohol free swabs, boot wash, and hand and face wash with warm soapy water prior to leaving site

PPE Requirements for Personnel Performing Decontamination: Level D

Personnel Decontamination in General: Following appropriate decontamination procedures, all field personnel will wash their hands and faces with soap and potable water. Personnel should shower at the end of each work shift.

Disposition of Disposable PPE: Disposable PPE must be rendered unusable and disposed as indicated in the work plan.

Disposition of Decontamination Wastes (e.g., dry wastes, decontamination fluids, etc.): Disposable PPE must be rendered unusable and disposed of as indicated in the work plan.

TABLE 8-1						
HEALTH AND SAFETY MONITORING						
Instrument	Task Number	Contaminant(s)	Monitoring Location	Monitoring Frequency	Action Levels ^a	
<input type="checkbox"/> PID (e.g., RAE mini RAE) <input type="checkbox"/> FID (e.g., OVA 128-) <input type="checkbox"/> TVA 1000					Unknown Vapors Background to 1 ppm above background: Level D 1 to 5 ppm above background: Level C 5 to 500 ppm above background: Level B >500 ppm above background: Level A	Contaminant-Specific
Oxygen Meter/Explosimeter					Oxygen <19.5% or >22.0%: Evacuate area; eliminate ignition sources; reassess conditions. 19.5 to 22.0%: Continue work in accordance with action levels for other instruments.	Explosivity ≤10% LEL: Continue work in accordance with action levels for other instruments; monitor continuously for combustible atmospheres. >10% LEL: Evacuate area; eliminate ignition sources; reassess conditions.
Radiation Alert Monitor (Rad-mini or RAM-4)					<0.1 mR/hr: Continue work in accordance with action levels for other instruments. ≥0.1 mR/hr: Evacuate area; reassess work plan, and contact radiation safety specialist.	
Mini-Ram Particulate Monitor	1-6	Arsenic Dust	With Field Teams	Continuous	General/Unknown Evaluate health and safety measures when dust levels exceed 2.5 milligrams per cubic meter.	Contaminant-Specific Arsenic = 0.28 mg/m ³ in areas with enriched concentrations-tailings impoundments. 0.625 mg/m ³ in other site areas.
HCN/H ₂ S (Monitox)					_4 ppm: Leave area and consult with SSO.	
Draeger Colorimetric Tubes					Tube	Action Level Action
Air Monitor/Sampler Type: _____ Sampling medium: _____					Action Level	Action

>

TABLE 8-1
HEALTH AND SAFETY MONITORING

Instrument	Task Number	Contaminant(s)	Monitoring Location	Monitoring Frequency	Action Levels^a
Personal Sampling Pump Type: _____ Sampling medium: _____					Action Level Action
Micro R Meter					<2 mR/hr: Continue work in accordance with action levels for other instruments. 2 to 5 mR/hr: In conjunction with a radiation safety specialist, continue work and perform stay-time calculations to ensure compliance with dose limits and ALARA policy. >5 mR/hr: Evacuate area to reassess work plan, and evaluate options to maintain personnel exposures ALARA and within dose limits.
Ion Chamber					See micro R meter action levels above.
Radiation Survey Ratemeter/Scaler with External Detector(s)					Detector Action Level Action
Noise Dosimeter (Sound Level Meter)					_85 decibels as measured, using the A-weighted network (dBA): Use hearing protection if exposure will be sustained throughout work shift. >85 dBA: Use hearing protection. >120 dBA: Leave area and consult with safety personnel.
Other: Lumex or Jerome Mercury Meter	1-6		Work Zones	Continuous	Action level: Any instantaneous (not TWA) reading at or above 0.05 mg/m ³ requires upgrade to level C.

^a Unless stated otherwise, airborne contaminant concentrations are measured as a time-weighted average in the worker's breathing zone. Acceptable concentrations for known airborne contaminants will be determined based on OSHA/NIOSH/ACGIH and/or NRC exposure limits. As a guideline, 1/2 the PEL/REL/TLV, whichever is lowest, should be used.

10. EMERGENCY RESPONSE

This section contains additional information pertaining to on-site emergency response and does not duplicate pertinent emergency response information contained in earlier sections of this plan (e.g., site layout, monitoring equipment, etc.). Emergency response procedures will be rehearsed regularly, as applicable, during project activities.

10.1 EMERGENCY RESPONSIBILITIES

All Personnel: All personnel shall be alert to the possibility of an on-site emergency; report potential or actual emergency situations

to the team leader and SSO; and notify appropriate emergency resources, as necessary.

Team Leader: The team leader will determine the emergency actions to be performed by E & E personnel and will direct these actions. The team leader will also ensure that applicable incidents are reported to appropriate E & E and client project personnel and government agencies.

SSO: The SSO will recommend health/safety and protective measures appropriate to the emergency.

Other: kunsanga

10.2 LOCAL AND SITE RESOURCES (including phone numbers)

Ambulance: Request emergency air transportation from Vanderpol's Flying Service, Red Devil AK to hospital or clinic.

Hospital: Clara Morgan Sub-regional Clinic. 269 Morgan's Road, Aniak, AK. 907-675-4556
Also, Providence Alaska Medical Center. 3200 Providence Dr., Anchorage AK. 907-562-2211

Directions to Hospital (map attached at the end of this plan): See attached maps at end of plan.

Poison Control: (907) 261-3193 (Anchorage)

Police Department: N/A

Fire Department: N/A

Client Contact: Paul Krabacher, BLM Project Manager: (907) 271-3266; Larry Beck, BLM COR: (907) 267-1226

Site Contact: N/A

On-Site Telephone Number: None. In case of emergency, E&E personnel will use telephone at Red Devil Lodge to call for help.

Cellular Telephone Number: No cell service available on site.

Radios Available: Two Motorola hand-held radios for on-site communication

Other: Red Devil Lodge 907-447-3225, only means of communication in Red Devil, AK

10.3 E & E EMERGENCY CONTACTS

E & E Emergency Operations Center (24 Hours): 716/684-8060

Corporate Health and Safety Director: Dr. Paul Jonmaire 716/684-8060 (office) 716/655-1260 (home)

Assistant Corporate Safety Director: Tom Siener, CIH: 716/684-8060 (office) 716/662-4740 (home)

Regional Office Contact:

Len Marcus

907-257-5000 (office)

907-276-1608 (home)

10.4 OTHER EMERGENCY RESPONSE PROCEDURES

On-Site Evacuation Signal/Alarm (must be audible and perceptible above ambient noise and light levels): Rapid Whistle
Blasts

On-Site Assembly Area: TBD in field

Emergency Egress Route to get off site: TBD in field

Off-Site Assembly Area: TBD in field

Preferred Means of Reporting Emergencies: Use Red Devil Lodge telephone to request Vanderpol Flying Service for transportation to
Aniak if necessary, then contact Bill Richards, then contact Paul Jonmaire, then contact client.

Site Security and Control: In an emergency situation, personnel will attempt to secure the affected area and control site access.

