U.S. Environmental Protection Agency, Region 9
Emergency Response Section
Consolidated Site-Specific Health and Safety Plan

This Consolidated Site-Specific Health and Safety Plan (HASP) is for use on U.S. Environmental Protection Agency (EPA) emergency response actions to incorporate the individual site safety plans of the USEPA, other participating government agencies, the Superfund Technical Assessment and Response Team (START) contractor, the Emergency and Rapid Removal Service (ERRS) contractor, and other subcontractors into a unified site safety plan. This plan is designed to conform to the requirements pursuant to 29 Code of Federal Regulations (CFR) 1910.120(b)(4) by summarizing the hazards on-site, personal protective equipment issues and emergency procedures and incorporating all applicable corporate and government agency safety plans and standard operating procedures (SOPs) by reference. This plan does not supersede any individual entity's safety program plans as mandated by 29 CFR 1910.120(b), site specific safety plans or other SOPs. Individual corporations or government agencies should refer to their internal site safety program plan and site specific safety plan for compliance with their safety requirements.

All entities that participate in this plan acknowledge that they comply with the relevant sections of 29 CFR 1910.120, 29 CFR 1910 Subpart I, 29 CFR 1910.146 and 29 CFR 1910 Subpart Z. This plan meets the requirements pursuant to 40 CFR 300.135(l) and 300. 150. Requirements pursuant to 29 CFR 1910.146: Permit Required Confined Space (PRCS) will be addressed in a separate document prepared by the contractor making the PRCS entry.

Plan Acceptance/Approval:

EPA On-Scene Coordinator	Date
START Project Manager	Date
Environmental Response Team (ERT)'s Scientific, Engineering, Response, and Analytical Services (SERAS) Contractor	Date
Name/Agency	Date
Name/Agency	Date
Name/Agency	Date

A. SITE INFORMATION, ROLES AND RESPONSIBILITIES

Site Name: Tronox Abandoned Uranium Mine (AUM) Sections 32 and 33 Removal Assessment
Site Address: Route 19, Casamero Lake Loop Road, Prewitt, McKinley County, New Mexico AUM Section 32 – Latitude: 35° 29' 26.7576" N, Longitude: -108° 1' 2.7798" W AUM Section 33 – Latitude: 35° 29' 26.1972" N, Longitude: -108° 0' 59.8583" W
Date of Activities: June 11 to 15, 2012
Participants: ☑ USEPA ☑ START ☐ ERRS ☐ PST ☑ Other ERT/ SERAS **(Individual site safety plans in Appendix C)**

Table A-1
Site Roles/Responsibilities

Site Role/Responsibility	Agency / Entity	Name	Title
EPA-Lead	EPA	Randy Nattis	On-Scene Coordinator
Site Safety Officer	EPA	Randy Nattis	On-Scene Coordinator
START Project Manager	Ecology and Environment, Inc.	Aileen Mendoza	START member
START Safety Officer	Ecology and Environment, Inc.	Craig Tiballi	START member
START Field Team Member, GIS	Ecology and Environment, Inc.	Adam Ellis	START member
START Field Team Member	Ecology and Environment, Inc.	Bill Sass	START member
SERAS Contractor	Lockheed Martin		SERAS member

B. SITE CHARACTERIZATION

Site Description:

Tronox AUM Section 32 (AUM 32) and Section 33 (AUM 33) are adjacent to each other and located approximately 1 mile east of County Road 19, in Prewitt, McKinley County, New Mexico (Figure 1).

AUM 32 has an area of 12,103 square meters and an undetermined extent of underground workings (Weston Solutions, Inc. [Weston] 2009). AUM 32 is located in an Indian Allotment land which is part of the Casamero Lake Chapter of the Navajo Nation. AUM 32 includes an unsecured deep shaft located in the southeastern portion of the site. No residences, public structures, water sources or sensitive environment were found within 0.25 miles of the AUM 32. The nearest resident is Lucita Sardo who lives to the west of the historical mine and had relatives who formerly worked for Cobb Nuclear. The residential property had some materials (tarps and lumber) obtained from the mine and had gamma radiation measurements of approximately 12,000 counts per minute (cpm). Gamma radiation measured at AUM 32 ranged from 10,689 cpm to 180,367 cpm. Gamma radiation measured at background locations ranged from 16,630 cpm to 17,128 cpm. No waste piles, other mine features, or visible signs of reclamation were reported at AUM 32.

AUM 33 has an area of 11,005 square meters and an undetermined extent of underground workings (Weston 2009). AUM 33 is classified as private land owned by Lynn "Buddy" Elkins. No residences, public structures, water sources or sensitive environment were found within 0.25 miles of AUM 33. The nearest resident is Lucita Sardo. Gamma radiation measured at AUM 33 ranged from 14,322 cpm to 140,917 cpm. Gamma radiation measured at background locations ranged from 16,630 cpm to 17,128 cpm. Numerous waste piles were observed at AUM 33 and some former unidentified workings. No visible signs of reclamation were reported.

The area is: ☐ predominately commercial ☐ predominately residential ☐ mixed commercial/residential ☑ Other Open space

Site History:

AUM 32 and AUM 33 were historical uranium mines reportedly owned by Cobb Nuclear and were closed due to a fatality (Weston 2009). No other information on historical ownership of the mine and mining operations were available.

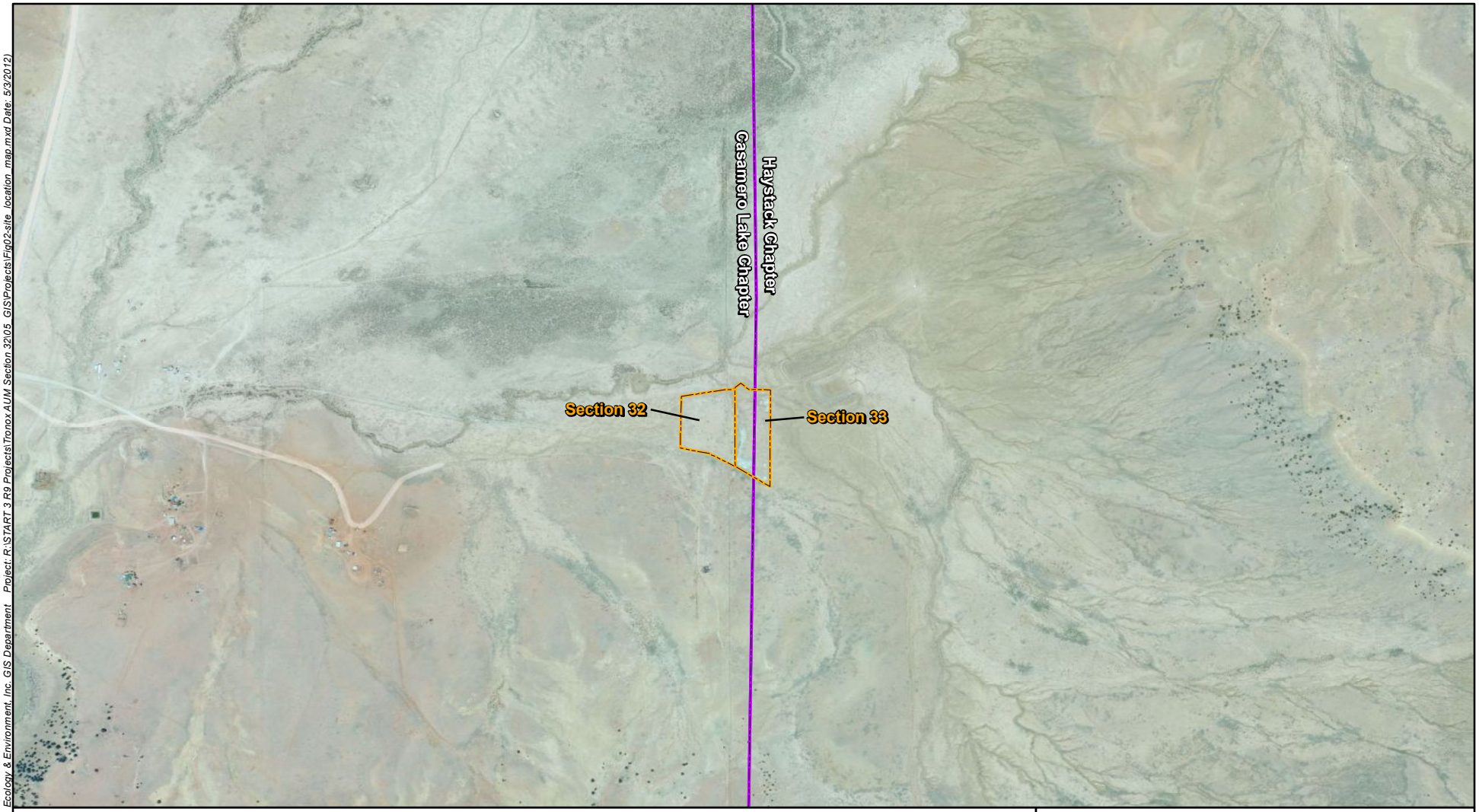
Scope of Work:

E & E was tasked by EPA under the START contract to conduct a removal assessment to delineate the extent of contamination at AUM 32 and AUM 33. Under this task order, E & E will perform radiation scan/survey of surface soils, soil sampling from known and potential areas of contamination based on previous investigation (Weston 2009) and radiation scan/survey results, and collect background radiation and contaminant of potential concern (COPC) levels. SERAS will provide additional technical assistance to EPA and will perform radiation scan/survey of surface soils using VIPER equipment.

Project # 002693.2164.01RA
TDD# TO2-09-11-10-0004

Source: Aerial Photography - Bing Maps

Ecology & Environment, Inc. GIS Department Project: R:\START 3 R9 Projects\Tronox AUM Section 32\05 GIS\Projects\Fig02-site location map.mxd Date: 5/3/2012



LEGEND

Mine boundary

Chapter boundary

N

0 1,000 2,000 Feet

Figure 1

Site Location Map
Tronox AUM 32 and 33

Casamero Lake Chapter, Navajo Nation, Prewitt, New Mexico

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International Specialists in the Environment

The individual activities that are required to complete the scope of work are divided into numbered tasks. Table B-1 provides a description of each numbered task.

Table B-1 Project Tasks and Task Descriptions	
Task Number	**Task Description**
1	Site walk
2	Surface radiation scan/survey on site
3	Collection of soil samples
4	Background study
5	Documentation (global positioning system [GPS], photographs, logs)
6	Homesite investigation
7	
8	
9	
10	
11	
12	

C. HAZARD EVALUATION AND HAZARD CONTROL

This section identifies and describes safety and health hazards associated with site work. The hazards associated with each task, by site location are identified in the following table. Based on the best available knowledge of how that task will be performed, the likelihood of exposure to the hazards identified for that task at that location is specified and control measures implemented to protect employees from the hazards are identified. Engineering controls, work practices, personal protective equipment, or a combination of these shall be implemented in accordance with 29 CFR 1910.120(g) to protect employees from exposure to hazardous substances and safety and health hazards.

Make additional copies of the following Job Hazard Analysis Form as needed for all project tasks.

Job Hazard Analysis (JHA) TASK 1 – SITE WALK			
JHA Number	**Task**	**Location Where Task Performed**	
1	**1**	Entire site	
Date JHA conducted: 22 May 2012		**Date(s) JHA updated:** 5 June 2012	
Biological Hazards			
Name of Biological Hazard	**Characteristics**	**Concentration**	**Exposure Potential during Task**
Local flora and fauna such as poison ivy, cacti, fire ants, dogs, spiders, snakes	☑ Infectious/Pathogenic ☑ Toxic ☑ Other harmful		☐ High ☐ Low ☐ Medium ☑ Unknown
Prairie dogs (carry plague)	☑ Infectious/Pathogenic ☐ Toxic		☐ High ☑ Low ☐ Medium ☐ Unknown
See Table D-1 for a summary of Biological Agent information. CDC Disease Information and/or EPA ERT Technical Bulletins are included in Appendix A.			
Chemical Hazards			
Chemical Name or Type	**Characteristics**	**State/Concentration**	**Exposure Potential during Task**
Radionuclides/Radiation	☐ Flammable / Ignitable ☐ Corrosive ☑ Poison / Acutely Toxic ☐ Air/Water Reactive ☑ Carcinogenic ☐ Explosive/Shock Sensitive ☐ Volatile	☐ Gas/ Vapor ☑ Solid ☐ Liquid ☑ Other	☐ High ☐ Low ☐ Medium ☑ Unknown
Uranium	☐ Flammable / Ignitable ☐ Corrosive ☑ Poison / Acutely Toxic ☐ Air/Water Reactive ☑ Carcinogenic ☐ Explosive/Shock Sensitive ☐ Volatile	☐ Gas/ Vapor ☑ Solid ☐ Liquid	☐ High ☐ Low ☐ Medium ☑ Unknown
	☐ Flammable / Ignitable ☐ Corrosive ☐ Poison / Acutely Toxic ☐ Air/Water Reactive ☐ Carcinogenic ☐ Explosive/Shock Sensitive ☐ Volatile	☐ Gas/ Vapor ☐ Solid ☐ Liquid	☐ High ☐ Low ☐ Medium ☑ Unknown
See Table D-2 for a summary of Chemical information. Chemical Evaluation Sheet or Material Safety Data			

Job Hazard Analysis (JHA) TASK 1 – SITE WALK		
JHA Number	**Task**	**Location Where Task Performed**
1	**1**	Entire site
Sheets (MSDS) are located in Appendix A for known chemical hazards.		

Physical Hazards	
Type of Physical Hazard	**Exposure Potential during Task**
☐ Overhead ☑ Below Grade ☑ Trip/Fall ☑ Sunburn ☑ Puncture ☑ Cut ☐ Splash ☑ Animal/Insect/Plant ☐ Noise ☑ Heat Stress ☐ Cold Stress ☑ Other – Open mine shaft	☐ High ☐ Low ☑ Medium ☐ Unknown
☑ Ionizing Radiation ☑ Alpha Particles ☑ Beta Particles ☑ Gamma Rays ☑ Neutrons	☐ High ☐ Low ☐ Medium ☑ Unknown
☐ Confined Space (Hazards associated with PRCS entries will be addressed in separate document prepared by the contractor making the PRCS entry.	☐ High ☐ Low ☐ Medium ☐ Unknown

Control Measures

Engineering Controls: (if feasible, describe)
Ensure support zone is in an uncontaminated background radiation area. Decrease time in radiation areas; increase distance; increase shielding as needed. Work upwind if possible. Use dust suppression during sampling activities as required. Radiation monitoring equipment will be protected from contamination by placing it in plastic bags (leaving probe areas uncovered). If applicable, ventilate indoor areas (open windows and doors) in order to dissipate any radon buildup.

A physical or visual barrier (construction fencing or caution tape) will be set up a distance of at least 6 feet around the mine shaft. Vehicles will be kept away from the mine shaft area.

Work Practices: (describe those work practices specific to this task or that differ from the general work practices described in Section F) Wear personal protective equipment (PPE) appropriate for each task (e.g. Level C in exclusion zone, as defined by elevated surface gamma activity). Avoid unprotected contact with site materials. Avoid soil coming in contact with skin or clothing.

PPE Steel-toe boots and safety glasses for level D

Group	**PPE Level**	**Modifications Allowed**
START/SERAS/EPA	D	Based on experiences with air sampling for gross alpha/beta on other uranium mine sites in New Mexico (e.g., NECR and Skyline), air sampling results from high dust-generating activities such as vehicular traffic, soil excavation and loading, and grading were still orders of magnitude below the most conservative DAC. Dust generating activities will involve RAT work and soil sampling. If dust caused by high winds should impact work activities, it is likely that it would involve nuisance dust. Therefore, worker protection decisions can be managed visually.

Job Hazard Analysis (JHA) TASK 2 - SURFACE RADIATION SCAN/SURVEY (ON-SITE)			
JHA Number	**Task**	**Location Where Task Performed**	
2	**2**	Entire site and surrounding areas	
Date JHA conducted: 22 May 2012		**Date(s) JHA updated:** 5 June 2012	
Biological Hazards			
Name of Biological Hazard	**Characteristics**	**Concentration**	**Exposure Potential during Task**
Local flora and fauna such as poison ivy, cacti, fire ants, dogs, spiders, snakes	☑ Infectious/Pathogenic ☑ Toxic ☑ Other harmful		☐ High ☐ Low ☐ Medium ☑ Unknown
Prairie dogs (carry plague)	☑ Infectious/Pathogenic ☐ Toxic		☐ High ☑ Low ☐ Medium ☐ Unknown
See Table D-1 for a summary of Biological Agent information. CDC Disease Information and/or EPA ERT Technical Bulletins are included in Appendix A.			
Chemical Hazards			
Chemical Name or Type	**Characteristics**	**State/Concentration**	**Exposure Potential during Task**
Radionuclides/Radiation	☐ Flammable / Ignitable ☐ Corrosive ☑ Poison / Acutely Toxic ☐ Air/Water Reactive ☐ Carcinogenic ☐ Explosive/Shock Sensitive ☐ Volatile	☐ Gas/ Vapor ☑ Solid ☐ Liquid ☑ Other	☐ High ☐ Low ☐ Medium ☑ Unknown
Uranium	☐ Flammable / Ignitable ☐ Corrosive ☑ Poison / Acutely Toxic ☐ Air/Water Reactive ☑ Carcinogenic ☐ Explosive/Shock Sensitive ☐ Volatile	☐ Gas/ Vapor ☑ Solid ☐ Liquid	☐ High ☐ Low ☐ Medium ☑ Unknown
	☐ Flammable / Ignitable ☐ Corrosive ☐ Poison / Acutely Toxic ☐ Air/Water Reactive ☐ Carcinogenic ☐ Explosive/Shock Sensitive ☐ Volatile	☐ Gas/ Vapor ☐ Solid ☐ Liquid	☐ High ☐ Low ☐ Medium ☐ Unknown

Job Hazard Analysis (JHA) TASK 2 - SURFACE RADIATION SCAN/SURVEY (ON-SITE)		
JHA Number	**Task**	**Location Where Task Performed**
2	**2**	Entire site and surrounding areas
See Table D-2 for a summary of Chemical information. Chemical Evaluation Sheet or Material Safety Data Sheets (MSDS) are located in Appendix A for known chemical hazards.		