Spill Control Procedures: N/A

Emergency Decontamination Procedures: Douse with copious amounts of water. Remove contaminated clothing and/or PPE

PPE: Personnel will don appropriate PPE when responding to an emergency situation. The SSO and Section 7 of this plan will
provide guidance regarding appropriate PPE.

Emergency Equipment: Appropriate emergency equipment is listed in Attachment 1. Adequate supplies of this equipment
shall be maintained in the support area or other approved work location.

Incident Reporting Procedures: Notify appropriate local emergency services, notify E & E Regional Health and Safety Officer (Len
Marcus), notify E & E Corporate Health and Safety Office (Paul Jonmaire).

ATTACHMENT A
SITE-SPECIFIC HEALTH AND SAFETY PLAN ACCEPTANCE

ATTACHMENT B
EXISTING SITE SAFETY PLAN ADDENDUM FORM

ecology and environment, inc.
EXISTING SITE SAFETY PLAN ADDENDUM FORM

Site Name:			
Date of original SSP:			
Date of amendment:			
Date of proposed new work:			
Added activities and hazard evaluations:			
Added monitoring activities:			
Level of protection: 9A 9B 9C 9D			
Reason for up/downgrading:			
PPE:			
Decon:			
Team Members		Responsibility	
Equipment	Quantity	Equipment	Quantity
The terms of the original SSP shall be in effect except as noted on this form.			
Prepared by:		Date:	
Reviewed by:		Date:	

ATTACHMENT C
EQUIPMENT/SUPPLIES CHECKLIST

ecology and environment, inc. EQUIPMENT/SUPPLIES CHECKLIST			
Instrumentation	No.	Emergency Equipment	No.
TVA 1000 (Probe: eV)	1	First Aid Kit	1
MiniRAE (Probe: eV)		Stretcher	
OVA		Portable Eye Wash	
HNu (Probe: eV)		Blood Pressure Monitor	
Thermal Desorber		Fire Blanket	
O ₂ /Explosimeter with Calibration Kit		Fire Extinguisher	2
Photovac Tip		Thermometer (Medical)	
Magnetometer		Spill Kit	
Pipe Locator			
Weather Station		Decontamination Equipment	
Draeger Tube Kit (Tubes:)		Wash Tubs	2
Brunton Compass		Buckets	2
Real-Time Cyanide Monitor		Scrub Brushes	4
Real-Time H ₂ S Monitor		Pressurized Sprayer	1
Heat Stress Monitor		Spray Bottle	2
Noise Equipment		Detergent (Type: TRISODIUM PHOSPHATE)	1
Personal Sampling Pumps and Supplies		Solvent (Type: DENATURED ALCOHOL)	1
Mini Ram Dust Monitor		Plastic Sheeting	
Mercury Monitor		Tarps and Poles	
Spare batteries (Type:)		Trash Bags	X
		Trash Cans	
Radiation Equipment/Supplies		Masking Tape	
Documentation Forms		Duct Tape	X
Portable Ratemeter		Paper Towels	X
Scaler/Ratemeter		Face Mask	
1" NaI Gamma Probe		Face Mask Sanitizer	
2" NaI Gamma Probe		Step Ladders	
ZnS Alpha Probe		Distilled Water	X
GM Pancake Probe		Deionized Water	
Tungsten-Shielded GM Probe			
Micro R Meter		Miscellaneous	
Ion Chamber		Pump	
Alert Monitor		Surveyor's Tape	
Pocket Dosimeter		100' Fiberglass Tape	
Dosimeter Charger		300' Nylon Rope	
Radiation Warning Tape		Nylon String	
Radiation Decontamination Supplies		Surveying Flags	
Spare Batteries (Type:)		Camera	2
		Film	
Sampling Equipment		Bung Wrench	
8-oz Bottles	X	Soil Auger	
Half-Gallon Bottles		Pick	
VOA Bottles		Shovel	X
String		Catalytic Heater	
Hand Bailers		Propane Gas	
Thieving Rods with Bulbs		Banner Tape	
Spoons	X	Surveying Meter Stick	
Knives		Chaining Pins and Ring	
Filter Paper		Logbooks (Large, Small)	
Bottle Labels	X	Required MSDSs	
		Intrinsically Safe Flashlight	

ecology and environment, inc. EQUIPMENT/SUPPLIES CHECKLIST			
Instrumentation	No.	Emergency Equipment	No.
Shipping Equipment		Potable Water	
Coolers	X	Gatorade or Equivalent	
Paint Cans with Lids, Seven Clips Each		Tables	
Vermiculite		Chairs	
Shipping Labels		Weather Radio	
DOT Labels:		Two-Way Radios	
“Up”		Binoculars	1
“Danger”		Megaphone	
“Inside Container Complies...”		Cooling Vest	
“Hazard Group”			
Strapping Tape	X		
Baggies	X		
Custody Seals	X		
Chain-of-Custody Forms	X		
FedEx Forms	X		
Clear Packing Tape	X		
Permanent Markers	X		

ATTACHMENT D
DAILY SAFETY MEETING RECORD

ecology and environment, inc.
DAILY SAFETY MEETING RECORD

General Information

Project: Red Devil Mine RI/FS

Project No: 001096.OX70

Project Location: Red Devil Mine, Alaska

Date:

Time:

Weather:

Specific Location:

Planned Activities:

Safety Topics Presented

Chemical Hazards Update:

Physical Hazards Update:

Radiation Hazards Update:

Review of Previous Monitoring Results:

Protective Clothing/Equipment Modifications:

Special Equipment/Procedures:

Drilling Safety Issues (including testing the operation of drill rig emergency stop switches):

Emergency Procedures:

Additional Topics/Observations:

Team Members' Comments/Suggestions:

ecology and environment, inc.
DAILY SAFETY MEETING RECORD

Initial Project Safety Checklist

1. Emergency information reviewed? ___ and made familiar to all team members?
2. Route to nearest hospital driven? ___ and its location known to all team members?
3. Health and safety plan readily available and its location known to all team members?
4. E & E drilling SOP on site? ___ and available for team member review?

ATTENDEES

Meeting shall be attended by all personnel who will be working within the exclusion area. Daily informal update meetings will be held prior to work and when site tasks and/or conditions change.

Name (Printed)	Name (Signature)	Date	Representing (Company/Agency)
Meeting Conducted By:			

ATTACHMENT E
INNOV-X XRF FIELD SCREENING PROTOCOL

**REGION 10
SUPERFUND TECHNICAL ASSESSMENT AND RESPONSE TEAM
(START-3)**

**STANDARD OPERATING PROCEDURE
FOR
INNOV-X
X-RAY FLUORESCENCE
FIELD SCREENING**

January 2007

Prepared by

Region 10 START-3
Ecology and Environment, Inc.
Seattle, Washington

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1.0 INTRODUCTION

X-ray fluorescence (XRF) has proven itself to be a cost-effective and time-saving technique for metals screening and analysis on environmental sites. The Removal Program within Superfund has especially benefited from XRF because of its ability to provide immediate information on contaminants, and its low per-unit cost of analysis. Contaminant assessment error is reduced by increasing sampling density rather than increasing the precision of the analytical method. One of the greatest advantages to XRF field screening is its ability to direct on-going removal activities, which reduces costly manpower/equipment down-time and more accurately defines the area of contamination.