Physical Hazards	
Type of Physical Hazard	**Exposure Potential during Task**
☐ Overhead ☑ Below Grade ☑ Trip/Fall ☑ Sunburn ☑ Puncture ☑ Cut ☐ Splash ☑ Animal/Insect/Plant ☐ Noise ☑ Heat Stress ☐ Cold Stress ☑ Other – Open mine shaft	☐ High ☐ Low ☑ Medium ☐ Unknown
☑ Ionizing Radiation ☑ Alpha Particles ☑ Beta Particles ☑ Gamma Rays ☑ Neutrons	☐ High ☐ Low ☐ Medium ☑ Unknown
☐ Confined Space (Hazards associated with PRCS entries will be addressed in separate document prepared by the contractor making the PRCS entry.	☐ High ☐ Low ☐ Medium ☐ Unknown

Control Measures

Engineering Controls: (if feasible, describe)
Ensure support zone is in an uncontaminated background radiation area. Decrease time in radiation areas; increase distance; increase shielding as needed. Work upwind if possible. Use dust suppression during sampling activities as required. Radiation monitoring equipment will be protected from contamination by placing it in plastic bags (leaving probe areas uncovered). If applicable, ventilate indoor areas (open windows and doors) in order to dissipate any radon buildup.

A physical or visual barrier (construction fencing or caution tape) will be set up a distance of at least 6 feet around the mine shaft. Vehicles will be kept away from the mine shaft area.

Work Practices: (describe those work practices specific to this task or that differ from the general work practices described in Section F) Wear personal protective equipment (PPE) appropriate for each task (e.g. Level C in exclusion zone, as defined by elevated surface gamma activity). Avoid unprotected contact with site materials. Avoid soil coming in contact with skin or clothing.

PPE Steel-toe boots and safety glasses for level D.

Group	**PPE Level**	**Modifications Allowed**
START/SERAS	D	Based on experiences with air sampling for gross alpha/beta on other uranium mine sites in New Mexico (e.g., NECR and Skyline), air sampling results from high dust-generating activities such as vehicular traffic, soil excavation and loading, and grading were still orders of magnitude below the most conservative DAC. Dust generating activities will involve RAT work and soil sampling. If dust caused by high winds should impact work activities, it is likely that it would involve nuisance dust. Therefore, worker protection decisions can be managed visually.

Job Hazard Analysis (JHA) TASK 3 - COLLECTION OF SOIL SAMPLES			
JHA Number	**Task**	**Location Where Task Performed**	
3	**3**	Entire site	
Date JHA conducted: 22 May 2012		**Date(s) JHA updated:** 5 June 2012	
Biological Hazards			
Name of Biological Hazard	**Characteristics**	**Concentration**	**Exposure Potential during Task**
Local flora and fauna such as poison ivy, cacti, fire ants, dogs, spiders, snakes	☑ Infectious/Pathogenic ☑ Toxic ☑ Other harmful		☐ High ☐ Low ☐ Medium ☑ Unknown
Prairie dogs (carry plague)	☑ Infectious/Pathogenic ☐ Toxic		☐ High ☑ Low ☐ Medium ☐ Unknown
See Table D-1 for a summary of Biological Agent information. CDC Disease Information and/or EPA ERT Technical Bulletins are included in Appendix A.			
Chemical Hazards			
Chemical Name or Type	**Characteristics**	**State/Concentration**	**Exposure Potential during Task**
Radionuclides/Radiation	☐ Flammable / Ignitable ☐ Corrosive ☑ Poison / Acutely Toxic ☐ Air/Water Reactive ☐ Carcinogenic ☐ Explosive/Shock Sensitive ☐ Volatile	☐ Gas/ Vapor ☑ Solid ☐ Liquid ☑ Other	☐ High ☐ Low ☐ Medium ☑ Unknown
Uranium	☐ Flammable / Ignitable ☐ Corrosive ☑ Poison / Acutely Toxic ☐ Air/Water Reactive ☑ Carcinogenic ☐ Explosive/Shock Sensitive ☐ Volatile	☐ Gas/ Vapor ☑ Solid ☐ Liquid	☐ High ☐ Low ☐ Medium ☑ Unknown
	☐ Flammable / Ignitable ☐ Corrosive ☐ Poison / Acutely Toxic ☐ Air/Water Reactive ☐ Carcinogenic ☐ Explosive/Shock Sensitive ☐ Volatile	☐ Gas/ Vapor ☐ Solid ☐ Liquid	☐ High ☐ Low ☐ Medium ☐ Unknown

Job Hazard Analysis (JHA) TASK 3 - COLLECTION OF SOIL SAMPLES		
JHA Number	**Task**	**Location Where Task Performed**
3	**3**	Entire site
See Table D-2 for a summary of Chemical information. Chemical Evaluation Sheet or Material Safety Data Sheets (MSDS) are located in Appendix A for known chemical hazards.		

Physical Hazards	
Type of Physical Hazard	**Exposure Potential during Task**
☐ Overhead ☑ Below Grade ☑ Trip/Fall ☑ Sunburn ☑ Puncture ☑ Cut ☐ Splash ☑ Animal/Insect/Plant ☐ Noise ☑ Heat Stress ☐ Cold Stress ☑ Other – Open mine shaft	☐ High ☐ Low ☑ Medium ☐ Unknown
☑ Ionizing Radiation ☑ Alpha Particles ☑ Beta Particles ☑ Gamma Rays ☑ Neutrons	☐ High ☐ Low ☐ Medium ☑ Unknown
☐ Confined Space (Hazards associated with PRCS entries will be addressed in separate document prepared by the contractor making the PRCS entry.	☐ High ☐ Low ☐ Medium ☐Unknown

Control Measures

Engineering Controls: (if feasible, describe)
Ensure support zone is in an uncontaminated background radiation area. Decrease time in radiation areas; increase distance; increase shielding as needed. Work upwind if possible. Use dust suppression during sampling activities as required. Radiation monitoring equipment will be protected from contamination by placing it in plastic bags (leaving probe areas uncovered). If applicable, ventilate indoor areas (open windows and doors) in order to dissipate any radon buildup.

A physical or visual barrier (construction fencing or caution tape) will be set up a distance of at least 6 feet around the mine shaft. Vehicles will be kept away from the mine shaft area.

Work Practices: (describe those work practices specific to this task or that differ from the general work practices described in Section F) Wear personal protective equipment (PPE) appropriate for each task (e.g. Level C in exclusion zone, as defined by elevated surface gamma activity). Avoid unprotected contact with site materials. Avoid soil coming in contact with skin or clothing.

PPE Steel-toe boots and safety glasses for level D. Nitrile gloves required for conducting sampling or while handling samples.

Group	**PPE Level**	**Modifications Allowed**
START	D	Based on experiences with air sampling for gross alpha/beta on other uranium mine sites in New Mexico (e.g., NECR and Skyline), air sampling results from high dust-generating activities such as vehicular traffic, soil excavation and loading, and grading were still orders of magnitude below the most conservative DAC. Dust generating activities will involve RAT work and soil sampling. If dust caused by high winds should impact work activities, it is likely that it would involve nuisance dust. Therefore, worker protection decisions can be managed visually.

Job Hazard Analysis (JHA) TASK 4 – BACKGROUND STUDY			
JHA Number	**Task**	**Location Where Task Performed**	
4	**4**	Uncontaminated area near site	
Date JHA conducted: 22 May 2012		**Date(s) JHA updated:** 5 June 2012	
Biological Hazards			
Name of Biological Hazard	**Characteristics**	**Concentration**	**Exposure Potential during Task**
Local flora and fauna such as poison ivy, cacti, fire ants, dogs, spiders, snakes	☑ Infectious/Pathogenic ☑ Toxic ☑ Other harmful		☐ High ☐ Low ☐ Medium ☑ Unknown
Prairie dogs (carry plague)	☑ Infectious/Pathogenic ☐ Toxic		☐ High ☑ Low ☐ Medium ☐ Unknown
See Table D-1 for a summary of Biological Agent information. CDC Disease Information and/or EPA ERT Technical Bulletins are included in Appendix A.			
Chemical Hazards			
Chemical Name or Type	**Characteristics**	**State/Concentration**	**Exposure Potential during Task**
	☐ Flammable / Ignitable ☐ Corrosive ☐ Poison / Acutely Toxic ☐ Air/Water Reactive ☐ Carcinogenic ☐ Explosive/Shock Sensitive ☐ Volatile	☐ Gas/ Vapor ☐ Solid ☐ Liquid ☐ Other	☐ High ☐ Low ☐ Medium ☐ Unknown
	☐ Flammable / Ignitable ☐ Corrosive ☐ Poison / Acutely Toxic ☐ Air/Water Reactive ☐ Carcinogenic ☐ Explosive/Shock Sensitive ☐ Volatile	☐ Gas/ Vapor ☐ Solid ☐ Liquid	☐ High ☐ Low ☐ Medium ☐ Unknown
	☐ Flammable / Ignitable ☐ Corrosive ☐ Poison / Acutely Toxic ☐ Air/Water Reactive ☐ Carcinogenic ☐ Explosive/Shock Sensitive ☐ Volatile	☐ Gas/ Vapor ☐ Solid ☐ Liquid	☐ High ☐ Low ☐ Medium ☐ Unknown

Job Hazard Analysis (JHA) TASK 4 – BACKGROUND STUDY		
JHA Number	**Task**	**Location Where Task Performed**
4	**4**	Uncontaminated area near site
See Table D-2 for a summary of Chemical information. Chemical Evaluation Sheet or Material Safety Data Sheets (MSDS) are located in Appendix A for known chemical hazards.		

Physical Hazards	
Type of Physical Hazard	**Exposure Potential during Task**
☐ Overhead ☑ Below Grade ☑ Trip/Fall ☑ Sunburn ☑ Puncture ☑ Cut ☐ Splash ☑ Animal/Insect/Plant ☐ Noise ☑ Heat Stress ☐ Cold Stress ☐ Other	☐ High ☐ Low ☑ Medium ☐ Unknown
☐ Ionizing Radiation ☐ Alpha Particles ☐ Beta Particles ☐ Gamma Rays ☐ Neutrons	☐ High ☐ Low ☐ Medium ☐ Unknown
☐ Confined Space (Hazards associated with PRCS entries will be addressed in separate document prepared by the contractor making the PRCS entry.	☐ High ☐ Low ☐ Medium ☐ Unknown

Control Measures		
Engineering Controls: (if feasible, describe)		
Work Practices: (describe those work practices specific to this task or that differ from the general work practices described in Section F)		
PPE Steel-toe boots and safety glasses for level D.		
Group	**PPE Level**	**Modifications Allowed**
START	D	None required

Job Hazard Analysis (JHA) TASK 5 - DOCUMENTATION			
JHA Number	**Task**	**Location Where Task Performed**	
5	**5**	Entire site and support zone	
Date JHA conducted: 22 May 2012		**Date(s) JHA updated:** 5 June 2012	
Biological Hazards			
Name of Biological Hazard	**Characteristics**	**Concentration**	**Exposure Potential during Task**
Local flora and fauna such as poison ivy, cacti, fire ants, dogs, spiders, snakes	☑ Infectious/Pathogenic ☑ Toxic ☑ Other harmful		☐ High ☐ Low ☐ Medium ☑ Unknown
Prairie dogs (carry plague)	☑ Infectious/Pathogenic ☐ Toxic		☐ High ☑ Low ☐ Medium ☐ Unknown
See Table D-1 for a summary of Biological Agent information. CDC Disease Information and/or EPA ERT Technical Bulletins are included in Appendix A.			
Chemical Hazards			
Chemical Name or Type	**Characteristics**	**State/Concentration**	**Exposure Potential during Task**
Radionuclides/Radiation	☐ Flammable / Ignitable ☐ Corrosive ☑ Poison / Acutely Toxic ☐ Air/Water Reactive ☐ Carcinogenic ☐ Explosive/Shock Sensitive ☐ Volatile	☐ Gas/ Vapor ☑ Solid ☐ Liquid ☑ Other	☐ High ☐ Low ☐ Medium ☑ Unknown
Uranium	☐ Flammable / Ignitable ☐ Corrosive ☑ Poison / Acutely Toxic ☐ Air/Water Reactive ☑ Carcinogenic ☐ Explosive/Shock Sensitive ☐ Volatile	☐ Gas/ Vapor ☑ Solid ☐ Liquid	☐ High ☐ Low ☐ Medium ☑ Unknown
	☐ Flammable / Ignitable ☐ Corrosive ☐ Poison / Acutely Toxic ☐ Air/Water Reactive ☐ Carcinogenic ☐ Explosive/Shock Sensitive ☐ Volatile	☐ Gas/ Vapor ☐ Solid ☐ Liquid	☐ High ☐ Low ☐ Medium ☐ Unknown

Job Hazard Analysis (JHA) TASK 5 - DOCUMENTATION		
JHA Number	**Task**	**Location Where Task Performed**
5	**5**	Entire site and support zone
See Table D-2 for a summary of Chemical information. Chemical Evaluation Sheet or Material Safety Data Sheets (MSDS) are located in Appendix A for known chemical hazards.		

Physical Hazards	
Type of Physical Hazard	**Exposure Potential during Task**
☐ Overhead ☑ Below Grade ☑ Trip/Fall ☑ Sunburn ☑ Puncture ☑ Cut ☐ Splash ☑ Animal/Insect/Plant ☐ Noise ☑ Heat Stress ☐ Cold Stress ☑ Other – Open mine shaft	☐ High ☐ Low ☑ Medium ☐ Unknown
☐ Ionizing Radiation ☑ Alpha Particles ☑ Beta Particles ☑ Gamma Rays ☑ Neutrons	☐ High ☐ Low ☐ Medium ☑ Unknown
☐ Confined Space (Hazards associated with PRCS entries will be addressed in separate document prepared by the contractor making the PRCS entry.	☐ High ☐ Low ☐ Medium ☐ Unknown

Control Measures

Engineering Controls: (if feasible, describe)
Ensure support zone is in an uncontaminated background radiation area. Decrease time in radiation areas; increase distance; increase shielding as needed. Work upwind if possible. Radiation monitoring equipment will be protected from contamination by placing it in plastic bags (leaving probe areas uncovered).

Work Practices: (describe those work practices specific to this task or that differ from the general work practices described in Section F) Wear personal protective equipment (PPE) appropriate for each task (e.g. Level C in exclusion zone, as defined by elevated surface gamma activity). Avoid unprotected contact with site materials. Avoid soil coming in contact with skin or clothing.

A physical or visual barrier (construction fencing or caution tape) will be set up a distance of at least 6 feet around the mine shaft. Vehicles will be kept away from the mine shaft area.

PPE Steel-toe boots and safety glasses for level D.

Group	**PPE Level**	**Modifications Allowed**
START	D	Based on experiences with air sampling for gross alpha/beta on other uranium mine sites in New Mexico (e.g., NECR and Skyline), air sampling results from high dust-generating activities such as vehicular traffic, soil excavation and loading, and grading were still orders of magnitude below the most conservative DAC. Dust generating activities will involve RAT work and soil sampling. If dust caused by high winds should impact work activities, it is likely that it would involve nuisance dust. Therefore, worker protection decisions can be managed visually.

Job Hazard Analysis (JHA) TASK 6 – HOMESITE INVESTIGATION			
JHA Number	**Task**	**Location Where Task Performed**	
6	**6**	Homesite(s) located approximately 0.5 mile west of the sites	
Date JHA conducted: 22 May 2012		**Date(s) JHA updated:** 7 June 2012	
Biological Hazards			
Name of Biological Hazard	**Characteristics**	**Concentration**	**Exposure Potential during Task**
Local flora and fauna such as poison ivy, cacti, fire ants, dogs, spiders, snakes	☑ Infectious/Pathogenic ☑ Toxic ☑ Other harmful		☐ High ☐ Low ☐ Medium ☑ Unknown
Prairie dogs (carry plague)	☑ Infectious/Pathogenic ☐ Toxic		☐ High ☑ Low ☐ Medium ☐ Unknown
See Table D-1 for a summary of Biological Agent information. CDC Disease Information and/or EPA ERT Technical Bulletins are included in Appendix A.			
Chemical Hazards			
Chemical Name or Type	**Characteristics**	**State/Concentration**	**Exposure Potential during Task**
Radionuclides/Radiation	☐ Flammable / Ignitable ☐ Corrosive ☑ Poison / Acutely Toxic ☐ Air/Water Reactive ☐ Carcinogenic ☐ Explosive/Shock Sensitive ☐ Volatile	☐ Gas/ Vapor ☑ Solid ☐ Liquid ☑ Other	☐ High ☐ Low ☐ Medium ☑ Unknown
Uranium	☐ Flammable / Ignitable ☐ Corrosive ☑ Poison / Acutely Toxic ☐ Air/Water Reactive ☑ Carcinogenic ☐ Explosive/Shock Sensitive ☐ Volatile	☐ Gas/ Vapor ☑ Solid ☐ Liquid	☐ High ☐ Low ☐ Medium ☑ Unknown
	☐ Flammable / Ignitable ☐ Corrosive ☐ Poison / Acutely Toxic ☐ Air/Water Reactive ☐ Carcinogenic ☐ Explosive/Shock Sensitive ☐ Volatile	☐ Gas/ Vapor ☐ Solid ☐ Liquid	☐ High ☐ Low ☐ Medium ☐ Unknown

Job Hazard Analysis (JHA) TASK 6 – HOMESITE INVESTIGATION		
JHA Number	**Task**	**Location Where Task Performed**
6	**6**	Homesite(s) located approximately 0.5 mile west of the sites
See Table D-2 for a summary of Chemical information. Chemical Evaluation Sheet or Material Safety Data Sheets (MSDS) are located in Appendix A for known chemical hazards.		

Physical Hazards	
Type of Physical Hazard	**Exposure Potential during Task**
☐ Overhead ☑ Below Grade ☑ Trip/Fall ☑ Sunburn ☑ Puncture ☑ Cut ☐ Splash ☑ Animal/Insect/Plant ☐ Noise ☑ Heat Stress ☐ Cold Stress ☑ Other – Open mine shaft	☐ High ☐ Low ☑ Medium ☐ Unknown
☑ Ionizing Radiation ☑ Alpha Particles ☑ Beta Particles ☑ Gamma Rays ☑ Neutrons	☐ High ☐ Low ☐ Medium ☑ Unknown
☐ Confined Space (Hazards associated with PRCS entries will be addressed in separate document prepared by the contractor making the PRCS entry.	☐ High ☐ Low ☐ Medium ☐ Unknown

Control Measures

Engineering Controls: (if feasible, describe)
Ensure support zone is in an uncontaminated background radiation area. Decrease time in radiation areas; increase distance; increase shielding as needed. Work upwind if possible. Use dust suppression during sampling activities as required. Radiation monitoring equipment will be protected from contamination by placing it in plastic bags (leaving probe areas uncovered). If applicable, ventilate indoor areas (open windows and doors) in order to dissipate any radon buildup.

Work Practices: (describe those work practices specific to this task or that differ from the general work practices described in Section F) Avoid unprotected contact with site materials. Avoid soil coming in contact with skin or clothing. Be aware and avoid contact with stray dogs and livestock.

PPE Steel-toe boots and safety glasses for level D.

Group	**PPE Level**	**Modifications Allowed**
START/SERAS	D	Based on experiences with air sampling for gross alpha/beta on other uranium mine sites in New Mexico (e.g., NECR and Skyline), air sampling results from high dust-generating activities such as vehicular traffic, soil excavation and loading, and grading were still orders of magnitude below the most conservative DAC. Dust generating activities will involve RAT work and soil sampling. If dust caused by high winds should impact work activities, it is likely that it would involve nuisance dust. Therefore, worker protection decisions can be managed visually.

Table D-1 Biological Agent Information Summary Agent – Fire Ant	
Biological Class	Fire ants
Persistence	Common in New Mexico; nests are visible as dome-shaped mounds of soil, 12 inches or more in diameter and height up to 3 feet across and 1 ½ feet in height, in sunny, open areas such as pastures, meadows, rotting logs, and around trees.
Routes of Exposure	Dermal, bites/stings
Transmissible Person to Person	No
Infectious Dose	--
Lethality	Rare
Incubation Period	--
Symptoms of exposure	Burning pain when stung, then mild itch which may last a few days. After being stung, the wound may form a red welt. The next day a white pustule (blister) will form. If the pustule is popped or broken open, an infection and scarring can occur. Severe allergic reaction (anaphylaxis) may occur in rare occasions which may involve severe headache, severe nausea, profuse sweating, and shortness of breath or chest pain.
Treatment	• Apply cold compress to relieve swelling and pain. • Wash affected area with soap and water leaving the blister intact. • May use over-the-counter products for sting relief • For allergic reactions, seek immediate medical attention

Table D-1 Biological Agent Information Summary Agent – Dogs	
Biological Class	Dogs
Persistence	Unleashed dogs are common in Navajo Nation
Routes of Exposure	Dermal, bites
Transmissible Person to Person	--
Infectious Dose	Rabies and tetanus Bacteria such as *Streptococcus, Staphylococcus, and Pasteurella* may be inoculated deep into the tissue by dog bites.
Lethality	Yes, due to physical injury or infection
Incubation Period	--
Symptoms of exposure	Puncture, laceration, or tear of skin; pain which may indicate injury to underlying tissues such as muscle, nerve, and bone; bleeding. If skin is not disrupted, redness, warmth, swelling, and drainage of pus or fluid may indicate infection. Rabies symptoms and signs may include odd behaviors, delirium, combativeness, loss of muscle function, muscle spasms, drooling, convulsions, pain, and other problems.
Treatment	• Call 911 if emergency help is needed. • Wash your hands thoroughly with soap and clean water before treating the bite wound. • Apply direct pressure with a clean cloth to any bleeding wound to stop bleeding. • After bleeding has stopped, gently flood the wound with bottled water or clean running water (if available, sterile saline solution is preferred). • Gently clean around the wound with soap and water. • Pat dry and apply an adhesive bandage or dry clean cloth. • Leave unclean bites open. Bite wounds that are not cleaned correctly can trap bacteria and result in infection. • Seek medical attention for additional care • Report the bite to the local animal control agency

Table D-1 Biological Agent Information Summary Agent – Plague (*Yersinia pestis*)	
Biological Class	Plague (bacteria) - carried by fleas on Rabbits, Prairie Dogs, and other rodents
Persistence	Prairie dogs are rodents that are common in New Mexico. Plague is endemic in McKinley County.
Routes of Exposure	Dermal bite by infected fleas
Transmissible Person to Person	Yes, through contact with nasal droplets
Infectious Dose	Organism *Yersinia pestis* infects a person when they are bit by a flea carrying the bacteria or through direct contact with infected tissues or fluids from handling sick or dead animals.
Lethality	Mortality 50-90% if untreated; 15% when diagnosed and treated
Incubation Period	2 to 6 days
Symptoms of exposure	Swollen gland, fever, chills, headache, and extreme exhaustion, and a history of possible exposure to infected rodents, rabbits, or fleas
Treatment	Antibiotics – requires professional medical treatment

Add additional Tables as needed for each biological agent.

Table D-2 Chemical Compound Information Summary							
Compound	**Exposure Limits (TWA)**			**IDLH Level**	**Route(s) of Exposure**	**Acute Symptoms**	**Odor Threshold/Description**
	PEL	**REL**	**TLV**				
Uranium (insoluble compounds)	0.25 mg/m^3	0.2 mg/m^3	0.2 mg/m^3		inhalation, ingestion, skin and/or eye contact	Dermatitis; kidney damage; blood changes; [potential occupational carcinogen]; in animals: lung, lymph node damage [Potential for cancer is a result of alpha-emitting properties & radioactive decay products (e.g., radon).]	odorless
Uranium (soluble compounds)	0.05 mg/m^3	0.05 mg/m^3	0.2 mg/m^3		inhalation, ingestion, skin and/or eye contact	Lacrimation (discharge of tears), conjunctivitis; shortness breath, cough, chest rales; nausea, vomiting; skin burns; red blood cell, casts in urine; proteinuria; high blood urea nitrogen; [potential occupational carcinogen] [Potential for cancer is a result of alpha-emitting properties & radioactive decay products (e.g., radon).]	odorless

Note: Use and asterisk (*) to indicate known or suspected carcinogens.

E. ACTION LEVELS AND HEALTH AND SAFETY MONITORING

Delete information for biological agents not of concern at the site.

Table E-1 Site-Specific Action Levels				
Contaminant	**Level**	**Action**	**Level**	**Action**
Radiation	Above background but <1 mR/hr	Continue monitoring	≥1 mR/hr	Withdraw, contact Health Physicist and reassess work plan

Table E-2 General Action Levels*				
Contaminant	**Level**	**Action**	**Level**	**Action**
Oxygen	19.5% - 22%	Continue work in Level D or C	< 19.5% or > 22%	Upgrade to Level B or A
Lower Explosive Limit (LEL)	10 to 22% of LEL	Continuous monitoring	> 22% of LEL	Evacuate immediately
Particulates	≥ 5 mg/m^3 (assume all dust is respirable dust)	Upgrade to Level C		
Unknown Organic Vapors/Gases	Background to 1part per million (ppm)	Level D with continuous monitoring	> 5 ppm to ≤ 500 ppm	Level B
	1 ppm to ≤ 5 ppm	Level C with continuous monitoring	>500 ppm	Level A
Other:				

*Site investigation work at the Tronox sites will not include monitoring for oxygen, LEL, particulates, or organic vapors. All work will be conducted outdoors in open areas with no history of impacts by chemical contaminants other than TENORM.

Table E-3 Health and Safety Monitoring				
Contaminant	**Task or JHA Number**	**Type of Sample (Area/Personal)**	**Monitoring Equipment**	**Frequency of Sampling**
Site-Specific				
Radionuclide/ Radiation	JHA No. 1-4	Area Personal	Ratemeter/Scaler (Ludlum 2221/ 2241) with External Detector (Ludlum 44-20 3x3 NaI) Ratemeter/Scaler with External Detector (pancake GM detector) Canberra dosimeter TLD badge	As necessary to characterize work area. After each workday or as necessary as personnel and personal equipment/ materials cross hotline Continuous during workday Continuous when radiation exposure is anticipated
General				
LEL/Percent Oxygen	Monitoring will not be included in this investigation.			
Unknown Organic Vapor/Gas	Monitoring will not be included in this investigation.			
Particulates	Monitoring will not be included in this investigation.			

Decontamination Procedures:	
Type	**Responsible Entity**
Personnel: START, EPA, SERAS	START, SERAS
Equipment: Tasks 1,2,3,5	START/SERAS
Instruments: Tasks 1,2,3,5	START/SERAS
Samples: Task 3	START

F. SITE CONTROL

Draw site map indicating work zones. (To be completed on site.)

Buddy System: All on-site personnel shall comply with the buddy system. The buddy system will be maintained on a line-of-sight basis.

Work Practices and Site Control Measures Common to All Site Tasks

1. The exclusion zone and contamination reduction zone (CRZ) will be clearly marked and access to it restricted to those personnel directly involved with the response operations.

2. Entry and exit corridors leading to the CRZ will be clearly marked.

3. Exclusion and CRZ zone entry and egress protocols will be established prior to any entry to these zones.

4. Prior to entering the exclusion zone and CRZ, personnel will know their specific tasks for the entry.

5. Personnel will enter and exit the exclusion zone only through designated corridors, which are located in and traverse the CRZ, unless emergency exiting of the facility is required.

Communications:

On-Site Radio Frequencies:
_____

Cell Phone #:

Name	**Phone**
Randy Nattis (EPA)	(415) 940-1108
Aileen Mendoza (START)	(415) 971-9633
Craig Tiballi (START)	(415) 306-1490
Adam Ellis (START)	(415) 264-5573
Bill Sass (START)	(815) 690-3342
SERAS	

Hand Signals:_____

Illumination: All work will be conducted during daytime operational period unless sufficient artificial lighting in compliance with 29 CFR 1910.120(m) has been provided.

Sanitation: All work sites will be in compliance with the requirements pursuant to 29 CFR 1910.120(n).

H. TRAINING/MEDICAL SURVEILLANCE

Check all that apply:

Regulation	USEPA	START	SERAS	Other	Other
29 CFR 1910.120(e)(3)(i): General Site Worker - 40 hr	X	X	X		
29 CFR 1910.120(e)(3)(ii): Occasional Worker - 24 hr					
29 CFR 1910.120(e)(3)(iii): Workers in Area <PEL - 24 hr					
29 CFR 1910.120(e)(4): Management & Supervisors - 40/8 hr					
29 CFR 1910.120(e)(7): Emergency Response					
29 CFR 1910.120(e)(8): Refresher - 8 hr	X	X	X		
First Responder Awareness					
First Responder Operational - 8 hr					
Hazmat Technician - 24 hr					
Hazmat Specialist- 24 hr					
On-Scene Commander - 24 hr					
29 CFR 1910.134: Resp. Std.					
29 CFR 1910.146: PRCS					
29 CFR 1910.120(f): Medical Surveillance Participation	X	X	X		

I. EMERGENCY RESPONSE PLAN

Note: Information will be completed on site.

On-Site Emergency Signal: Verbal or cell phone

On-Site Meeting Location: AUM 32 located approximately 1 mile east of County Road 19, Prewitt, McKinley County, New Mexico (Latitude: 35° 29' 26.7576" N, Longitude: -108° 1' 2.7798" W)

Emergency Egress Route Off-Site: Private road connecting to County Road 19, Prewitt, McKinley County

Off-Site Meeting Location: Hampton Inn and Suites Gallup
1460 W Maloney Ave
Gallup NM 87301

Emergency Decontamination Procedures: For JHA 1 (Tasks 1,2,3,5 – START) See START's attached HASP

Company/Resource	**Name Contact**	**Telephone Numbers**
USEPA	Region Response Center Harry Allen, ERS Chief OSC:	(415) 947-4400 (415) 972-3063 (Office) (415) 218-7406 (Cell)
START	Buffalo EOC Dr. Paul Jonmaire, Safety Director Cindy McLeod, START	(716) 684-8940 (Hotline) (716) 684-8060 (Office) (716) 655-1260 (Home) (510) 893-6700 (Office) (415) 238-3379 (cell)
SERAS		
Hospital: Cibola General Hospital, 1016 E Roosevelt Ave, Grants, NM 87020 - (505) 287-4446 (Route Map in Appendix B)	**Directions:** Head SW on Co Rd 19. Turn left onto NM-122E/Frontage Road for 18 miles. Continue onto W Santa Fe Ave for 1.4 miles. Turn left onto 1st St for 0.9 miles. Slight right onto W Roosevelt Ave. Hospital will be on the left in 0.7 mile	(505) 287-4446
Poison Control Center		(800) 222-1222
Police		911 (Gallup Metro Dispatch)
Fire		911 (Gallup Metro Dispatch)
Site	USEPA START SERAS	SEE TABLE IN COMMUNICATIONS SECTION

Participant Acknowledgment Sheet

Name	**Organization**	**Date**

Appendix A: Chemical Hazard Sheets

Centers for Disease Control and Prevention
CDC 24/7: Saving Lives. Protecting People. Saving Money through Prevention.

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SEARCH

Enter search terms separated by spaces.

Uranium (soluble compounds, as U)

Synonyms & Trade Names Synonyms vary depending upon the specific soluble uranium compound.

CAS No.	RTECS No.	DOT ID & Guide
	Conversion	IDLH Ca [10 mg/m3 (as U)] See: uranium (/niosh/idlh/uranium.html)

Exposure Limits	Measurement Methods
NIOSH REL : Ca TWA 0.05 mg/m3 See Appendix A (nengapdxa.html) OSHA PEL : TWA 0.05 mg/m3	None available See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html)

Physical Description Appearance and odor vary depending upon the specific soluble uranium compound.

Properties vary depending upon the specific soluble uranium compound.					

Incompatibilities & Reactivities Uranyl nitrate: combustibles Uranium hexafluoride: water

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms lacrimation (discharge of tears), conjunctivitis; short breath, cough, chest rales; nausea, vomiting; skin burns; red blood cell, casts in urine; proteinuria; high blood urea nitrogen; [potential occupational carcinogen] Potential for cancer is a result of alpha-emitting properties & radioactive decay products (e.g., radon).

Target Organs respiratory system, blood, liver, kidneys, lymphatic system, skin, bone marrow

Cancer Site [lung cancer]

Personal Protection/Sanitation	First Aid
(See protection codes (protect.html)) **Skin:** Prevent skin contact **Eyes:** Prevent eye contact **Wash skin:** When contaminated/Daily **Remove:** When wet or contaminated **Change:** Daily **Provide:** Eyewash (UF_6), Quick drench	(See procedures (firstaid.html)) **Eye:** Irrigate immediately **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 (Halides):
(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 (pgintrod.html#nrp) for information on selection of N, R, or P filters.
Any appropriate escape-type, self-contained breathing apparatus

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

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See MEDICAL TESTS: 0239 (/niosh/docs/2005-110/nmed0239.html)

Page last reviewed: April 4, 2011
Page last updated: November 18, 2010
Content source: National Institute for Occupational Safety and Health (NIOSH) Education and Information Division

Centers for Disease Control and Prevention 1600 Clifton Rd. Atlanta, GA 30333, USA
800-CDC-INFO (800-232-4636) TTY: (888) 232-6348, New Hours of Operation 8am-8pm ET/Monday-Friday
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Uranium (insoluble compounds, as U)

Synonyms & Trade Names **Uranium metal:** Uranium I
Synonyms of other insoluble uranium compounds vary depending upon the specific compound.

CAS No. 7440-61-1 (metal)	**RTECS No.** YR3490000 (metal) (/niosh-rtecs/YR3540D0.html)	**DOT ID & Guide** 2979 162 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=162) (metal, pyrophoric)
Formula U (metal)	**Conversion**	**IDLH** Ca [10 mg/m3 (as U)] See: 7440611 (/niosh/idlh/7440611.html)
Exposure Limits **NIOSH REL** : Ca TWA 0.2 mg/m3 ST 0.6 mg/m3 See Appendix A (nengapdxa.html) **OSHA PEL** † (nengapdxg.html) : TWA 0.25 mg/m3		**Measurement Methods** None available See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html)

Physical Description Metal: Silver-white, malleable, ductile, lustrous solid. [Note: Weakly radioactive.]