This document outlines recommended and required procedures and equipment for representative collection and/or analysis of samples for XRF field screening.

For further information on the instrument, instrument procedures, instrument maintenance, and instrument trouble shooting please refer to the instrument manual or the manufacturer's website at www.innov-xsystems.com.

2.0 METHOD SUMMARY

The analytical method referenced by this SOW is EPA SW-846 Method 6200, A Field Portable X-Ray Fluorescence Spectrometry for the Determination of Elemental Concentrations in Soil and Sediment. The Sampling Plan/ Quality Assurance Project Plan should address the site-specific data quality objectives.

XRF field screening situations vary widely and therefore no universal analytical procedure can be recommended. Likewise, XRF instruments vary in technology and capability. The Sampling Plan/ Quality Assurance Project Plan should address these variables based on site characteristics and required data quality objectives.

The Innov-X XRF is a fundamental parameters instrument. This fundamental parameters instrument is factory calibrated. Before use, the instrument should undergo a self-calibration and the instrument precision and accuracy should be checked with samples of known concentrations (NIST certified). Following calibration or optimization, the sample is collected and prepared. Sample preparation of in-situ analysis may only consist of removing surface debris and placing the probe on the surface to be analyzed. However, if more precision is required to address the site data quality objectives, samples may need to be sieved, dried, crushed, and placed into x-ray cells prior to analysis.

Samples are then analyzed by exposing the matrix to the selected source for no less than 30 seconds. The instrument displays the concentration of the selected elements in the units in which they were calibrated. Depending on the application and data quality objectives, a variety of quality assurance measures are taken to ensure data validity. Additionally, a portion of the samples are sent to a laboratory or analyzed by a second fundamental parameters instrument for confirmation of results.

3.0 INSTRUMENT CALIBRATION

3.1 Site-Specific Empirical Calibration

The following instrument calibration criteria apply to non-fundamental parameters instruments incorporating empirical calibrations. The instrument should be calibrated according to vendor specifications, and the following considerations.

- Pure elements should be re-analyzed prior to each calibration.
- A minimum of 10 site-specific samples must be used for the calibration.
- The sample concentrations of site-specific samples used for the calibration should range the concentrations of interest. Several samples from the calibration suite should be at or near the decisive action level.
- The gain channel should be monitored and recorded during the initial calibration.

- Field in-situ analysis time versus the measurement time used during initial calibration is not considered critical and may vary depending on the application.
- A minimum r^2 value of 0.70 is required for an acceptable initial calibration. No criteria are established for deleting points from the initial calibration. The benefit of maximizing the r^2 value versus the detriment of reducing calibration population and eliminating some potential real matrix effects must be weighed.

3.2 Fundamental Parameters Performance Check

The performance of a fundamental parameters software-driven instrument will be monitored by analyzing a National Institute of Standards and Technology (NIST) primary standard. Available standards include Standard Reference Material (SRM) 2709, 2710, and 2711 (low, medium, and high concentration metal concentrations in environmental samples matrix). SRMs of similar concentrations to the samples will be analyzed prior to analysis, and during sample analysis at a frequency of at least every ten samples. Acceptable results will be within + 20% of the certified values.

A site-specific sample characterized to at least 99.5% elemental constituency by a high-resolution (less than 100 KeV Mn K α) fundamental parameters instrument is an acceptable substitute for NIST SRMs, provided that the concentrations of the analytes of interest are near the area of interest, or action level.

4.0 SAMPLE PREPARATION

Because of the impromptu and diverse nature of work performed by the Removal Program, every effort has been made to preserve the project manager's freedom to vary the degree of sample preparation to meet particular site specific data quality objectives or time/budget constraints. It should be noted that XRF field screening results can be dramatically improved if samples are dried, sieved, and crushed prior to analysis. No matter the degree of sample preparation, the samples from the site should be analyzed in the same manner as the samples analyzed during the empirical calibration.

4.1 Mandatory Sample Preparation Measures:

- Interfering surface debris will be removed for in-situ XRF measurements.
- A minimum measurement time of 30 seconds will be used.
- A single thickness plastic bag should be used as a protective layer between probe and sample for in-situ measurements. Instrument calibration should be performed with the same material between the sample and probe.
- Samples used for confirmation will be collected and homogenized as a minimum prior to XRF and laboratory analysis.

4.2 Optional Sample Preparation Measures:

- A minimum of three measurements should be taken and averaged for every grid point or measurement node to minimize error caused by microheterogeneity (nugget effect).
- Microwave drying of samples is acceptable (excluding mercury analysis).
- Sample preparation with a 10-mesh sieve will provide more precise results, but is left to the discretion of the analyst. Sieving samples must be consistent with the calibration.
- The prepared portion of the sample analyzed by XRF should be sent for laboratory confirmation to reduce the effects of microheterogeneity.

5.0 QUALITY ASSURANCE

5.1 Quality Assurance Requirements (EPA 540-R-93-071, Data Quality Objective Process for Superfund)

Screening Data (Definitive Data Without Error and Bias Determination) objectives are met by XRF

analysis if either fundamental parameters modeling is used, or if the K α and K β peak, or the L α and L β peaks are positively identified for the element in question. Ten percent of the samples must be sent for independent laboratory confirmation to meet Definitive Data criteria. On larger sites, once calibration confirmation has been established, the number of samples sent for confirmation may taper off to 5%.

Definitive Data criteria are met if in addition to meeting the Definitive Data objectives, error analysis is determined per matrix by analyzing 8 samples in replicate, and variance is calculated.

5.2 PARCC Parameter Criteria

- **Precision** will be established by measuring an action-level concentration standard and a low concentration standard at a frequency of 10% of all field measurements. An acceptable level of $\pm 20\%$ Relative Percent Difference (RPD) from the XRF value after initial calibration (not laboratory assay value) was established. If this control limit is exceeded, all samples from the last acceptable measurement must be reanalyzed. The low concentration sample would be used to establish the detection limit and the analytical quantitation limit as defined by 3 times the standard deviation of this measurement.
- **Accuracy** will initially be established by sending high, medium and low concentration field samples for verification analysis. Following this initial accuracy check, calibration accuracy will be monitored by sending 10% of the project samples for laboratory confirmation.
- **Representativeness** will heavily depend on project-specific data quality objectives and will not be monitored directly. It should be noted in the project-specific quality assurance plan that representativeness can be increased by reducing the geostatistical error associated with sample point density.
- **Comparable** data will be generated if the continuing calibration results are within $\pm 20\%$ RPD. It is critical to note that XRF results will be comparable to the method used in assaying the initial calibration samples. For most purposes, samples will be analyzed by atomic absorption spectroscopy or inductively coupled plasma emission spectroscopy following the EPA 3050 nitric acid/peroxide digestion, and the results by XRF are more representative of the digestion procedure than the actual analytical method.
- **Completeness** will be established by a simple percentage of the number of measurements taken compared to the number of measurements planned.