MW: 238.0	**BP:** 6895° F	MLT: 2097°F	**Sol:** Insoluble	**VP:** 0 mmHg (approx)	**IP:** NA
Sp.Gr: 19.05 (metal)	**Fl.P:** NA	**UEL:** NA	**LEL:** NA		**MEC:** 60 g/m3

Metal: Combustible Solid, especially turnings and powder.

Incompatibilities & Reactivities Carbon dioxide, carbon tetrachloride, nitric acid, fluorine [Note: Complete coverage of uranium metal scrap with oil is essential for prevention of fire.]

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms dermatitis; kidney damage; blood changes; [potential occupational carcinogen]; in animals: lung, lymph node damage; [potential occupational carcinogen] Potential for cancer is a result of alpha-emitting properties & radioactive decay products (e.g., radon).

Target Organs Skin, kidneys, bone marrow, lymphatic system

Cancer Site [lung cancer]

Personal Protection/Sanitation (See protection codes (protect.html)) **Skin:** Prevent skin contact **Eyes:** Prevent eye contact **Wash skin:** When contaminated/Daily	**First Aid** (See procedures (firstaid.html)) **Eye:** Irrigate immediately **Skin:** Soap wash promptly **Breathing:** Respiratory support **Swallow:** Medical attention immediately

Remove: When wet or contaminated
Change: Daily
Provide: Eyewash

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 (pgintrod.html#nrp) for information on selection of N, R, or P filters.
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 1251 (/niosh/ipcsneng/neng1251.html)
See MEDICAL TESTS: 0239 (/niosh/docs/2005-110/nmed0239.html)

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Occupational Safety and Health Guideline for Uranium and Insoluble Compounds

DISCLAIMER:

These guidelines were developed under contract using generally accepted secondary sources. The protocol used by the contractor for surveying these data sources was developed by the National Institute for Occupational Safety and Health (NIOSH), the Occupational Safety and Health Administration (OSHA), and the Department of Energy (DOE). The information contained in these guidelines is intended for reference purposes only. None of the agencies have conducted a comprehensive check of the information and data contained in these sources. It provides a summary of information about chemicals that workers may be exposed to in their workplaces. The secondary sources used for supplements III and IV were published before 1992 and 1993, respectively, and for the remainder of the guidelines the secondary sources used were published before September 1996. This information may be superseded by new developments in the field of industrial hygiene. Therefore readers are advised to determine whether new information is available.

Introduction | Applicability | Recognition | Evaluation | Controls | References | Bibliography | Reference Table

Introduction

This guideline summarizes pertinent information about uranium and insoluble uranium compounds (measured as uranium) for workers and employers as well as for physicians, industrial hygienists, and other occupational safety and health professionals who may need such information to conduct effective occupational safety and hea programs. Recommendations may be superseded by new developments in these fields; readers are therefore advised to regard these recommendations as general guidelines and to determine periodically whether new information is available.

Applicability

This guideline applies to metallic uranium and all insoluble uranium compounds; examples of such compounds include triuranium octaoxide, uranium dioxide, uranium hydride, uranium tetrafluoride, and uranium trioxide. The physical and chemical properties of uranium and of some insoluble uranium compounds are presented below fo illustrative purposes.

Recognition

Metallic uranium

SUBSTANCE IDENTIFICATION

* Formula
U
* Structure
(For Structure, see paper copy)
* Synonyms
U; Uranium metal, pyrophoric; uranium.
* Identifiers

1. CAS 7440-61-1.
2. RTECS YR3490000.
3. DOT UN: 2979 65 (for the pyrophoric forms of the metal).
4. DOT labels: Radioactive and Flammable Solid.

* Appearance and odor
Elemental uranium is a heavy, malleable, silvery white, lustrous, radioactive metal that is pyrophoric when finely divided. When uranium is obtained by reduction, it take the form of a black powder. In its natural state, uranium has three isotopes: (234)U, (235)U, and (238)U. U-238 has a half life of 4,510,000,000 years.

CHEMICAL AND PHYSICAL PROPERTIES

* Physical data

1. Atomic number: 92.
2. Atomic weight: 238.03.
3. Boiling point (760 torr): 3818 degrees C (6904 degrees F).
4. Specific gravity (water = 1): 19.05 + 0.02 at 20 degrees C (68 degrees F).
5. Vapor density: Not applicable.
6. Melting point: 1132.3 degrees C (2070 degrees F).
7. Vapor pressure at 20 degrees C (68 degrees F): Nearly zero.
8. Solubility: Insoluble in water, alcohol, and alkalies; soluble in acids.

9. Evaporation rate: Not applicable.

Triuranium Octaoxide

SUBSTANCE IDENTIFICATION

* Formula
U(3)O(8)
* Structure
(For Structure, see paper copy)
* Synonyms
Uranium oxide, pitchblende, nasturan, uraninite.
* Identifiers

1. CAS 1317-99-3.
2. RTECS YR3400000.
3. Specific DOT number: None.
4. Specific DOT label: None.

* Appearance and odor
Triuranium octaoxide is an olive green to black, odorless solid.

CHEMICAL AND PHYSICAL PROPERTIES

* Physical data

1. Molecular weight: 842.1.
2. Boiling point: Not applicable.
3. Specific gravity (water = 1): 8.30 at 20 degrees C (68 degrees F).
4. Vapor density: Not applicable.
5. Melting point: 1300 degrees C (2372 degrees F) (decomposes to uranium dioxide).
6. Vapor pressure at 20 degrees C (68 degrees F): Nearly zero.
7. Solubility: Insoluble in water; soluble in nitric and sulfuric acids.
8. Evaporation rate: Not applicable.

Uranium dioxide

SUBSTANCE IDENTIFICATION

* Formula
UO(2)
* Structure
(For Structure, see paper copy)
* Synonyms
Uranous oxide, black uranium oxide, uranium oxide, uranic oxide, urania, yellow cake.
* Identifiers

1. CAS 1344-57-6.
2. RTECS: None.
3. Specific DOT number: None.
4. Specific DOT label: None.

* Appearance and odor
Uranium dioxide is a pyrophoric, black, crystalline solid. It occurs naturally in various minerals including uraninite, pitchblende, and tyuyamunite. The latter is the most important mineral commercially.

CHEMICAL AND PHYSICAL PROPERTIES

* Physical data

1. Molecular weight: 270.03.
2. Boiling point: Data not available.
3. Specific gravity (water = 1): 10.96 at 20 degrees C (68 degrees F).
4. Vapor density: Not applicable.
5. Melting point: 2858-2898 degrees C (5176-5248 degrees F).
6. Vapor pressure: Not applicable.
7. Solubility: Insoluble in water; soluble in concentrated sulfuric acid and nitric acid.
8. Evaporation rate: Not applicable.

Uranium hydride

SUBSTANCE IDENTIFICATION

* Formula
UH(3)
* Structure
(For Structure, see paper copy)
* Synonyms
Uranium trihydride.
* Identifiers

1. CAS 13598-56-6.
2. RTECS: None.
3. Specific DOT number: None.
4. Specific DOT label: None.

* Appearance and odor

Uranium hydride is a brownish-black or brownish-gray, pyrophoric powder.

CHEMICAL AND PHYSICAL PROPERTIES

* Physical data

1. Molecular weight: 241.05.
2. Boiling point (760 torr): Not applicable.
3. Specific gravity (water = 1): 10.95 at 20 degrees C (68 degrees F).
4. Vapor density: Not applicable.
5. Melting point: Decomposes.
6. Vapor pressure at 20 degrees C (68 degrees F): Nearly zero.
7. Solubility: Insoluble in water, alcohol, acetone, or liquid ammonia; slightly soluble in dilute hydrogen chloride; decomposes in nitric acid.
8. Evaporation rate: Not applicable.

Uranium tetrafluoride

SUBSTANCE IDENTIFICATION

* Formula
UF(4)
* Structure
(For Structure, see paper copy)
* Synonyms
Green salt.
* Identifiers

1. CAS 10049-14-6.
2. RTECS: None.
3. Specific DOT number: None.
4. Specific DOT label: None.

* Appearance and odor
Uranium tetrafluoride is a nonvolatile, green, odorless, crystalline solid.

CHEMICAL AND PHYSICAL PROPERTIES

* Physical data

1. Molecular weight: 314.
2. Boiling point (760 torr): 1417 degrees C (2582 degrees F).
3. Specific gravity (water = 1): 6.7 at 20 degrees C (68 degrees F).
4. Vapor density: Not applicable.
5. Melting point: 955-965 degrees C (1751-1769 degrees F).
6. Vapor pressure at 20 degrees C (68 degrees F): Nearly zero.
7. Solubility: Insoluble in water; soluble (decomposes) in concentrated acids and alkalies.
8. Evaporation rate: Not applicable.

* Reactivity

1. Conditions contributing to instability: Heat, flame, or exposure to air. Uranium metal reacts with nearly all nonmetals. Uranium turnings and fines stored out-of-doors in closed containers under water or water-soluble oil will convert partially to the hydride and will eventually ignite during hot weather.
2. Incompatibilities: Pure uranium is very reactive and is a strong reducing agent. Clean uranium turnings or chips oxidize readily in air. Contact of uranium with carbon dioxide, carbon tetrachloride, or nitric acid causes fires or explosions. Uranium hydride is spontaneously flammable in air, and contact of the hydride with strong oxidizers may cause fires and explosions. Contact of uranium hydride with water forms flammable and explosive hydrogen gas, and contact of the hydride with halogenated hydrocarbons can cause violent reactions. In finely divided form, uranium dioxide ignites spontaneously in air.
3. Hazardous decomposition products: Toxic particulates, gases, and vapors (such as uranium metal fume, oxides of uranium, hydrogen fluoride, carbon monoxide, and dangerous radioactive materials) may be released when uranium or an insoluble uranium compound decomposes.
4. Special precautions: Uranium is radioactive and highly reactive and should be handled with extreme caution at all times. Uranium tetrafluoride is highly corrosive.

* Flammability
The National Fire Protection Association has not assigned a flammability rating to uranium or the insoluble uranium compounds. Other sources rate uranium in solid or powder form as a very dangerous fire hazard when this substance is exposed to heat or open flame.

1. Flash point: Data not available.
   Autoignition temperature: The ignition temperature depends on the extent to which the metal is subdivided. The ignition temperature of the metal is 170 degrees C (338 degrees F) (if oxygen is present); finely divided uranium metal (dust) ignites at room temperature (20 degrees C (68 degrees F)).
2. Flammable limits in air: Not applicable.
3. Minimum explosive concentration: 60 g/m(3).
4. Extinguishant: Use graphite chips, carbon dust, asbestos blankets, or flooding with water to extinguish small uranium fires. There is no effective way to extinguish large uranium fires.

   Fires involving uranium or an insoluble uranium compound should be fought upwind and from the maximum distance possible. Keep unnecessary people away; isolate hazard area and deny entry. Emergency personnel should stay out of low areas and ventilate closed spaces before entering. Finely divided uranium (chips, turnings, shavings, etc.) are much more reactive than uranium in bulk form. If these are present during a fire, do not disperse them into a dust cloud, which may be explosive. Uranium metal may ignite spontaneously if exposed to air or other substances, may burn rapidly with a flare-burning effect, and may re-ignite after the fire has been extinguished. Containers of uranium or an insoluble uranium compound may explode in the heat of the fire and should be moved from the fire area if it is possible to do so safely. If this is not possible, cool containers from the sides with water until well after the fire is out. Stay away from the ends of containers. Personnel should withdraw immediately if a rising sound from a venting safety device is heard or if there is discoloration of a container due to fire. Dikes should be used to contain fire-control water for later disposal. If a tank car or truck is involved in a fire, personnel should isolate an area of a half a mile in all directions. Delay cleanup until arrival of, or instruction from, a qualified radiation authority. Firefighters should wear a full set of protective clothing, including a self-contained breathing apparatus, when fighting fires involving uranium or an insoluble uranium compound. Firefighters' protective clothing may provide limited protection against fires involving uranium or an insoluble uranium compound.

* Warning properties
No quantitative data are available on the odor threshold for uranium or insoluble uranium compounds; several of these substances are odorless. For the purpose of selecting appropriate respiratory protection, these substances are therefore considered to have inadequate odor warning properties.

* Eye irritation properties
No quantitative data are available on the eye irritation threshold for uranium or the insoluble uranium compounds.

EXPOSURE LIMITS

The current Occupational Safety and Health Administration (OSHA) permissible exposure limits (PELs) for uranium and the insoluble uranium compounds (measured as uranium) are 0.2 milligram per cubic meter (mg/m(3)) of air as an 8-hour time-weighted average (TWA) concentration and 0.6 mg/m(3) as a 15-minute TWA short-terr exposure limit (STEL). A STEL is the maximum 15-minute concentration to which workers may be exposed during any 15-minute period of the working day [29 CFR 1910.1000, Table Z-1-A]. The National Institute for Occupational Safety and Health (NIOSH) has not issued a recommended exposure limit (REL) for uranium or its insol uranium compounds; however, NIOSH concurs with the PEL established for this substance by OSHA [NIOSH 1988]. The American Conference of Governmental Industria Hygienists (ACGIH) has assigned uranium and the insoluble uranium compounds a threshold limit value (TLV) of 0.2 mg/m(3) as a TWA for a normal 8-hour workday an 40-hour workweek and a short-term exposure limit (STEL) of 0.6 mg/m(3) for periods not to exceed 15 minutes [ACGIH 1988, p. 37]. The OSHA and ACGIH limits are b on the risk of kidney and blood disorders and on the radiological damage associated with exposure to uranium or an insoluble uranium compound.

Evaluation

HEALTH HAZARD INFORMATION

* Routes of Exposure
Exposure to uranium or an insoluble uranium compound can occur via inhalation, ingestion, and eye or skin contact. Exposure to uranium trioxide can occur by absorptic through the skin, eyes, and mucous membranes.

* Summary of toxicology

1. Effects on Animals: Metallic uranium and insoluble uranium compounds may produce both chemical poisoning and radiation injury to the kidneys and lungs of exposed animals [Clayton and Clayton 1981, p. 1996]. The insoluble uranium compounds are less toxic chemically than the soluble compounds, but uranium and uranium compounds have the potential to cause radiation damage [Clayton and Clayton 1981, p. 2000; Klaassen, Amdur, and Doull 1986, p. 695]. The inhalation toxicity of uranium and the insoluble compounds of uranium is much greater than their oral toxicity [Clayton and Clayton 1981, p. 2000]. No dietary amount of insoluble uranium compounds acceptable to rats was lethal, and no evidence of systemic poisoning developed after the application of an insoluble compound to rabbit skin [Clayton and Clayton 1981, p. 2000]. However, uranium trioxide is lethal when placed in the conjunctival sac of rabbits' eyes, and uranium tetrafluorid causes direct eye injury [Grant 1986, p. 965]. Acute inhalation exposure to 20-mg/m(3) concentrations of uranium tetrafluoride, uranium dioxide, or high-grade uranium ore was occasionally fatal to some laboratory animals; exposure to a 2.5-mg/m(3) concentration of uranium tetrafluoride, uranium dioxide, or high-grade uranium ore caused mild or no renal damage and no fatalities in these animals [Clayton and Clayton 1981, p. 2001]. Chronic inhalation exposure to an insoluble uranium compound may produce radiation injury. In dogs and monkeys exposed to 5 mg/m(3) uranium dioxide for 6 hours/day, 5 days/week for up to 5 years, fibrotic changes suggestive of radiation injury were found in the tracheobronchial lymph nodes of both species and in the lungs of monkeys. No kidney damage w observed in these animals [Clayton and Clayton 1981, p. 2002]. Dogs tolerated inhalation of a 10-mg/m(3) concentration of uranium dioxide every day for 1 year dietary exposure to 10 g/kg/day for 1 year [Clayton and Clayton 1981, pp. 2001-2002]. Rats injected with metallic uranium in the femoral bone marrow and ches wall developed site-of-contact sarcomas; in these cases, the effects of chemical injury could not be distinguished from those of radiation damage [Clayton and Clayton 1981, p. 2003].
2. Effects on Humans: Metallic uranium and insoluble uranium compounds may produce both chemical poisoning and radiation injury [Clayton and Clayton 1981, p. 1996]. The insoluble uranium compounds are less toxic chemically than the soluble compounds, but uranium and all uranium compounds have the potential to ca radiation damage [Clayton and Clayton 1981, p. 2000; Klaassen, Amdur, and Doull 1986, p. 695]. Exposure to the dusts of uranium or to an insoluble uranium compound may cause respiratory irritation, cough, and shortness of breath [Genium MSDS 1988, No. 238]. Dermatitis has also been reported, and prolonged skir contact causes radiation injury to the basal cells [Proctor, Hughes, and Fischman 1988, p. 502]. Studies have shown that uranium workers are at increased risk o death from respiratory, lymphatic, and hematopoietic cancers; these deaths are presumed to be caused by radiation injury from radon gas, a byproduct of uraniu decay [Rom 1983, p. 688]. A study of the risk of respiratory deaths among uranium miners in the United States showed the following dose-response: miners exp occupationally for 5 to 9.9 years had a 2-fold increase in risk; miners exposed for 10 to 24.9 years had a 3.6-fold increase in risk; and those exposed for greater t 24.9 years had a 3.75-fold increase in risk. Smoking was shown both to increase the risk of death from respiratory disease and to shorten the neoplastic latency period [Clayton and Clayton 1981, pp. 2010-2011].

* Signs and symptoms of exposure

1. Acute exposure: The signs and symptoms of acute exposure to uranium or an insoluble uranium compound include respiratory irritation, cough, and shortness of breath.
2. Chronic exposure: 2. Chronic exposure: The signs and symptoms of chronic exposure to uranium or an insoluble uranium compound include those of lung damag shortness of breath, dry or productive cough, rales, cyanosis, and clubbing of the fingers. Long-term exposure also may cause cancer of the blood-forming syster the lymph system, and the respiratory tract, as well as anemia and leukopenia. The signs and symptoms of uranium-induced dermatitis may include irritation, redness, blistering, thickening, or hyperpigmentation of the skin.

* Emergency procedures:
In the event of an emergency, remove the victim from further exposure, send for medical assistance, and initiate the following emergency procedures:

1. Eye exposure: If uranium or an insoluble uranium compound gets into the eyes, immediately flush the eyes with large amounts of water for a minimum of 15 minutes, lifting the lower and upper lids occasionally. If irritation persists, get medical attention as soon as possible.
2. Skin exposure: If uranium or an insoluble uranium compound contacts the skin, the contaminated skin should be washed with soap and water. Contaminated bod surfaces should immediately be decontaminated in accordance with radiation procedures. Get medical attention.
3. Inhalation: If uranium or an insoluble uranium compound is inhaled, move the victim at once to fresh air and get medical care as soon as possible. If the victim is breathing, perform cardiopulmonary resuscitation; if breathing is difficult, give oxygen. Keep the victim warm and quiet until medical help arrives.
4. Ingestion: If uranium or an insoluble uranium compound is ingested, give the victim several glasses of water to drink and then induce vomiting by having the vict touch the back of the throat with the finger or by giving syrup of ipecac as directed on the package. Do not force an unconscious or convulsing person to drink liquids or to vomit. Get medical help immediately. Keep the victim warm and quiet until medical help arrives.
5. Rescue: Remove an incapacitated worker from further exposure and implement appropriate emergency procedures (e.g., those listed on the Material Safety Data Sheet required by OSHA's Hazard Communication Standard, 29 CFR 1910.1200). All workers should be familiar with emergency procedures and the location and proper use of emergency equipment.

EXPOSURE SOURCES AND CONTROL METHODS

The following operations may involve uranium and insoluble uranium compounds and lead to worker exposures to these substances:

- Mining, grinding, and milling of uranium ores
- Use in nuclear reactors as fuel and to pack nuclear fuel rods and in the production of nuclear weapons
- Burning of uranium metal chips and smelting operations
- Use in the ceramics industry for pigments, coloring porcelain, painting on porcelain, and enamelling

- Use as catalysts for many reactions, in gas manufacture, and in production of fluorescent glass
- Use in photographic processes, for alloying steel, in radiation shielding, and in aircraft counterweights
- Use as a source of plutonium and radium salts

Uranium hydride:

* Use as a lab source for pure hydrogen, for separation of hydrogen isotopes, and as a reducing agent
Methods that are effective in controlling worker exposures to uranium and insoluble uranium compounds, depending on the feasibility of implementation, are

- Process enclosure,
- Local exhaust ventilation,
- General dilution ventilation, and
- Personal protective equipment.

The following publications are good sources of information on control methods:

1. ACGIH [1986]. Industrial ventilation--a manual of recommended practice. Cincinnati, OH: American Conference of Governmental Industrial Hygienists.
2. Burton DJ [1986]. Industrial ventilation--a self study companion. Cincinnati, OH: American Conference of Governmental Industrial Hygienists.
3. Alden JL, Kane JM [1982]. Design of industrial ventilation systems. New York, NY: Industrial Press, Inc.
4. Wadden RA, Scheff PA [1987]. Engineering design for control of workplace hazards. New York, NY: McGraw-Hill.
5. Plog BA [1988]. Fundamentals of industrial hygiene. Chicago, IL: National Safety Council.

MEDICAL MONITORING

Workers who may be exposed to chemical and radiation hazards should be monitored in a systematic program of medical surveillance that is intended to prevent occupational injury and disease. The program should include education of employers and workers about work-related hazards, placement of workers in jobs that do not jeopardize their safety or health, early detection of adverse health effects, and referral of workers for diagnosis and treatment. The occurrence of disease or other work-related adverse health effects should prompt immediate evaluation of primary preventive measures (e.g., industrial hygiene monitoring, engineering controls, and perso protective equipment). A medical monitoring program is intended to supplement, not replace, such measures. To place workers effectively and to detect and control wor related health effects, medical evaluations should be performed (1) before job placement, (2) periodically during the period of employment, and (3) at the time of job transfer or termination.

* Preplacement medical evaluation
Before a worker is placed in a job with a potential for exposure to uranium or an insoluble uranium compound, the examining physician should evaluate and document tl worker's baseline health status with thorough medical, environmental, and occupational histories, a physical examination, and physiologic and laboratory tests appropria for the anticipated occupational risks. These should concentrate on the function and integrity of the kidneys, respiratory system, blood, liver, bone marrow, skin, and lymphatics. Medical monitoring for respiratory disease should be conducted using the principles and methods recommended by NIOSH and the American Thoracic Societ

A preplacement medical evaluation is recommended to assess an individual's suitability for employment at a specific job and to detect and assess medical conditions tha may be aggravated or may result in increased risk when a worker is exposed to uranium or an insoluble uranium compound at or below the prescribed exposure limit. Tl examining physician should consider the probable frequency, intensity, and duration of exposure as well as the nature and degree of any applicable medical condition. S conditions (which should not be regarded as absolute contraindications to job placement) include a history and other findings consistent with diseases of the kidneys, respiratory system, blood, liver, bone marrow, skin, or lymphatics.

* Periodic medical examinations and biological monitoring
Occupational health interviews and physical examinations should be performed at regular intervals during the employment period, as mandated by any applicable Federa State, or local standard. Where no standard exists and the hazard is minimal, evaluations should be conducted every 3 to 5 years or as frequently as recommended by a experienced occupational health physician. Additional examinations may be necessary if a worker develops symptoms attributable to uranium exposure. The interviews, examinations, and medical screening tests should focus on identifying the adverse effects of uranium on the kidneys, respiratory system, blood, liver, bone marrow, skin lymphatics. Current health status should be compared with the baseline health status of the individual worker or with expected values for a suitable reference populatior

Biological monitoring involves sampling and analyzing body tissues or fluids to provide an index of exposure to a toxic substance or metabolite. Urinary uranium concentrations correlate well with airborne uranium levels. Some sources report that urinary concen-trations of 50 þg uranium per liter of urine or 100 þg uranium per lit of urine correspond to constant daily exposures of approximately 0.05 mg/m(3) or 0.25 mg/m(3), respectively. Because there is great interindividual and intraindividual variability in urinary uranium concentrations, a pattern of urinary uranium excretion should be established for every exposed worker by sampling individuals at the same time on several different shifts and by sampling frequently.

* Medical examinations recommended at the time of job transfer or termination
The medical, environmental, and occupational history interviews, the physical examination, and selected physiologic or laboratory tests that were conducted at the time placement should be repeated at the time of job transfer or termination to determine the worker's medical status at the end of his or her employment. Any changes in tl worker's health status should be compared with those expected for a suitable reference population. Because occupational exposure to uranium or an insoluble uranium compound may cause diseases with prolonged latent periods, the need for medical monitoring may extend well beyond the termination of employment.

WORKPLACE MONITORING AND MEASUREMENT PROCEDURES

Determination of a worker's exposure to airborne uranium or an insoluble uranium compound (measured as uranium) is made using a mixed cellulose ester filter (0.8 micron). Samples are collected at a maximum flow rate of 2 liters per minute until a maximum air volume of 960 liters is collected. Analysis is conducted by neutron activation. This method is included in the OSHA In-House Methods File.

Controls

PERSONAL HYGIENE PROCEDURES

If uranium or an insoluble uranium compound contacts the skin, workers should immediately wash the affected areas with soap and water. Contaminated body surfaces should immediately be decontaminated in accordance with radiation procedures.
Clothing contaminated with uranium or an insoluble uranium compound should be removed immediately, and provisions should be made for the safe removal of the chemical from the clothing. Persons laundering the clothes should be informed of the toxic and radioactive hazards of uranium.
A worker who handles uranium or an insoluble uranium compound should thoroughly wash hands, forearms, and face with soap and water before eating, using tobacco products, or using toilet facilities.
Workers should not eat, drink, or use tobacco products in areas where uranium or an insoluble uranium compound is handled, processed, or stored.

STORAGE

Uranium and insoluble uranium compounds should be stored in a cool, dry, well-ventilated area in tightly sealed containers that are labeled in accordance with OSHA's Hazard Communication Standard [29 CFR 1910.1200]. Containers of uranium or of insoluble uranium compounds should be protected from physical damage and should

stored separately from carbon dioxide, carbon tetra-chloride, nitric acid, air, nonmetals, heat, sparks, and open flame. Uranium hydride should not be allowed to contact water, strong oxidizers, or halogenated hydrocarbons. Because empty containers that formerly contained uranium or a uranium compound may still hold product residue they should be handled appropriately.

SPILLS AND LEAKS

In the event of a spill or leak involving uranium or an insoluble uranium compound, persons not wearing protective equipment and clothing should be restricted from contaminated areas until cleanup has been completed. A clean-up plan must be available to address an accidental leak or spill of uranium or an insoluble uranium compo because special radiation procedures are required and professional assistance is needed. The following steps should be undertaken following a spill or leak:

1. Do not touch the spilled material; stop the leak if it is possible to do so without risk.
2. Notify safety personnel.
3. Remove all sources of heat and ignition.
4. Ventilate the area of the spill or leak.
5. Protect cleanup personnel from contact with or inhalation of uranium dust.

EMERGENCY PLANNING, COMMUNITY RIGHT-TO-KNOW, AND HAZARDOUS WASTE MANAGEMENT REQUIREMENTS

The Environmental Protection Agency's (EPA's) regulatory requirements for emergency planning, community right-to-know, and hazardous waste management may vary over time. Users are therefore advised to determine periodically whether new information is available.

* Emergency planning requirements
Uranium and insoluble uranium compounds are not subject to EPA emergency planning requirements under the Superfund Amendments and Reauthorization Act (Title I

* Reportable quantity requirements for hazardous releases
Employers are not required by the emergency release notification provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) [CFR Part 355.40] to notify the National Response Center of an accidental release of uranium or an insoluble uranium compound; there is no reportable quantity for these substances.

* Community right-to-know requirements
Employers are not required by Section 313 of the Superfund Amendments and Reauthorization Act (SARA) to submit a Toxic Chemical Release Inventory form (Form R) EPA reporting the amount of uranium or an insoluble uranium compound emitted or released from their facility annually.

* Hazardous waste management requirements
EPA considers a waste to be hazardous if it exhibits any of the following characteristics: ignitability, corrosivity, reactivity, or toxicity, as defined in 40 CFR 261.21-261.24 Under the Resource Conservation and Recovery Act (RCRA), EPA has specifically listed many chemical wastes as hazardous. Although uranium and insoluble uranium compounds are not specifically listed as a hazardous waste under RCRA, EPA requires employers to treat any waste as hazardous if it exhibits any of the characteristics discussed above.

Providing more information about the removal and disposal of specific chemicals is beyond the scope of this guideline. EPA, U.S. Department of Transportation, and Stat and local regulations should be followed to ensure that removal, transport, and disposal of this substance are conducted in accordance with existing regulations. To be certain that chemical waste disposal meets EPA regulatory requirements, employers should address any questions to the RCRA hotline at (202) 382-3000 (in Washingtor D.C.) or toll-free at (800) 424-9346 (outside Washington, D.C.). In addition, relevant State and local authorities should be contacted for information on any requirements they may have for the waste removal and disposal of this substance.

RESPIRATORY PROTECTION

* Conditions for respirator use
Good industrial hygiene practice requires that engineering controls be used where feasible to reduce workplace concentrations of hazardous materials to the prescribed exposure limit. However, some situations may require the use of respirators to control exposure. Respirators must be worn if the ambient concentration of uranium or ar insoluble uranium compound exceeds prescribed exposure limits. Respirators may be used (1) before engineering controls have been installed, (2) during work operatior such as maintenance or repair activities that involve unknown exposures, (3) during operations that require entry into tanks or closed vessels, and (4) during emergency situations. If the use of respirators is necessary, the only respirators permitted are those that have been approved by NIOSH and the Mine Safety and Health Administrat (MSHA).

* Respiratory protection program
Employers should institute a complete respiratory protection program that, at a minimum, complies with the requirements of OSHA's Respiratory Protection Standard [29 CFR 1910.134]. Such a program must include respirator selection (see Table 1), an evaluation of the worker's ability to perform the work while wearing a respirator, the regular training of personnel, fit testing, periodic workplace monitoring, and regular respirator maintenance, inspection, and cleaning. The implementation of an adequat respiratory protection program (including selection of the correct respirator) requires that a knowledgeable person be in charge of the program and that the program be evaluated regularly. For additional information on the selection and use of respirators and on the medical screening of respirator users, consult the **NIOSH Respirator Decision Logic** and the **NIOSH Guide to Industrial Respiratory Protection**.

Table 1 lists the respiratory protection that NIOSH recommends for workers exposed to uranium or an insoluble uranium compound. The recommended protection may over time because of changes in the exposure limit for uranium or the insoluble uranium compounds or in respirator certification requirements. Users are therefore advis to determine periodically whether new information is available.

PERSONAL PROTECTIVE EQUIPMENT

Protective clothing should be worn to prevent skin contact with uranium or an insoluble uranium compound. Impervious gloves, boots, and aprons should be worn as appropriate when handling any of these substances. Chemical protective clothing should be selected on the basis of available performance data, manufacturers' recommendations, and evaluation of the clothing under actual conditions of use. No reports have been published on the resistance of various protective clothing materia permeation by uranium or an insoluble uranium compound; however, one source recommends natural rubber, neoprene, or polyvinyl chloride as a protective clothing material. If permeability data are not readily available, protective clothing manufacturers should be requested to provide information on the best chemical protective clothing for workers to wear when they are exposed to uranium or an insoluble uranium compound.

If uranium or an insoluble uranium compound is dissolved in an organic solvent, the permeation properties of both the solvent and the mixture must be considered wher selecting personal protective equipment and clothing.

Safety glasses, goggles, or faceshields should be worn during operations in which uranium or an insoluble uranium compound might contact the eyes. Eyewash fountain and emergency showers should be available within the immediate work area whenever the potential exists for eye or skin contact with uranium or its insoluble compoun Contact lenses should not be worn if the potential exists for exposure to any of these substances.

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Reference Table

Table 1
NIOSH recommended respiratory protection for workers exposed to uranium or an insoluble uranium compound*

Condition	Minimum respiratory protection**
Airborne concentration of uranium or an insoluble uranium compound:	
0.2 to 2 mg/m(3) (10 X PEL)	Single-use or quarter mask respirator
5 to 50 mg/m(3) (10 X PEL)	Any air-purifying, half-mask respirator equipped with a fume or high-efficiency filter approved for radon daughters or radionuclides, or Any air-purifying, full-facepiece respirator equipped with a fume filter approved for radon daughters, or Any supplied-air respirator equipped with a half mask and operated in a

	demand (negative-pressure) mode
0.2 to 5 mg/m(3) (25 X PEL)	Any powered, air-purifying respirator equipped with a hood or helmet and a fume or high-efficiency filter approved for radon daughters or radio-nuclides, or Any supplied-air respirator equipped with a hood or helmet and operated in a continuous-flow mode
0.2 to 10 mg/m(3) (50 X PEL)	Any air-purifying, full-facepiece respirator equipped with a high-efficiency filter approved for radon daughters or radio-nuclides, or Any powered, air-purifying respirator equipped with a tight-fitting facepiece and a high-efficiency filter approved for radon daughters or radio-nuclides, or Any supplied-air respirator equipped with a full facepiece and operated in a demand (negative-pressure) mode, or Any supplied-air respirator equipped with a tight-fitting facepiece and operated in a continuous-flow mode, or Any self-contained respirator equipped with a full facepiece and operated in a demand (negative-pressure) mode
0.2 to 30 mg/m(3) (150 X PEL)	Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode
Entry into IDLH(+) or unknown concentrations	Any self-contained respirator equipped with a full facepiece and operated in a pressure-demand or other positive-pressure mode, or Any supplied-air respirator equipped with a full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode
Firefighting	Any self-contained respirator equipped with a full facepiece and operated in a pressure-demand or other positive-pressure mode
Escape	Any air-purifying, full-facepiece respirator equipped with a high-efficiency filter approved for radon daughters or radionuclides, or Any escape-type, self-contained breathing apparatus with a suitable service life (number of minutes required to escape the environment)

* The OSHA PEL is 0.2 mg/m(3) as an 8-hour TWA. No NIOSH REL has been issued.

** Only NIOSH/MSHA-approved equipment should be used. Also note the following:

1. Respirators accepted for use at higher concentrations may be used at lower concentrations; respirators must not, however, be used at concentrations higher than those for which they are approved.
2. Air-purifying respirators may not be used in oxygen-deficient atmospheres or in airborne concentrations that are immediately dangerous to life or health (IDLH).

(+) The uranium or an insoluble uranium compound concentration that is immediately dangerous to life and health (IDLH) is 30 mg/m(3) [NIOSH 1987b].

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www.OSHA.gov

Tick Borne Disease

(The following are recommended good work practices and are not OSHA standards)

Anyone working in the outdoors, especially in areas with tall grasses, shrubs, low hanging branches, or leaf mold is susceptible to being bitten by a tick.