5.3 Replicate Sample Analysis

Eight replicates of one sample are to be collected and analyzed whenever error determination is required. No duplicate sample analysis (2 replicates) is required.

5.4 Performance Evaluation Samples

Performance Evaluation (PE) sample analysis is appropriate for fundamental parameter instrumentation. However, because empirical calibration models are highly matrix dependent, PE sample analysis is not suggested.

6.0 DATA VALIDATION

Throughout sample analysis, a mid-range or action level concentration standard will be analyzed at a frequency of 10%. This analysis will serve as a continuing calibration check and results must be within $\pm 20\%$ of the true sample value, as determined by the appropriate EPA CLP-style analysis. If sample results from this analysis lie outside the $\pm 20\%$ control limit, all samples from the last successful continuing calibration check must be re-analyzed following adjustment of the appropriate instrument parameters.

In addition, a low concentration standard will be analyzed at the same frequency. From the standard deviation of this measurement, the detection limit and analytical quantitation limit will be calculated as defined by 3 times the standard deviation of this low concentration standard.

Following the field project, a follow-up data summary report will be written evaluating XRF conformance to standard operating procedures and appropriate quality control criteria. Additionally, from laboratory confirmation analyses and XRF results, a correlation coefficient will be calculated. Data sets above the upper calibration range may be eliminated due to model bias (heteroscedasticity), unless an even distribution is apparent. Data pairs below XRF and analytical detection limit will be left to the discretion of the reviewer. A correlation coefficient of 0.70 or greater must be obtained for data to be considered acceptable.

7.0 HEALTH AND SAFETY

All field-portable XRF units either incorporate radioactive sources, or X-ray tubes. All site-specific health and safety precautions as outlined in the site safety plan must be adhered to when performing XRF field screening analyses.

In addition to site chemical hazards is the consideration of radiological activity of the source(s). A current wipe test certification should accompany the instrument, dated no more than 6 months from the current date. A real-time monitoring instrument should be used periodically to monitor the instrument with the shutter closed to ensure adequate shielding. Site personnel will not be allowed to operate XRF instrumentation unless they are equipped with a dosimetry monitoring device (e.g., TLD badge, pocket dosimeter).

Prior to the removal of the instrument from the hot zone, or from the site, the instrument should be thoroughly decontaminated with a mild solution of soap and water.

8.0 POTENTIAL SOURCES OF ERROR

The following are recognized sources of error when using XRF for field screening applications. Some sources of error are unavoidable, or may cause error within acceptable limits as established by the data quality objectives. Although they will not be discussed in detail, the user should be aware of these error sources.

- Sample matrix causes the greatest potential for error during analysis, especially with instruments with high pressure gas proportional detectors (resolution greater than 800 eV). Causes of error include factors such as chemical, geomorphology, surface texture, particle size, density (average Z number), microheterogeneity, and moisture content.
- High energy sources and radio frequency generators may cause software and detector interferences. Interfering sources may include site radios and video monitors.
- Certain unavoidable site characteristics are inherent for error in XRF analysis such as particle size, temperature, humidity, and geomorphology.
- Chemical interferences may lead to increased error especially with proportional gas detectors. More common chemical interference may include Pb and As, Fe with Cr and Ni, Pb with Bi and Rb.
- Instrumental factors may lead to error such as battery loss, gain control, drift, and temperature fluctuations.

ATTACHMENT F
HAZARD EVALUATION SHEETS FOR MAJOR KNOWN CONTAMINANTS

[CDC Home](#)[CDC Search](#)[CDC Health Topics A-Z](#)

[Search NIOSH](#) | [NIOSH Home](#) | [NIOSH Topics](#) | [Site Index](#) | [Databases and Information Resources](#) | [NIOSH Products](#) | [Contact Us](#)

NIOSH Publication 2005-149

September
2005

NIOSH Pocket Guide to Chemical Hazards

[NPG Home](#) | [Introduction](#) | [Synonyms & Trade Names](#) | [Chemical Names](#) | [CAS Numbers](#) | [RTECS Numbers](#) | [Appendices](#) | [Search](#)

	CAS
Antimony	7440-36-0
	RTECS
Sb	CC4025000
	DOT ID & Guide
Synonyms & Trade Names	1549 157 (inorganic compounds, n.o.s.) 2871 170 (powder) 3141 157 (inorganic liquid compounds, n.o.s.)
Antimony metal, Antimony powder, Stibium	

Exposure Limits NIOSH REL*: TWA 0.5 mg/m³ [*Note: The REL also applies to other antimony compounds (as Sb).]

OSHA PEL*: TWA 0.5 mg/m³ [*Note: The PEL also applies to other antimony compounds (as Sb).]

IDLH

Conversion

50 mg/m³ (as Sb) See: [7440360](#)

Physical Description

Silver-white, lustrous, hard, brittle solid; scale-like crystals; or a dark-gray, lustrous powder.

MW: 121.8

BP: 2975°F

MLT: 1166°F

Sol: Insoluble

VP: 0 mmHg (approx) IP: NA

Sp.Gr: 6.69

Fl.P: NA

UEL: NA

LEL: NA

Noncombustible Solid in bulk form, but a moderate explosion hazard in the form of dust when exposed to flame.

Incompatibilities & Reactivities

Strong oxidizers, acids, halogenated acids [Note: Stibine is formed when antimony is exposed to nascent (freshly formed) hydrogen.]

Measurement Methods

NIOSH [7301](#), [7303](#), [P&CAM261 \(II-4\)](#); OSHA [ID121](#), [ID125G](#), [ID206](#)

See: [NMAM](#) or [OSHA Methods](#)

Personal Protection & Sanitation

([See protection codes](#))

Skin: Prevent skin contact

Eyes: Prevent eye contact

Wash skin: When contaminated

Remove: When wet or contaminated

Change: Daily

First Aid

([See procedures](#))

Eye: Irrigate immediately

Skin: Soap wash immediately

Breathing: Respiratory support

Swallow: Medical attention immediately

Respirator Recommendations

NIOSH/OSHA

Up to 5 mg/m³:

(APF = 10) Any particulate respirator equipped with an N95, R95, or P95 filter (including N95, R95, and P95 filtering facepieces) except quarter-mask respirators. The following filters may also be used: N99, R99, P99, N100, R100, P100. [Click here](#) for information on selection of N, R, or P filters.

(APF = 10) Any supplied-air respirator

Up to 12.5 mg/m³:

(APF = 25) Any supplied-air respirator operated in a continuous-flow mode

(APF = 25) Any powered air-purifying respirator with a high-efficiency particulate filter.