- There are several diseases which can be carried by ticks, with the most well known being Lyme disease.
- The ticks that carry Lyme disease, as well as several other diseases, are the black-legged tick in the eastern United States, and the western black-legged tick along the west coast. The lone star tick is also a possible carrier.
- Other types of ticks carry other diseases, though the diseases are less common than Lyme disease.
- The ticks can carry disease in their larval, nymph, or adult stages. In the larval stage they may look like small black specks, the nymph is about the size of a poppy seed, and the adults can be less than 1/8 inch (3 mm) long.
- There were over 18,000 cases of Lyme disease reported in the United States during 1997 (total, not just occupational). Other tick borne diseases affected several hundred people.
- Some estimates indicate that as few as 10% of the cases of tick borne disease are actually reported.

How do Ticks Get on a Person

- Ticks do not jump, crawl, or fall onto a person. They are picked up when your clothing or hair brushes a leaf or other object they are on.
- Ticks are generally found within three feet of the ground.
- Once picked up, they will crawl until they find a favorable site to feed. Often they will find a spot at the back of a knee, near the hairline, or behind the ears.

Precautionary Measures

The best way to prevent tick borne diseases is to avoid tick bites. There are several things you can do which will lessen your chance of being bitten.

- Wear long pants and a long sleeved shirt. Tuck your shirt into your pants. Tuck your pants into your socks or boots, or use tape to close the opening where they meet.
- Wear a hat, and tie back long hair
- Use an EPA approved insect repellant or arachnicide (pesticide) which is effective for ticks, such as DEET (N,N-diethyl-m-toluamide) or pyrethrin. Be sure to heed all precautionary information, and be aware that some people are sensitive to these chemicals.
- Wear light colored clothing so that a tick can be seen more easily.
- Change clothes when you return from an area where ticks may be located.
- Shower to wash off any loose ticks.

Tick Check and Removal

- Check clothing for ticks on a frequent basis. If you find a tick, do a more thorough tick check.
- When you return from an area where ticks may be located, check all of your body for ticks. It may be helpful to have someone else check your back or other areas which are difficult to see. Be sure to include:
  - Parts that bend (back of knee, between fingers and toes, underarms).
  - Pressure points where clothing presses against skin (underwear elastic, belts, neck).
  - Other common areas (belly button, around or in ear, hairline, top of head).
- Once inside do a final, thorough tick check and clothing change.
- If you are in a tick infested area or an area known to have disease carrying ticks, perform the checks on a more regular basis.
- Remove unattached ticks promptly.
- Attached ticks are promptly removed using fine pointed tweezers:
  - The mouth parts of the tick are grasped with the tweezers as close to the skin as possible;
  - Apply firm steady pressure upward until the tick releases - do not jerk, twist, squash or squeeze the tick;
  - Clean the wound and the tweezers with an antiseptic.

- Do not use petroleum jelly or nail polish remover, or prick or burn the tick, these actions can cause infected secretions to enter the wound.

Other Steps You Can Take

- Place clothing worn in tick infested areas into the dryer for at least 30 minutes in order to kill any ticks.
- Be sure and check pets and other animals for ticks. Use approved tick repellants or products which kill ticks.
- If you want to have the tick checked for disease, place the tick in a clean vial or ziplock bag with a blade of grass, then contact your State Health Department for more information.

Diseases Carried by Ticks

Ticks can carry a number of diseases. In the United States these diseases include:

- Babesiosis (a malaria like infection)
- Colorado Tick Fever (generally in the western United States including the coast)
- Ehrlichiosis
- Lyme Disease
- Relapsing Fever (most common in the western United States)
- Rocky Mountain Spotted Fever (throughout the United States but most prevalent in the east)
- Tick Paralysis
- Tularemia (rabbit fever)

Additional Information:

- The Lyme Disease Foundation sponsors the Lyme Disease Hotline (1-800-886-LYME) which provides information on Lyme disease and other tick borne diseases.
- Your State Health Department has information available about Lyme disease in your area.
- Your State Library may have educational materials available.

<< Back to Fist Aid

Scope and Application | Standards | Safety and Health Plan
Tree Harvesting Plan | Manual Operations | Mechanical Operations

eTools Home : Logging Standards | Glossary | Bibliography | User Guide | Credits

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U.S. Department of Labor | Occupational Safety & Health Administration | 200 Constitution Ave., NW, Washington, DC 20210
Telephone: 800-321-OSHA (6742) | TTY: 877-889-5627
www.OSHA.gov

OSHA QUICK CARD™

Rodents, Snakes and Insects

Insects, Spiders and Ticks

- To protect yourself from biting and stinging insects, wear long pants, socks, and long-sleeved shirts.
- Use insect repellents that contain DEET or Picaridin.
- Treat bites and stings with over-the-counter products that relieve pain and prevent infection.
- Avoid fire ants; their bites are painful and cause blisters.
- Severe reactions to fire ant bites (chest pain, nausea, sweating, loss of breath, serious swelling or slurred speech) require immediate medical treatment.

Rodents and Wild or Stray Animals

- Dead and live animals can spread diseases such as Rat Bite Fever and Rabies.
- Avoid contact with wild or stray animals.
- Avoid contact with rats or rat-contaminated buildings. If you can't avoid contact, wear protective gloves and wash your hands regularly.
- Get rid of dead animals as soon as possible.
- If bitten/scratched, get medical attention immediately.

Snakes

- Watch where you place your hands and feet when removing debris. If possible, don't place your fingers under debris you are moving. Wear heavy gloves.
- If you see a snake, step back and allow it to proceed.
- Wear boots at least 10 inches high.
- Watch for snakes sunning on fallen trees, limbs or other debris.
- A snake's striking distance is about 1/2 the total length of the snake.
- If bitten, note the color and shape of the snake's head to help with treatment.
- Keep bite victims still and calm to slow the spread of venom in case the snake is poisonous. Seek medical attention as soon as possible.
- Do not cut the wound or attempt to suck out the venom. Apply first aid: lay the person down so that the bite is below the level of the heart, and cover the bite with a clean, dry dressing.

For more complete information:

OSHA® Occupational Safety and Health Administration

U.S. Department of Labor
www.osha.gov (800) 321-OSHA

OSHA 3274-09N-05

OSHA FactSheet

Protect Yourself! Workers may be exposed to

Black Widow Spider

The black widow belongs to a group of spiders commonly known as cobweb spiders. The characteristic hourglass is located on the underside of the abdomen. Female black widows are dangerous and can bite and inject toxic venom.

Identification

- The female black widow is normally shiny black, with a red hourglass marking (see photo) on the underside of the abdomen.
- The abdominal marking may range in color from yellowish orange to red and its shape may range from an hourglass to a dot.
- The body of an adult black widow female is about 1/2 inch long.

Photo: Extension Entomology, Texas A&M University

Photo: University of Missouri Extension

Habitat

The black widow is commonly found in the following places:

- Outdoors - woodpiles, rubble piles, under stones, in hollow stumps, and in rodent burrows, privies, sheds and garages.
- Indoors - undisturbed, cluttered areas in basements and crawl spaces.

Symptons

- The bite of the black widow may be painful or it may go unnoticed.
- The skin may display one or two bite marks with local swelling. Pain usually progresses from the bite site and eventually to the abdomen and back.
- Severe cramping or rigidity may occur in the abdominal muscles.
- Symptoms may include nausea, profuse perspiration, tremors, labored breathing, restlessness, increased blood pressure and fever.
- The pain from the bite will usually persist for the first 8-12 hours.
- Symptoms may continue for several days.

Protection

- Wear a long-sleeved shirt, hat, gloves, and boots when handling boxes, firewood, lumber, and rocks, etc.
- Inspect and shake out clothing and shoes before getting dressed.
- Use insect repellants, such as DEET or Picaridin, on clothing and footwear.

Treatment

- Clean the bite area with soap and water.
- Apply ice to the bite area to slow absorption of the venom.
- Elevate and immobilize the extremity.
- Capture the spider, if at all possible, for identification purposes.
- Seek medical attention immediately.
- If you have a heart condition or other heart problem, you may need hospitalization.

This is one in a series of informational fact sheets highlighting OSHA programs, policies or standards. It does not impose any new compliance requirements. For a comprehensive list of compliance requirements of OSHA standards or regulations, refer to Title 29 of the Code of Federal Regulations. This information will be made available to sensory impaired individuals upon request. The voice phone is (202) 693-1999; teletypewriter (TTY) number: (877) 889-5627.

For more complete information:

OSHA Occupational Safety and Health Administration

U.S. Department of Labor

www.osha.gov

(800) 321-OSHA

DSG 10/2005

OSHA FactSheet

Protect Yourself! Workers may be exposed to

Brown Recluse Spider

The brown recluse belongs to a group of spiders commonly known as violin spiders or fiddlebacks. The characteristic fiddle-shaped pattern is located on the top of the leg attachment region (cephalothorax). Because they are secluded and withdrawn, as their name implies, the brown recluse avoids open spaces. Brown recluse spiders are dangerous and they can bite and inject toxic venom.

Identification

- Body size: 1/4 to 3/4 inch (6.4-19.1mm)
- Color: Golden brown
- A dark violin/fiddle shape (see top photo) is located on the top of the leg attachment region (cephalothorax) with the neck of the violin/fiddle pointing backward toward the abdomen.
- Unlike most spiders that have 8 eyes, the brown recluse has 6 eyes. The eyes, arranged in pairs – one pair in front and a pair on either side – can be readily seen under low magnification.

Habitat

The Brown Recluse Spider builds small retreat webs behind objects of any type.

Symptoms

- The severity of the bite may vary. Symptoms may vary from none to very severe.
- The bite generally becomes reddened within several hours.

Photo: R. Bessin, University of Kentucky

Photo: creatures.ifas.ufl.edu

- There is often a systemic reaction within 24-36 hours characterized by restlessness, fever, chills, nausea, weakness and joint pain.
- Tissue at the site of the bite and the surrounding area dies and eventually sheds.

Protection

- Wear a long-sleeved shirt, hat, gloves, and boots when handling stored boxes, firewood, lumber and rocks, etc.
- Inspect and shake out clothing and shoes before getting dressed.
- Use insect repellants, such as DEET or Picaridin, on clothing and footwear.

Treatment

- Clean the bite area with soap and water.
- Apply ice to the bite area to slow absorption of the venom.
- Elevate and immobilize the bitten extremity.
- Capture the spider, if at all possible, for identification purposes.
- Seek medical attention.

This is one in a series of informational fact sheets highlighting OSHA programs, policies or standards. It does not impose any new compliance requirements. For a comprehensive list of compliance requirements of OSHA standards or regulations, refer to Title 29 of the Code of Federal Regulations. This information will be made available to sensory impaired individuals upon request. The voice phone is (202) 693-1999; teletypewriter (TTY) number: (877) 889-5627.

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OSHA Occupational Safety and Health Administration

U.S. Department of Labor

www.osha.gov

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DSG 10/2005

BE ALERT FOR FIRE ANTS AT ORNL

Imported fire ants were accidentally introduced into the United States from South America, beginning in about 1918. The black imported fire ant (*Solenopsis richteri*) was the first of two species of fire ants to be introduced via shipping into Mobile, Alabama. This species remains limited to northeastern Mississippi, northwestern Alabama and southern Tennessee. The red imported fire ant (*Solenopsis invicta*) also became established in the Mobile area by the early 1940's. It now infests more than 318 million acres comprising most of nine southeastern states and Puerto Rico, with small infestations in Tennessee, Oklahoma, New Mexico and California. A large population of hybrid fire ants (imported red x imported black) exists in a band between the two parent species and can be found in southeastern Tennessee, northwestern Georgia, northern Alabama, and northern Mississippi. The first confirmed sighting of an imported fire ant in Tennessee was an isolated infestation in Shelby County in 1948, which was quickly eradicated. Natural migration of imported fire ants was first documented in Tennessee in Hardin County in 1987. Today, much of southern Tennessee is infested with imported fire ants. It is the hybrid fire ant that is present in our area.

Imported fire ants are reddish-brown to black and are 1/8 to ¼ inch long. They construct nests that are often most visible as dome-shaped mounds of soil, sometimes as large as 3 feet across and 1 ½ feet in height. In general, mounds are 12 inches or more in diameter and height. In sandy soils, mounds are flatter and less visible. Fire ants usually build mounds in sunny, open areas such as lawns, pastures, cultivated fields and meadows, but they are not restricted to these areas. Mounds or nests may also be located in rotting logs, around trees and stumps, under pavement and buildings, and occasionally indoors. Fire ants are most notable here at ORNL in sparse grassy areas, and along sidewalks and curbs. Typically at home you will notice fire ants in sparse areas of your lawn,, or along the edges of your driveway, curbs or walks. Many of the fire ant mounds in the ORNL developed areas are of the smaller, flatter variety. Outlying natural areas at ORNL where areas are undisturbed will contain the more classic larger, higher mounds.

Fire Ant Mound Along Curb at ORNL

Fire ants can travel long distances when newly mated queens land on cars, trucks or trains, or when winged forms are carried by the wind. Fire ants have a high reproductive rate and disperse easily. Thousands of reproductive females are produced per colony, and the mated females begin a colony wherever they land. Queen ants can fly up to one mile on their own, or further when assisted by favorable winds. The ants eliminate competing insects, and then rapidly overwhelm an area. Whole colonies can move, and in the multiple queen form, the colonies can split into many new colonies. The shipment of nursery stock or soil from infested areas is one way that entire colonies can move from one place to another. For this reason, the U. S. Department of Agriculture implemented a quarantine program in the 1950's. The purpose of the quarantine program is to minimize the spread of imported fire ants by requiring proper inspection and treatment of all nursery stock, turf grass, hay and other articles shipped out of designated quarantined areas.

For the most part, fire ants are a "people pest" because they often occupy the same areas where we work, live and play. It is estimated that about 40 million people are in potential conflict with fire ants, almost on a daily basis.

Fire ants are most notorious for their stinging behavior. They respond rapidly and aggressively to any disturbance of the colony or to a food source. A single fire ant can sting repeatedly. The attacks are carried out by many ants, sometimes numbering in the hundreds or more. The classic attack occurs when the fire ant mound is disturbed by accident, at which time the ants will deploy rapidly to attack the invader. They will bite the victim with their powerful jaws, while arching their backs and stabbing the victim with a stinger located in their rear abdomen.

After being stung, the wound typically forms a red welt, about twice the size of a normal freckle. The next day, a white pustule (blister) forms. The most common symptom, other than the burning pain when the sting happens, is a mild itch. The itch usually lasts no more than a few days. If the pustule is popped or broken open, an infection and scarring can occur. It is best to just leave it alone and let the healing process take it's course.

If you are stung by a fire ant:

- Apply a cold compress to relieve the swelling and pain.
- Gently wash the affected area with soap and water and leave the blister intact.
- Stings can be treated with over the counter products that give relief from insect stings.
- People who are allergic to insect stings should seek medical attention immediately.
- On rare occasions, fire ant stings can cause severe acute allergic reaction (anaphylaxis). Symptoms to watch for are severe headache, severe nausea, profuse sweating and, most importantly, shortness of breath or chest pain. If these symptoms occur, the person should seek emergency medical attention by calling 911.

To minimize the risk of being bitten:

- Be alert for the presence of fire ant mounds and avoid them.
- When at all possible, wear protective clothing during outdoor activities in areas where fire ants may be present. Wear shoes or boots and/or tuck pant legs into socks.
- Use insect repellents on clothing and footwear.
- Control fire ants in areas used most frequently by people and pets.

Fire ants are typically controlled with chemical pesticides. However, the high reproductive rate of the ants and their ability to disperse easily significantly hinders the success of any measures taken. In addition, the queen is protected from many poison baits because she is fed only by food eaten first by workers and larvae. If the poison works too rapidly, the worker is killed before the poison is passed

on to the queen. Also, worker ants from well-fed colonies may not forage on poison baits, or baits may not be as attractive as some abundant natural food.

The implementation of Integrated Pest Management (IPM) can increase the success of eradication programs. IPM, which combines compatible chemical, biological and cultural controls, can be used to manage pest populations. IPM prevents or reduces pest problems in cost-effective and environmentally sound ways. Biological control methods, such as the introduction of decapitating flies, are currently being studied. Cultural control methods use agronomic (turf) and horticultural (ornamental plants) practices to produce an environment or habitat that is unattractive to the infestation of this exotic pest.

Cultural control methods that may minimize the presence of fire ants include the following:

- Shade – Imported fire ants tend to nest in open, sunny areas. Numerous surveys have shown that relatively few fire ant colonies are found in shady wooded areas. Planting of shade trees to increase shading may be a good deterrent.

- Planting Pest-Free Plants – Imported fire ants eat caterpillars, beetles and other insects. Growing plant varieties that are not insect pest prone may indirectly provide less food for the fire ants.

- Good Sanitation – Pet food bowls left outside can provide ample food for fire ants. Similarly, fly larvae in pet manure serves as ant food and should be properly discarded. Reducing any form of litter could make your yard less attractive to fire ant foraging and nesting.

- Access to Water - Fire ants need water daily. Lack of water in low maintenance dry areas can limit fire ant nesting and establishment. Fix leaky faucets, irrigation valves and heads, improve drainage and conserve water to discourage fire ant infestations.

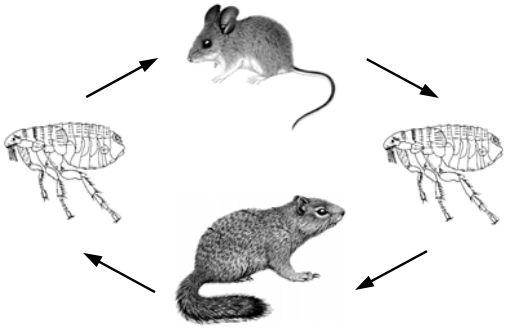
- Mulches and Nesting Sites – Some mulches like cedar bark may repel fire ants, although no studies confirm these manufacturer's claims. Areas covered by pea gravel or other small stones in sunny areas may be non-conducive to ant nesting. Using rough gravel instead of sand underneath brick or other patio structures also may deter fire ants from nesting there. Conversely, "hardscape" edges (i.e., edges of cement slabs, landscape timbers) and many other types of mulch (straw, composted leaves, bark) often attract fire ants because they provide a structure, moisture and temperature buffering effects that are apparently ideal for fire ant nesting.

- Mowing and Disturbing Ant Mounds – Disturbing colonies frequently may cause fire ants to move to a new location. When grass is mowed frequently at a low cutting heights, the disturbed colonies will move to less disturbed areas, adjacent to sidewalks and foundations or to hedgerows and trees. Conversely, fire ants are recognized as rapid invaders and will rapidly reinvade the disturbed lands once these practices are stopped.

Be aware that cultural elements and practices alone will never eliminate this pest. At best, manipulation of these cultural influences may reduce fire ant infestations, and thereby reduce dependence on insecticides.

If you discover a fire ant mound on the ORNL campus, please contact Ernest Ryan at 576-1409. For more information about fire ants, please visit the UT fire ant website at **http://fireants.utk.edu** .

What is Plague?

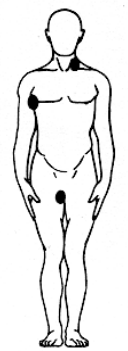


Plague is a disease of wild rodents and rabbits caused by the bacterium *Yersinia pestis*. It is spread among animals and to humans by the bites of infected fleas. Animals most often infected include rock squirrels, prairie dogs, pack rats, chipmunks, rabbits and mice.

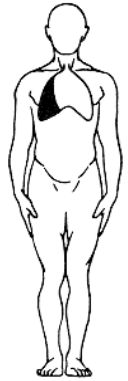
When an animal with plague dies, the infected fleas must find a new host. This may be another rodent, a pet or a person.

Although most human plague cases result from flea bites, people have also contracted the disease by coming into direct contact with an infected animal's blood or tissues, such as when skinning a rabbit or other game.

People can also get plague by inhaling infectious droplets expelled by a person or cat with pneumonic plague.



BUBONIC



PNEUMONIC FORM

The three forms of plague are bubonic ...

Symptoms usually develop within two to six days after a flea bite or contact with an infected animal and include high fever, chills, weakness, headache and muscle aches. In bubonic plague, a lymph node in the groin, armpit or neck becomes swollen and very painful.

... septicemic ...

Sometimes the bacteria go directly into the blood and there are no swollen lymph nodes, just fever and severe flu-like symptoms. Secondary septicemic plague can result from untreated bubonic plague.

... and pneumonic.

If the bacteria invade the lungs, pneumonia may develop and the disease may be spread to other people when the patient coughs or sneezes. For plague pneumonia patients, the death rate is over 50%.

Plague is curable if treated in time.

See your doctor immediately about any illness having sudden onset of high fever. Report if you have had flea bites, have handled any wild rodents or rabbits, or have a pet that hunts. Plague is curable with antibiotics if promptly diagnosed and treated.

Pets that hunt may bring plague-infected fleas into the home and can also become infected with plague. Cats are more likely than dogs to get sick, and can spread the disease to their owners through biting, coughing, or draining abscesses. Take your pet to the vet immediately if it has had contact with rodents and develops symptoms of fever, lethargy, and loss of appetite.

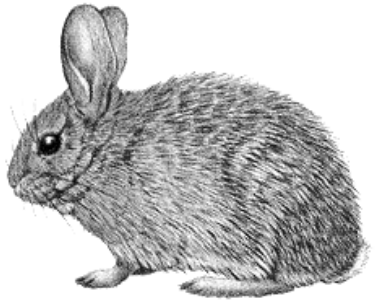
Preventing Plague

- Avoid contact with wild rodents and their fleas, nests and burrows.
- Prevent pets from hunting.
- Treat outdoor pets with flea control products regularly.
- Wear rubber gloves when handling game.
- Eliminate rodent shelter around the home:
- Stack woodpiles at least 12" above the ground and 100 feet from the house;
- Keep animal feed in rodent-proof containers;
- Get rid of junk piles and abandoned vehicles around the home.
- Report sick or dead rodents and rabbits (in the absence of poisoning or trauma) to the Zoonoses Program in the New Mexico Department of Health. (Within Bernalillo County, contact the Albuquerque Environmental Health Dept.)

For more information, contact:

Zoonoses Program
Epidemiology & Response
NM Department of Health
1190 St. Francis Dr.
Santa Fe, NM 87505

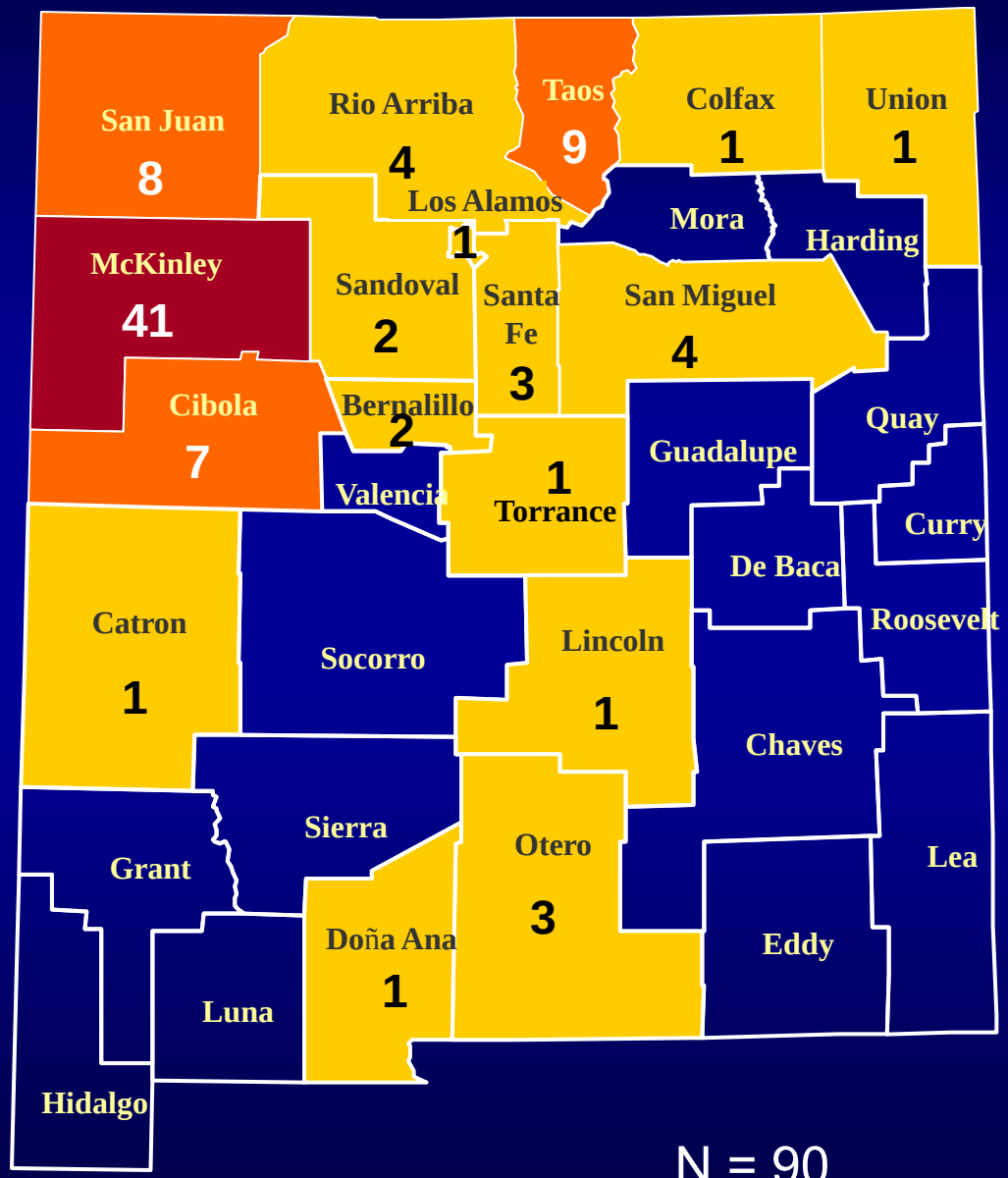
(505) 827-0006



PLAGUE IN NEW MEXICO

New Mexico Department of Health
Epidemiology and Response Division

HPS Cases in New Mexico by County, 1975 – 2011



Number of Cases

- >10
- 6-10
- 1-5
- 0

N = 90

12/31/2011

ATTACHMENT 4

Poison Ivy, Oak, & Sumac Information Center

FAST FACTS

URUSHIOL OIL IS POTENT

- Only 1 nanogram (billionth of a gram) needed to cause rash
- Average is 100 nanograms for most people
- 1/4 ounce of urushiol is all that is needed to cause a rash in every person on earth
- 500 people could itch from the amount covering the head of a pin
- Specimens of urushiol several centuries old have found to cause dermatitis in sensitive people.
- 1 to 5 years is normal for urushiol oil to stay active on any surface including dead plants
- Derived from **urushi**, Japanese name for lacquer

When the Japanese restored the gold leaf on the golden Temple in Kyoto, they painted the urushiol lacquer on it to preserve and maintain the gold. Guess you could say that you would be caught red handed if you stole it.

POISON IVY, OAK, AND SUMAC

- Most common allergy in the country claiming half the population
- Sensitivity to urushiol can develop at any time
- Solutions or cures are those that annihilate urushiol
- Everyone appears to react slightly different to all the remedies.
- Covered by workers compensation in some states (CA, for example)
- First published records of poison ivy in North America date back to 1600s
- Poison Ivy coined by Captain John Smith in 1609
- Western Poison Oak discovered by David Douglas (1799-1834) on Vancouver Island. Douglas fir also named after him.
- People will serious deficiency in cellular (T-cell) immunity such as AIDS patients may not have problems with dermatitis.

Myths vs. Facts

Myth	Fact
Poison Ivy rash is contagious.	Rubbing the rashes won't spread poison ivy to other parts of your body (or to another person). You spread the rash only if **urushiol oil** -- the sticky, resinlike substance that causes the rash -- has been left on your hands.
You can catch poison ivy simply by being near the plants	Direct contact is needed to release **urusiol oil**. Stay away from forest fires, direct burning, or anything else that can cause the oil to become airborne such as a lawnmower, trimmer, etc.
Leaves of three, let them be	Poison sumac has 7 to 13 leaves on a branch, although poison ivy and oak have 3 leaves per cluster.
Do not worry about dead plants	**Urushiol** oil stays active on any surface, including dead plants, for up to 5 years.
Breaking the blisters releases **urushiol** oil that can spread	Not true. But your wounds can become infected and you may make the scarring worse. In very extreme cases, excessive fluid may need to be withdrawn by a doctor.
I've been in poison ivy many times and never broken out. I'm immune.	Not necessarily true. Upwards of 90% of people are allergic to urushiol oil, it's a matter of time and exposure. The more times you are exposed to urushiol, the more likely it is that you will break out with an allergic rash. For the first time sufferer, it generally takes longer for the rash to show up - generally in 7 to 10 days.

How do you....

Want to know how to say poison ivy or oak in different languages? Look no further than the Poison oak and ivy translation project for your answer.

Special thanks to 1151 Clinch Road

© 1999 - 2006 by **Jim Dunphy**

KNOW YOUR ENEMY! Watch out for this seemingly harmless little vine or shrub in the woods. Note the three-part leaves with jagged edges...

Notice also the colour and configuration of **Poison Ivy berries**...

The triple leaves of **Poison Ivy**, as well as some developing fruit.

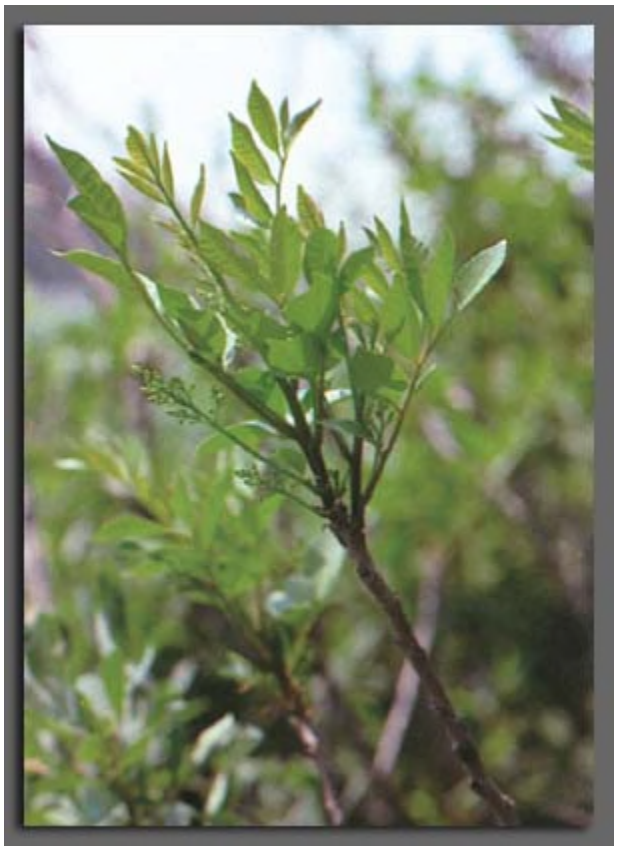
Poison Oak

(Toxicodendron diversilobum)

Poison-oak is usually a shrub, though it sometimes becomes a vine several inches in diameter that grows high into the oak trees attached by air-roots. The leaves DO come in threes. They are shiney, without prickers, and the middle leaf has a distinct stalk.

It is harder to identify Poison Oak in the winter, when it loses its leaves and looks like erect bare sticks coming from the ground.

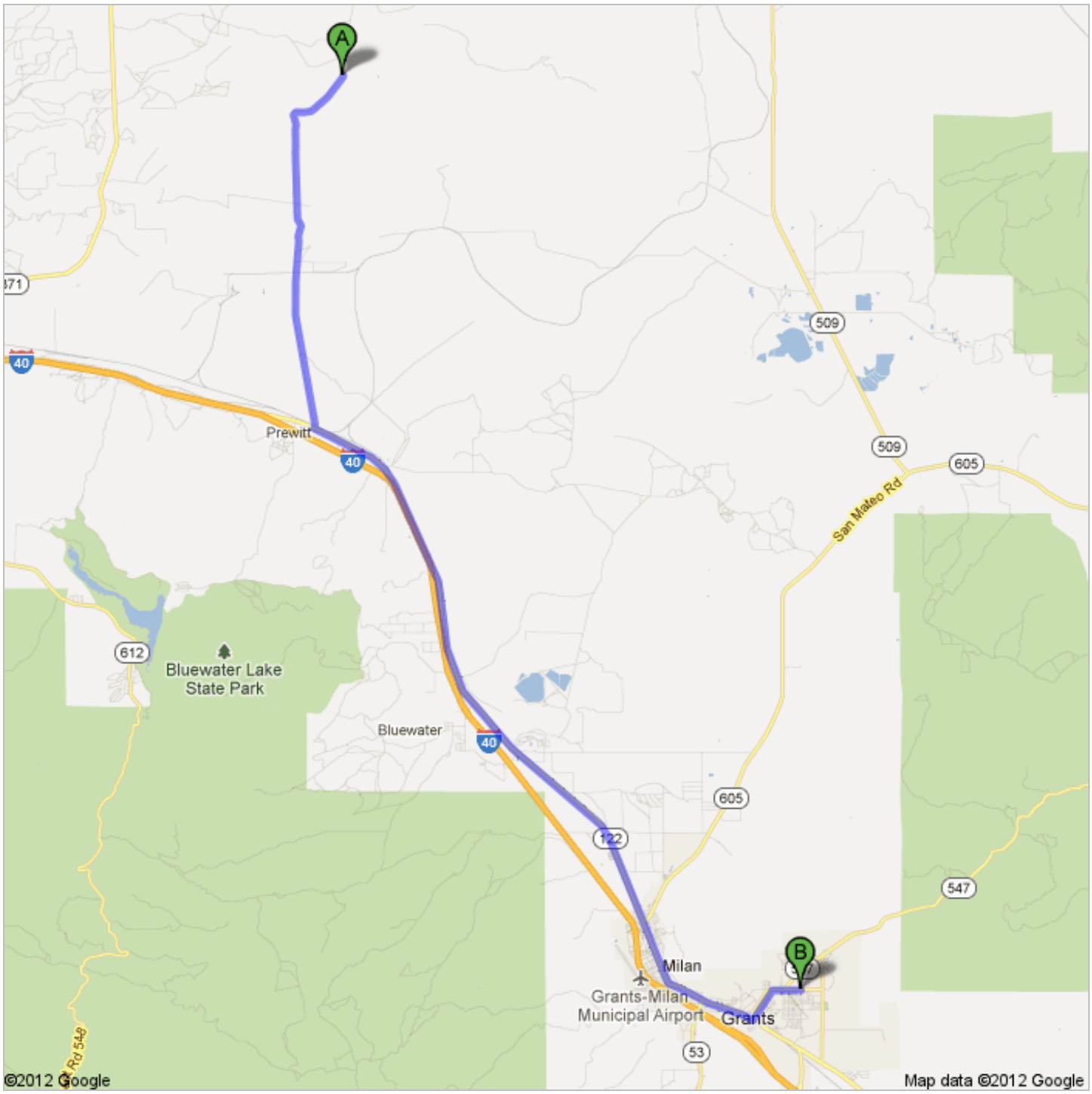
Poison Oak is highly variable. It varies from shrub to vine. The leaves vary from red to green. It has erect stems, leaves in threes, small greenish flowers, and smooth seeds that are about 1/4 inch across. It is often lush in coastal canyons, but sparse in the mountain woodland. It is deciduous, and often looses its leaves in late summer, leaving it hard to recognize. The erect branches give a clue.