Up to 25 mg/m³:

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter. [Click here](#) for information on selection of N, R, or P filters.

(APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode

(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter

(APF = 50) Any self-contained breathing apparatus with a full facepiece

(APF = 50) Any supplied-air respirator with a full facepiece

Up to 50 mg/m³:

(APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode

Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter. [Click here](#) for information on selection of N, R, or P filters./Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection](#)

Exposure Routes

inhalation, ingestion, skin and/or eye contact

Symptoms

Irritation eyes, skin, nose, throat, mouth; cough; dizziness; headache; nausea, vomiting, diarrhea; stomach cramps; insomnia; anorexia; unable to smell properly

Target Organs

Eyes, skin, respiratory system, cardiovascular system

See also: [INTRODUCTION](#) See ICSC CARD: [0775](#) See MEDICAL TESTS: [0016](#)

Arsenic (inorganic compounds, as As)		CAS	
		7440-38-2 (metal)	
As (metal)		RTECS	
		CG0525000 (metal)	
Synonyms & Trade Names		DOT ID & Guide	
Arsenic metal: Arsenia Other synonyms vary depending upon the specific As compound. [Note: OSHA considers "Inorganic Arsenic" to mean copper acetoarsenite & all inorganic compounds containing arsenic except ARSINE.]		1558 152 (metal) 1562 152 (dust)	
Exposure Limits		NIOSH REL: Ca C 0.002 mg/m ³ [15-minute] See Appendix A OSHA PEL: [1910.1018] TWA 0.010 mg/m ³	
IDLH		Conversion	
Ca [5 mg/m ³ (as As)] See: 7440382			
Physical Description			
Metal: Silver-gray or tin-white, brittle, odorless solid.			
MW: 74.9	BP: Sublimes	MLT: 1135°F (Sublimes)	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 5.73 (metal)
Fl.P: NA	UEL: NA	LEL: NA	
Metal: Noncombustible Solid in bulk form, but a slight explosion hazard in the form of dust when exposed to flame.			
Incompatibilities & Reactivities			
Strong oxidizers, bromine azide [Note: Hydrogen gas can react with inorganic arsenic to form the highly toxic gas arsine.]			
Measurement Methods			
NIOSH 7300 , 7301 , 7303 , 7900 , 9102 ; OSHA ID105 See: NMAM or OSHA Methods			
Personal Protection & Sanitation		First Aid	
(See protection) Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated/Daily Remove: When wet or contaminated Change: Daily Provide: Eyewash, Quick drench		(See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	

Respirator Recommendations

([See Appendix E](#)) NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted acid gas canister having an N100, R100, or P100 filter. [Click here](#) for information on selection of N, R, or P filters./Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection](#)

Exposure Routes

inhalation, skin absorption, skin and/or eye contact ingestion

Symptoms

Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, respiratory irritation, hyperpigmentation of skin, [potential occupational carcinogen]

Target Organs

Liver, kidneys, skin, lungs, lymphatic system

Cancer Site

[lung & lymphatic cancer]

Chromium metal		CAS	
		7440-47-3	
Cr		RTECS	
		GB4200000	
Synonyms & Trade Names		DOT ID & Guide	
Chrome, Chromium			
Exposure Limits	NIOSH REL: TWA 0.5 mg/m ³ See Appendix C		
	OSHA PEL*: TWA 1 mg/m ³ See Appendix C [*Note: The PEL also applies to insoluble chromium salts.]		
IDLH		Conversion	
250 mg/m ³ (as Cr) See: 7440473			
Physical Description			
Blue-white to steel-gray, lustrous, brittle, hard, odorless solid.			
MW: 52.0	BP: 4788°F	MLT: 3452°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 7.14
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid in bulk form, but finely divided dust burns rapidly if heated in a flame.			
Incompatibilities & Reactivities			
Strong oxidizers (such as hydrogen peroxide), alkalis			
Measurement Methods			
NIOSH 7024 , 7300 , 7301 , 7303 , 9102 ; OSHA ID121 , ID125G See: NMAM or OSHA Methods			
Personal Protection & Sanitation		First Aid	
(See protection) Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		(See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	

Respirator Recommendations

NIOSH

Up to 2.5 mg/m³:

(APF = 5) Any quarter-mask respirator. [Click here](#) for information on selection of N, R, or P filters.*

Up to 5 mg/m³:

(APF = 10) Any particulate respirator equipped with an N95, R95, or P95 filter (including N95, R95, and P95 filtering facepieces) except quarter-mask respirators. The following filters may also be used: N99, R99, P99, N100, R100, P100. [Click here](#) for information on selection of N, R, or P filters.*

(APF = 10) Any supplied-air respirator*

Up to 12.5 mg/m³:

(APF = 25) Any supplied-air respirator operated in a continuous-flow mode*

(APF = 25) Any powered air-purifying respirator with a high-efficiency particulate filter.*

Up to 25 mg/m³:

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter. [Click here](#) for information on selection of N, R, or P filters.

(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter*

(APF = 50) Any self-contained breathing apparatus with a full facepiece

(APF = 50) Any supplied-air respirator with a full facepiece

Up to 250 mg/m³:

(APF = 2000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter. [Click here](#) for information on selection of N, R, or P filters./Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection](#)

Exposure Routes

inhalation, ingestion, skin and/or eye contact

Symptoms

Irritation eyes, skin; lung fibrosis (histologic)

Target Organs

Eyes, skin, respiratory system

See also: [INTRODUCTION](#) See ICSC CARD: [0029](#) See MEDICAL TESTS: [0052](#)

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Cobalt metal dust and fume (as Co)	CAS
	7440-48-4
Co	RTECS
	GF8750000
Synonyms & Trade Names	
	DOT ID & Guide
Cobalt metal dust, Cobalt metal fume	

Exposure NIOSH REL: TWA 0.05 mg/m³**Limits** OSHA PEL†: TWA 0.1 mg/m³**IDLH**

Conversion

20 mg/m³ (as Co) See: [7440484](#)

Physical Description

Odorless, silver-gray to black solid.

MW: 58.9

BP: 5612°F

MLT: 2719°F

Sol: Insoluble

VP: 0 mmHg (approx) IP: NA

Sp.Gr: 8.92

Fl.P: NA

UEL: NA

LEL: NA

Noncombustible Solid in bulk form, but finely divided dust will burn at high temperatures.

Incompatibilities & Reactivities

Strong oxidizers, ammonium nitrate

Measurement Methods

NIOSH [7027](#), [7300](#), [7301](#), [7303](#), [9102](#); OSHA [ID121](#), [ID125G](#), [ID213](#)See: [NMAM](#) or [OSHA Methods](#)

Personal Protection & Sanitation

First Aid

([See protection codes](#))

Skin: Prevent skin contact

Eyes: No recommendation

Wash skin: When contaminated

Remove: When wet or contaminated

Change: Daily

([See procedures](#))

Eye: Irrigate immediately

Skin: Soap wash

Breathing: Respiratory support

Swallow: Medical attention immediately

Respirator Recommendations

NIOSH

Up to 0.25 mg/m³:

(APF = 5) Any quarter-mask respirator. [Click here](#) for information on selection of N, R, or P filters.

Up to 0.5 mg/m³:

(APF = 10) Any particulate respirator equipped with an N95, R95, or P95 filter (including N95, R95, and P95 filtering facepieces) except quarter-mask respirators. The following filters may also be used: N99, R99, P99, N100, R100, P100. [Click here](#) for information on selection of N, R, or P filters.*

(APF = 10) Any particulate respirator equipped with an N95, R95, or P95 filter (including N95, R95, and P95 filtering facepieces) except quarter-mask respirators. The following filters may also be used: N99, R99, P99, N100, R100, P100. [Click here](#) for information on selection of N, R, or P filters.*

(APF = 10) Any supplied-air respirator*

Up to 1.25 mg/m³:

(APF = 25) Any supplied-air respirator operated in a continuous-flow mode*

(APF = 25) Any powered air-purifying respirator with a high-efficiency particulate filter.*

(APF = 25) Any powered air-purifying respirator with a high-efficiency particulate filter.*

Up to 2.5 mg/m³:

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter. [Click here](#) for information on selection of N, R, or P filters.

(APF = 50) Any self-contained breathing apparatus with a full facepiece

(APF = 50) Any supplied-air respirator with a full facepiece

Up to 20 mg/m³:

(APF = 2000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter. [Click here](#) for information on selection of N, R, or P filters./Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection](#)

Exposure Routes

inhalation, ingestion, skin and/or eye contact

Symptoms

Cough, dyspnea (breathing difficulty), wheezing, decreased pulmonary function; weight loss; dermatitis; diffuse nodular fibrosis; respiratory hypersensitivity, asthma

Target Organs

Skin, respiratory system

See also: [INTRODUCTION](#) See ICSC CARD: [0782](#) See MEDICAL TESTS: [0055](#)

Mercury compounds [except (organo) alkyls] (as Hg)		CAS 7439-97-6 (metal)
Hg (metal)		RTECS OV4550000 (metal)
Synonyms & Trade Names Mercury metal: Colloidal mercury, Metallic mercury, Quicksilver Synonyms of "other" Hg compounds vary depending upon the specific compound.		DOT ID & Guide 2809 172 (metal)
Exposure Limits	NIOSH REL: Hg Vapor: TWA 0.05 mg/m ³ [skin] Other: C 0.1 mg/m ³ [skin]	
	OSHA PEL†: C 0.1 mg/m ³	
IDLH 10 mg/m ³ (as Hg) See: 7439976		Conversion
Physical Description Metal: Silver-white, heavy, odorless liquid. [Note: "Other" Hg compounds include all inorganic & aryl Hg compounds except (organo) alkyls.]		
MW: 200.6	BP: 674°F	FRZ: -38°F
VP: 0.0012 mmHg	IP: ?	Sp.Gr: 13.6 (metal)
Fl.P: NA	UEL: NA	LEL: NA
Metal: Noncombustible Liquid		
Incompatibilities & Reactivities Acetylene, ammonia, chlorine dioxide, azides, calcium (amalgam formation), sodium carbide, lithium, rubidium, copper		
Measurement Methods NIOSH 6009 ; OSHA ID140 See: NMAM or OSHA Methods		
Personal Protection & Sanitation (See protection) Skin: Prevent skin contact Eyes: No recommendation Wash skin: When contaminated Remove: When wet or contaminated Change: Daily		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately

Respirator Recommendations

Mercury vapor: NIOSH

Up to 0.5 mg/m³:

(APF = 10) Any chemical cartridge respirator with cartridge(s) providing protection against the compound of concern†

(APF = 10) Any supplied-air respirator

Up to 1.25 mg/m³:

(APF = 25) Any supplied-air respirator operated in a continuous-flow mode

(APF = 25) Any powered, air-purifying respirator with cartridge(s) providing protection against the compound of concern†(canister)

Up to 2.5 mg/m³:

(APF = 50) Any chemical cartridge respirator with a full facepiece and cartridge(s) providing protection against the compound of concern†

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern†

(APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode/PAPRTS(canister)

(APF = 50) Any self-contained breathing apparatus with a full facepiece

(APF = 50) Any supplied-air respirator with a full facepiece

Up to 10 mg/m³:

(APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode

Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern/Any appropriate escape-type, self-contained breathing apparatus

Other mercury compounds: NIOSH/OSHA

Up to 1 mg/m³:

(APF = 10) Any chemical cartridge respirator with cartridge(s) providing protection against the compound of concern†

(APF = 10) Any supplied-air respirator

Up to 2.5 mg/m³:

(APF = 25) Any supplied-air respirator operated in a continuous-flow mode

(APF = 25) Any powered, air-purifying respirator with cartridge(s) providing protection against the compound of concern†(canister)

Up to 5 mg/m³:

(APF = 50) Any chemical cartridge respirator with a full facepiece and cartridge(s) providing protection against the compound of concern†

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern†

(APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode/PAPRTS(canister)

(APF = 50) Any self-contained breathing apparatus with a full facepiece

(APF = 50) Any supplied-air respirator with a full facepiece

Up to 10 mg/m³:

(APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode

Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern/Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection](#)

Exposure Routes

inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms

Irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria

Target Organs

Eyes, skin, respiratory system, central nervous system, kidneys

See also: [INTRODUCTION](#) See ICSC CARD: [0056](#) See MEDICAL TESTS: [0136](#)

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Nickel metal and other compounds (as Ni)

CAS

7440-02-0 (Metal)

Ni (Metal)

RTECS

[QR5950000](#) (Metal)

Synonyms & Trade Names

DOT ID & Guide

Nickel metal: Elemental nickel, Nickel catalyst
Synonyms of other nickel compounds vary depending upon the specific compound.

Exposure Limits

NIOSH REL*: Ca TWA 0.015 mg/m³ [See Appendix A](#) [*Note: The REL does not apply to Nickel carbonyl.]

OSHA PEL*†: TWA 1 mg/m³ [*Note: The PEL does not apply to Nickel carbonyl.]

IDLH

Conversion

Ca [10 mg/m³ (as Ni)] See: [7440020](#)

Physical Description

Metal: Lustrous, silvery, odorless solid.

MW: 58.7

BP: 5139°F

MLT: 2831°F

Sol: Insoluble

VP: 0 mmHg (approx)

IP: NA

Sp.Gr: 8.90 (Metal)

Fl.P: NA

UEL: NA

LEL: NA

Metal: Combustible Solid; nickel sponge catalyst may ignite SPONTANEOUSLY in air.

Incompatibilities & Reactivities

Strong acids, sulfur, selenium, wood & other combustibles, nickel nitrate

Measurement Methods

NIOSH [7300](#), [7301](#), [7303](#), [9102](#); OSHA [ID121](#), [ID125G](#)
See: [NMAM](#) or [OSHA Methods](#)

Personal Protection & Sanitation

([See protection codes](#))

Skin: Prevent skin contact
Eyes: No recommendation
Wash skin: When contaminated/Daily
Remove: When wet or contaminated
Change: Daily

First Aid

([See procedures](#))

Skin: Water flush immediately
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations

NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter. [Click here](#) for information on selection of N, R, or P filters./Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection](#)

Exposure Routes

inhalation, ingestion, skin and/or eye contact

Symptoms

Sensitization dermatitis, allergic asthma, pneumonitis; [potential occupational carcinogen]

Target Organs

Nasal cavities, lungs, skin

Cancer Site

[lung and nasal cancer]

See also: [INTRODUCTION](#) See ICSC CARD: [0062](#) See MEDICAL TESTS: [0156](#)

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Coal tar pitch volatiles		CAS
		65996-93-2
		RTECS
		GF8655000
Synonyms & Trade Names		DOT ID & Guide
Synonyms vary depending upon the specific compound (e.g., pyrene, phenanthrene, acridine, chrysene, anthracene & benzo(a)pyrene). [Note: NIOSH considers coal tar, coal tar pitch, and creosote to be coal tar products.]		2713 153 (acridine)
Exposure Limits	NIOSH REL: Ca TWA 0.1 mg/m ³ (cyclohexane-extractable fraction) See Appendix A See Appendix C	
	OSHA PEL: TWA 0.2 mg/m ³ (benzene-soluble fraction) [1910.1002] See Appendix C	
IDLH	Conversion	
Ca [80 mg/m ³] See: 65996932		
Physical Description		
Black or dark-brown amorphous residue.		
Properties vary depending upon the specific compound.		
Combustible Solids		
Incompatibilities & Reactivities		
Strong oxidizers		
Measurement Methods		
OSHA 58 See: NMAM or OSHA Methods		
Personal Protection & Sanitation		First Aid
(See protection) Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: Daily Remove: No recommendation Change: Daily		(See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately

Respirator Recommendations

NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister having an N100, R100, or P100 filter. [Click here](#) for information on selection of N, R, or P filters./Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection](#)

Exposure Routes

inhalation, skin and/or eye contact

Symptoms

Dermatitis, bronchitis, [potential occupational carcinogen]

Target Organs

respiratory system, skin, bladder, kidneys

Cancer Site

[lung, kidney & skin cancer]

See also: [INTRODUCTION](#) See ICSC CARD: [1415](#) See MEDICAL TESTS: [0054](#)


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Thallium (soluble compounds, as TI)		CAS
		RTECS
Synonyms & Trade Names		DOT ID & Guide
Synonyms vary depending upon the specific soluble thallium compound.		1707 151 (compounds, n.o.s.)
Exposure Limits	NIOSH REL: TWA 0.1 mg/m ³ [skin]	
	OSHA PEL: TWA 0.1 mg/m ³ [skin]	
IDLH		Conversion
15 mg/m ³ (as TI) See: thallium		
Physical Description		
Appearance and odor vary depending upon the specific soluble thallium compound.		
Properties vary depending upon the specific soluble thallium compound.		
Incompatibilities & Reactivities		
Varies		
Measurement Methods		
NIOSH 7300 , 7301 , 7303 , 9102 ; OSHA ID121 See: NMAM or OSHA Methods		
Personal Protection & Sanitation		First Aid
(See protection codes) Skin: Prevent skin contact		(See procedures) Eye: Irrigate immediately

Eyes: Prevent eye contact
Wash skin: When contaminated
Remove: When wet or contaminated
Change: Daily

Skin: Water flush promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations

NIOSH/OSHA

Up to 0.5 mg/m³:

(APF = 5) Any quarter-mask respirator. [Click here](#) for information on selection of N, R, or P filters.

Up to 1 mg/m³:

(APF = 10) Any particulate respirator equipped with an N95, R95, or P95 filter (inclu

Zinc oxide		CAS	
		1314-13-2	
ZnO		RTECS	
		ZH4810000	
Synonyms & Trade Names		DOT ID & Guide	
Zinc peroxide		1516 143	
Exposure Limits	NIOSH REL: Dust: TWA 5 mg/m ³ C 15 mg/m ³ Fume: TWA 5 mg/m ³ ST 10 mg/m ³		
	OSHA PEL†: TWA 5 mg/m ³ (fume) TWA 15 mg/m ³ (total dust) TWA 5 mg/m ³ (resp dust)		
IDLH		Conversion	
500 mg/m ³ See: 1314132			
Physical Description			
White, odorless solid.			
MW: 81.4	BP: ?	MLT: 3587°F	Sol(64°F): 0.0004%
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 5.61
Fl.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid			
Incompatibilities & Reactivities			
Chlorinated rubber (at 419°F), water [Note: Slowly decomposed by water.]			
Measurement Methods			
NIOSH 7303 , 7502 ; OSHA ID121 , ID143 See: NMAM or OSHA Methods			
Personal Protection & Sanitation		First Aid	
(See protection) Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		(See procedures) Breathing: Respiratory support	

Respirator Recommendations

NIOSH/OSHA

Up to 50 mg/m³:

(APF = 10) Any particulate respirator equipped with an N95, R95, or P95 filter (including N95, R95, and P95 filtering facepieces) except quarter-mask respirators. The following filters may also be used: N99, R99, P99, N100, R100, P100. [Click here](#) for information on selection of N, R, or P filters.

(APF = 10) Any supplied-air respirator

Up to 125 mg/m³:

(APF = 25) Any supplied-air respirator operated in a continuous-flow mode

(APF = 25) Any powered air-purifying respirator with a high-efficiency particulate filter.

Up to 250 mg/m³:

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter. [Click here](#) for information on selection of N, R, or P filters.

(APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode

(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter

(APF = 50) Any self-contained breathing apparatus with a full facepiece

(APF = 50) Any supplied-air respirator with a full facepiece

Up to 500 mg/m³:

(APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode

Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter. [Click here](#) for information on selection of N, R, or P filters./Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection](#)

Exposure Routes

inhalation

Symptoms

Metal fume fever: chills, muscle ache, nausea, fever, dry throat, cough; lassitude (weakness, exhaustion); metallic taste; headache; blurred vision; low back pain; vomiting; malaise (vague feeling of discomfort); chest tightness; dyspnea (breathing difficulty), rales, decreased pulmonary function

Target Organs

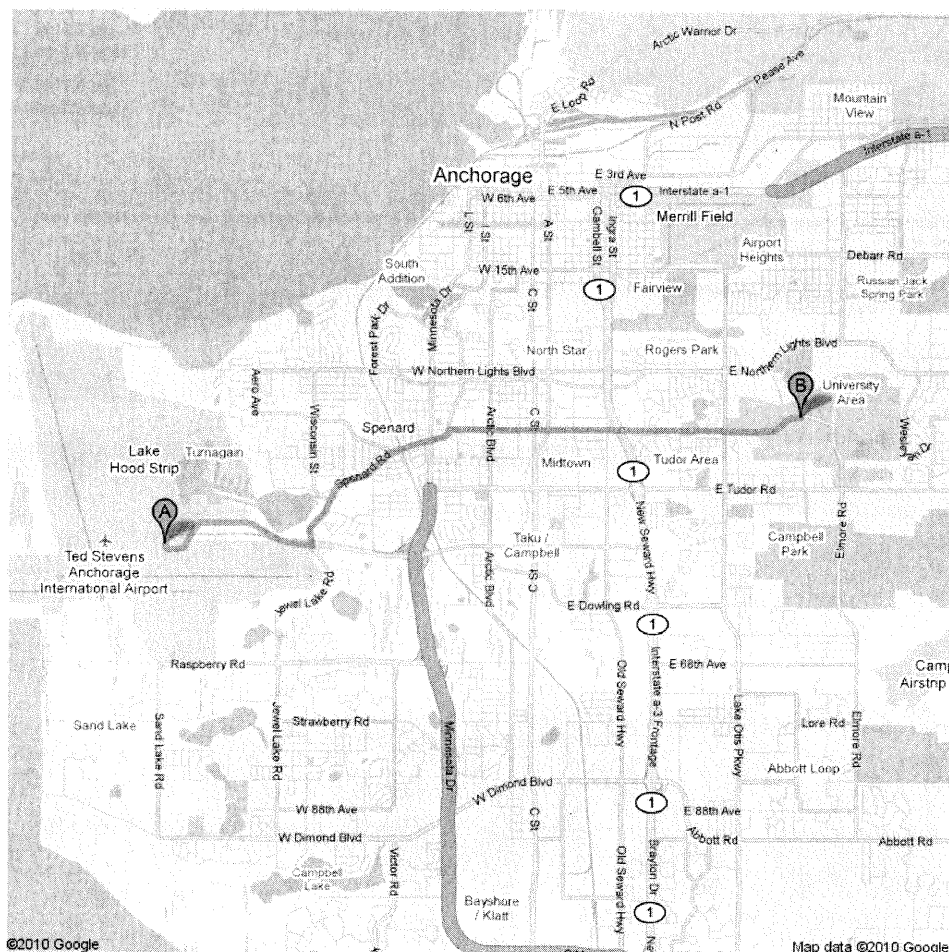
respiratory system

See also: [INTRODUCTION](#) See ICSC CARD: [0208](#) See MEDICAL TESTS: [0246](#)

ATTACHMENT G
MAP TO HOSPITAL AND SITE MAP/SKETCH



Directions to Providence Alaska Medical Center
3200 Providence Drive, Anchorage, AK 99508 - (907) 562-2211
6.1 mi – about 17 mins



A ANCHORAGE airport, Anchorage, AK 99502

1. Head south on W International Airport Rd toward W 50th Ave
About 4 mins
go 1.4 mi
total 1.4 mi
2. Turn left at Jewel Lake Rd/Spenard Rd
Continue to follow Spenard Rd
About 5 mins
go 1.7 mi
total 3.1 mi
3. Turn right at W 36th Ave
About 7 mins
go 2.3 mi
total 5.5 mi
4. Continue onto Providence Dr
About 2 mins
go 0.7 mi
total 6.1 mi

B Providence Alaska Medical Center
3200 Providence Drive, Anchorage, AK 99508 - (907) 562-2211

These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may cause conditions to differ from the map results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.

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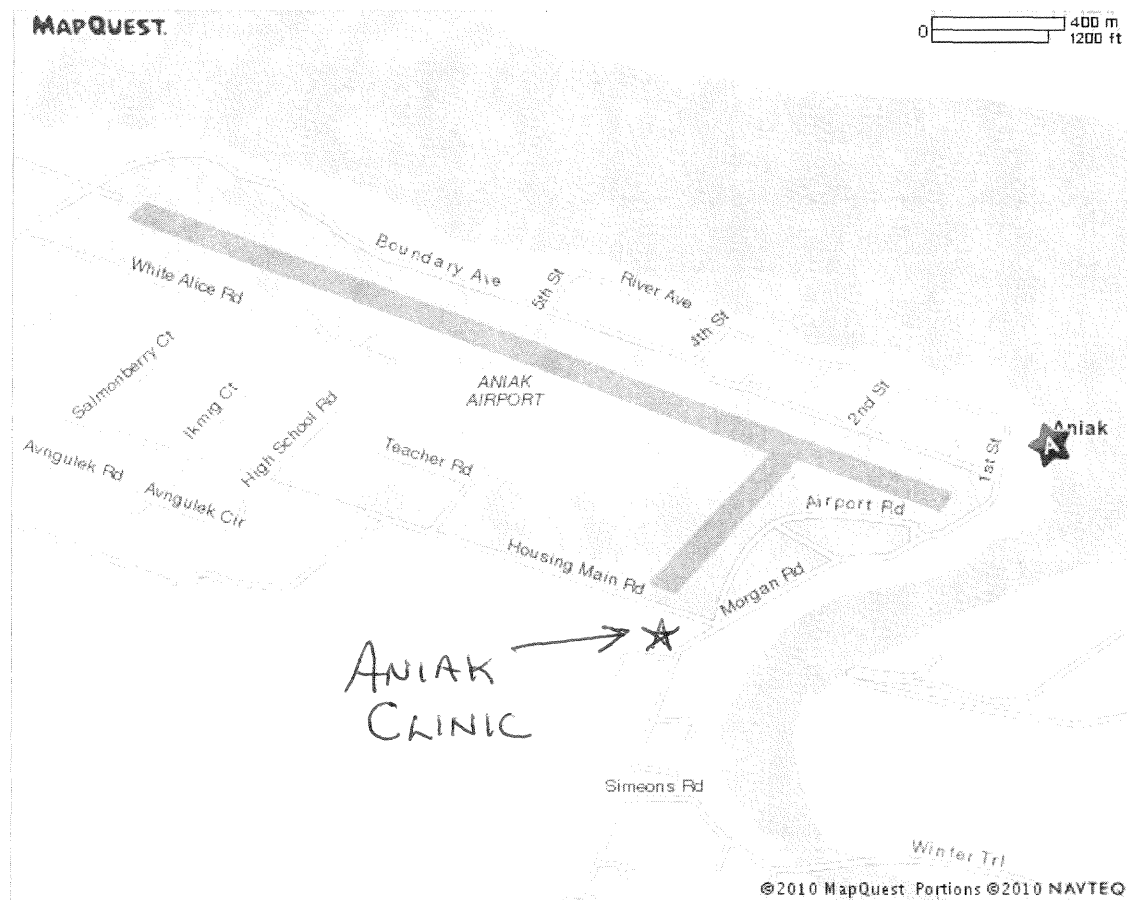
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Map of Aniak, AK

Notes



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