Poison sumac

Appendix B: Hospital Map

Directions to Cibola General Hospital
1016 E Roosevelt Ave, Grants, NM 87020 - (505) 287-4446
30.8 mi – about **49 mins**



Co Rd 19

1.	Head **southwest** on **Co Rd 19** About 24 mins	go 9.7 mi total 9.7 mi
2.	Turn left onto **NM-122 E/Frontage Rd** Continue to follow NM-122 E About 20 mins	go 18.1 mi total 27.8 mi
3.	Continue onto **W Santa Fe Ave** About 2 mins	go 1.4 mi total 29.2 mi
4.	Turn left onto **1st St** About 2 mins	go 0.9 mi total 30.0 mi
5.	Slight right onto **W Roosevelt Ave** Destination will be on the left About 2 mins	go 0.7 mi total 30.8 mi

Cibola General Hospital
1016 E Roosevelt Ave, Grants, NM 87020 - (505) 287-4446

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.

Map data ©2012 Google

Directions weren't right? Please find your route on maps.google.com and click "Report a problem" at the bottom left.

Appendix C: Participants Site Safety Plans

ECOLOGY AND ENVIRONMENT, INC.

SITE-SPECIFIC
HEALTH AND SAFETY PLAN

Project: Tronox AUM Section 32 Removal Assessment

Project No.: 002693.2164.01RA

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Project Location: Prewitt, New Mexico
Casamero Lake Chapter, Navajo Nation

Proposed Date of Field Activities:

Site Walk – April 22, 2012
Survey and Sampling – June 2012

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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 Site-Specific Health and Safety Plan 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 (HAZWOPER)
Other:

1.2 SCOPE OF WORK

Description of Work: E & E was tasked by U.S. EPA under the Superfund Technical Assistance and Response Team (START) contract to conduct a removal assessment to delineate the extent of contamination at the Tronox abandoned uranium mine (AUM): Section 32, Eastern Agency located in Prewitt, McKinley County, New Mexico. Under this task order, E & E will perform a site walk with federal on-scene coordinator (FOSC) Randy Nattis, radiation scan/survey of surface soils, soil sampling from known areas of contamination based on previous investigation (Weston Solutions, Inc. [Weston] 2009) and radiation scan/survey results, and collect survey information for a background study.

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	Site walk
2	Surface radiation scan/survey of known areas of contamination to delineate removal area
3	Collection of soil samples
4	Surface radiation scan/survey for background study
5	Documentation (global positioning system [GPS], photographs, logs)
6	Homesite Investigation

1.3 SITE DESCRIPTION

Site Map: See Attachment 2.

Site History/Description (see project work plan for detailed description):
Tronox AUM: Section 32 (site) is located 1 mile east of County Road 19, in Prewitt, McKinley County, New Mexico (Latitude: 35° 29' 26.7576" N, Longitude: -108° 1' 2.7798" W). The site has an area of 12,102.91 square meters and an undetermined extent of

underground workings (Weston 2009). The site is located in an Indian Allotment land which is part of the Casamero Lake Chapter of the Navajo Nation.

The site consists of a mine which was reportedly owned by Cobb Nuclear and was closed due to a fatality (Weston 2009). No other information on historical ownership of the mine and mining operations were available. Site features include an unsecured deep shaft located in the southeastern portion of the site. No residences, public structures, water sources or sensitive environment were found within 0.25 miles of the site. The nearest resident is Lucita Sardo who lives to the west of the mine and had relatives who formerly worked for Cobb Nuclear. The residential property had some materials (tarps and lumber) obtained from the mine and had gamma radiation measurements of approximately 12,000 counts per minute (cpm). Gamma radiation measured at the site ranged from 10,689 cpm to 180,367 cpm. Gamma radiation measured at background locations ranged from 16,630 cpm to 17,128 cpm. No waste piles, other mine features, or visible signs of reclamation were reported.

Is the site currently in operation? ☐ Yes ☒ No

Locations of Contaminants/Wastes: Naturally occurring uranium ore and mine waste is present at the site.

Types and Characteristics of Contaminants/Wastes:

☐ Liquid	☒ Solid	☐ Sludge	☐ Gas/Vapor
☐ Flammable/Ignitable	☐ Volatile	☐ Corrosive	☐ Acutely Toxic
☐ Explosive	☐ Reactive	☒ Carcinogenic	☒ Radioactive
☐ Medical/Pathogenic	Other: _____		

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
Aileen Mendoza	Project Manager, Field Team Leader
Craig Tiballi	Site Safety Officer, Sample Collection, Radiation Survey
E & E START Field Team	Sample Collection, Radiation Survey, Documentation

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
40-Hour Radiation Protection Procedures and Investigative Methods	
8-Hour General Radiation Health and Safety	X

Training	Required
Radiation Refresher	X
DOT and Biannual Refresher	X
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 (HSR) 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 for 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 at the site and when radiation exposure is anticipated.

Pocket Dosimeters: Electronic or pocket dosimeters will be worn to determine real-time personnel doses if there is a potential for an E & E worker to receive at least 1 milliroentgen (mR) in one day.

Other: _____

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 and presented in Table 4-1 below.

Site-Specific Dose Limits: **:** As a general guidance, if site work will continue for more than one quarter, limit weekly doses to approximately 80 mrem to ensure that quarterly dose limits are not exceeded.

ALARA Policy: Radiation doses to E & E personnel shall be maintained 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.

Table 4-1
E & E Radiation Dose Limits

Part of Body	Quarterly Limit (rems)	Annual Limit (rems)	Dost Limit Description
Whole body[a]	1	4	Total effective dose equivalent[b]
Any individual organ or tissue other than the lens of the eye[a]	10	40	Sum of deep-dose equivalent[c] and committed dose equivalent[d]
Lens of the eye	3	12	Lens dose equivalent[e]
Skin of whole body or skin of any extremity	10	40	Shallow-dose equivalent[f]

Notes:

a Precedence given to the more limiting dose.

b The sum of the deep-dose equivalent (for external exposures) and the committed effective dose equivalent (for internal exposure).

c The dose equivalent at a tissue depth of 1 cm; applies to external whole-body exposure and must be for the part of the body receiving the highest exposure.

d The dose equivalent to organs or tissues that will be received from an intake of radioactive material by an individual during the 50-year period following the intake.

e The external exposure of the lens of the eye, taken as the dose equivalent at a tissue depth of 0.3 cm.

f The external exposure of the skin of the whole body or the skin of an extremity; taken as the dose equivalent at a tissue depth of 0.007 cm averaged over the contiguous 10 square centimeters of skin receiving the highest exposure.

5. SITE CONTROL

5.1 SITE LAYOUT AND WORK ZONES

Site Work Zones: A site map is included as Attachment 2. The work zones will be determined and documented on site. In general, surface gamma activity counts will be used to delineate exclusion zones. Contaminant reduction (Decon) zones will be established at the entry/exits point of the exclusion zone(s). Personnel will need to pass through the Decon area to shed PPE and get checked for radiation contamination when exiting the exclusion zone(s).

Site Access Requirements and Special Considerations: Site access will be arranged by U.S. EPA.

Illumination Requirements: Work will be conducted in daylight hours unless prior approval is obtained and the illumination requirements in 29 CFR 1910.120(m) are satisfied.

Sanitary Facilities (e.g., toilet, shower, potable water): Sanitary facilities will be arranged on site. Bottled water and/or electrolyte beverages will be available.

On-Site Communications: Primary method: verbal; Secondary method: radios/cell phones

Other Site-Control Requirements: _____

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.

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

Other Work Limitations: _____

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.

Vermiculite Handling: It is against E&E policy to use vermiculite; therefore, bubble wrap will be used to cushion sample containers for shipment.

Other Safe Work Practices: Cold drinks and a shaded area will be provided to prevent heat stress.

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, 5, 6	■ Potential hazard: feral dogs, prairie dogs (plague carriers), snakes, spiders, poisonous plants ■ Establish site-specific procedures for working around identified hazards. ■ Other: See attachments
Cold Stress	1, 2, 3, 4, 5, 6	■ Provide warm break area and adequate breaks. ■ Provide warm noncaffeinated beverages. ■ Promote cold stress awareness. ■ See *Cold Stress Prevention and Treatment* (attached at the end of this plan if cold stress is a potential hazard).
Compressed Gas Cylinders	N/A	■ 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	N/A	■ Ensure compliance with 29 CFR 1910.146. ■ See SOP for Confined Space Entry. Additional documentation is required. ■ Other:

Hazard	Task Number	Hazard Control Measures
Drilling	N/A	■ See SOP for Health and Safety on Drilling Rig 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	N/A	■ 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:
Electrical	N/A	■ 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	N/A	■ 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	1, 2, 3, 4, 5, 6	■ Other: Avoid parking vehicles on tall, dry vegetation. ■ 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. ■ 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.
Heat Stress	1, 2, 3, 4, 5, 6	■ Provide cool break area and adequate breaks. ■ Provide cool noncaffeinated beverages. ■ Promote heat stress awareness.

Hazard	Task Number	Hazard Control Measures
		■ Use active cooling devices (e.g., cooling vests) where specified. ■ See *Heat Stress Prevention and Treatment* (See Attachment 3).
Heavy Equipment Operation	N/A	■ 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: Site personnel to wear reflective safety vests
Heights (Scaffolding, Ladders, etc.)	N/A	■ Ensure compliance with applicable subparts of 29 CFR 1910. ■ Identify special PPE needs (e.g., lanyards, safety nets, etc.) ■ Other: Use of fall protection: body harness and lanyard
Noise		■ 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	N/A	■ Wear hard hat. ■ Other:
Power Tools	N/A	■ Ensure compliance with 29 CFR 1910 Subpart P. ■ Other:
Sunburn	1, 2, 3, 4, 5, 6	■ Apply sunscreen. ■ Wear hats/caps and long sleeves. ■ Other:
Utility Lines	N/A	■ 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, 5, 6	■ Potential hazards: ■ Establish site-specific contingencies for severe weather situations. ■ Provide for frequent weather broadcasts. ■ Weatherize safety gear, as necessary (e.g., ensure eye wash units cannot freeze, etc.). ■ Identify special PPE (Section 7) needs. ■ Discontinue work during severe weather.
Other: Uneven Terrain: Slips, trips & falls	1, 2, 3, 4, 5, 6	■ Use three points of contact on steep or rocky slopes and use a backpack to carry tools/supplies so that at least one hand is always free. ■ Watch footing when walking among debris.
Other: Burns, Shock, Fire, Noise and heavy lifting hazards from using portable gas-powered Auger	N/A	■ Use proper PPE (Level D w/safety goggles, hardhat, work gloves, ear plugs, etc). ■ Wait 20 minutes before refueling hot equipment. Use a funnel and safety gas can to avoid spilling. ■ Always have two persons around when lifting auger

Hazard	Task Number	Hazard Control Measures
Open Mine Shaft – Open Shafts can extend hundreds of feet to the lower level of a mine. The edge shafts can be concealed by mine debris, dirt, rock, and even water. Once solid beams and frameworks may have been decaying for more many years. In many cases, there may be no support beams at all and the fractured roof or walls of the mine tunnel eventually collapse in response to vibrations and/or the force of gravity. This becomes especially hazardous to personnel conducting gamma surveys, who are often paying more attention to their instruments than what is in front of them.	1, 2, 3, 4, 5, 6	▪ Bring the mine shaft to the attention of all personnel working on the site. ▪ Place a visual/physical barrier at least 6 feet outside the edge of the shaft. The barrier may consist of caution tape or construction fencing. Stay away from the edge of the shaft. ▪ Keep vehicles as far from the shaft as possible.
Off-road Driving	1, 2, 3, 4, 5, 6	■ Drive as slow as possible, and as fast as necessary. ■ Sometimes you cannot drive to your desired destination, so don't push it if conditions are hazardous. ■ Stay on the trail. ■ Walk it first if you cannot see the ground or if conditions are wet. **See attachment for Off-road driving safety.**

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: Work upwind if possible. Wear PPE appropriate for each task (e.g. Level C in exclusion zone, as defined by elevated surface gamma activity. Avoid soil coming in contact with skin or clothing).

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
1-6	Uranium, natural (primarily U-238) and daughter radionuclides	Various (most conservative is 3E-12 for Th-230)	INH, ING, external radiation exposure	Alpha, beta, gamma, depending on the radionuclide	Various	Various (from seconds to 4.5E09 yrs for U-238)
1-6	Radium-226 (a key U-238 daughter) Ra-226 daughters	3E-10 Various	INH, ING, external radiation exposure	Alpha Gamma Alpha, beta, gamma	4.8 0.186 Various	1,600 yrs Various
1-6	Radon-222 (direct daughter of Ra-226)	4E-06 (daughters removed) 3E-08 or 0.33 WL (daughters present)	INH	Alpha	5,49	3.8 days
1-6	Thorium, natural (primarily Th-232) and daughter radionuclides	Various (most conservative is 5E-13 for Th-232)	INH, ING, external radiation exposure	Alpha, beta, gamma, depending on the radionuclide	Various	Various (from seconds to 1.4E10 yrs for Th-232)

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: Ensure support zone is in an uncontaminated background radiation area. Decrease time in radiation areas; increase distance; increase shielding as needed. Avoid unprotected contact with site materials. Use dust suppression during sampling activities as required. Radiation monitoring equipment will be protected from contamination by placing it in plastic bags (leaving probe areas uncovered). If applicable, ventilate indoor areas (open windows and doors) in order to dissipate any radon buildup.

Radiation Surveying: (This section is intended to apply work-area radiation surveying for worker health and safety purposes. The surveying being conducted for work Task 1 in this safety plan will also suffice to be work-area radiation surveying for worker health and safety purposes.) The work area will be continually surveyed as appropriate to determine radiation exposure rates, areas of elevated radiation, and the location and magnitude of radioactive contamination, in order to ensure and guide worker health and safety. Surveys for gamma exposure will be conducted using a micro R meter (or ion chamber, if the micro R meter goes off-scale [5 mR/hr]) and a survey ratemeter with an attached 3-inch by 3-inch sodium iodide (NaI) (gamma) probe in accordance with established procedures. Off-site background measurements for portable survey instruments will be obtained from locations previously identified by EPA. Radiation levels exceeding approximately 2 times background will indicate radiation contamination and/or radiation areas and will be marked using surveying flags or equivalent. Previous investigations indicate that some areas exceed the action level of 2-3 times background and marking will be required. Workers performing dust generating activites in areas with elevated gamma activity will be required to use Level C PPE, including respirator, tyvek, nitrile gloves, booties, etc. Workers will also don Level C PPE if wind speeds increase to the point that visible dust is present (approx. 20 mph). Although previous data indicate they are not present, a corporate health physicist will be consulted if exposure rates $\geq$ 2 mR/hr are encountered.

Radiation Contamination Monitoring -Personnel: Personnel will be monitored for radioactive contamination at each work area if gamma activity levels exceeding the site action level (greater than approximately 2-3 times background) are measured. The monitoring will be performed using a survey ratemeter with an attached detector such as a pancake GM detector in accordance with E&E's procedure *Radiation Contamination Monitoring of Personnel*. The relative response of the different detectors to site materials will be determined during initial phases of the work in order to select the best detector for contamination monitoring. Radiation contamination monitoring will be performed of protective clothing and respirators as necessary to help with waste disposition decisions and if there is a suspicion of gross contamination that should be controlled before the protective clothing/respirator is removed (to ensure that loose contamination is not transferred to personnel). Otherwise, the protective clothing/respirator can be carefully removed without being monitored and the monitoring will focus on the person in his/her street clothes. Contamination results exceeding approximately 2 to 3 times background indicate contamination and that decontamination or disposal as a contaminated waste must be performed (see Section 9).

Radiation Contamination Monitoring - Personal and Work-Related Items, Equipment, and Materials: (This section refers to radiation contamination monitoring of personal and work-related items for health and safety purposes. Examples include monitoring instruments, personal gear, tools, and laptop computers. This does not apply to the free release of non-E & E items.) Radiation contamination monitoring will be performed for personal and work-related items, equipment, and materials as they cross the hotline into the contamination reduction area. The monitoring will be performed using a survey ratemeter with an attached detector such as a pancake GM detector in accordance with established procedures. The relative response of the different detectors to site materials will be determined during initial phases of the work in order to select the best detector for contamination monitoring. Swipe testing will be used for contamination monitoring when direct monitoring is not effective (e.g., small surface areas, nooks and crannies). Swipes will be counted by instruments suitable for the contaminant (typically, fixed-geometry, thin-window counters for uranium and its daughters). Contamination results exceeding approximately 2 to 3 times background indicate contamination and that decontamination or disposal as a contaminated waste must be performed (see Section 9).

Air Monitoring and Sampling: In leiu of performing air sampling, personnel will don Level C PPE during dust generating activities (e.g. soil sampling and auger boring) that are performed in areas with elevated gamma activity.

PPE: See Section 7.

TABLE 6-1

CHEMICAL HAZARD EVALUATION

Task Number	Compound	Exposure Limits (TWA)			Dermal Hazard (Y/N)	Route(s) of Exposure	Acute Symptoms	Odor Threshold/ Description	FID/PID	
		PEL	REL	TLV					Relative Response	Ioniz. Poten. (eV)
1-6	Uranium (insoluble compounds)	0.25 mg/m3	0.2 mg/m3	0.2 mg/m3	N	inhalation, ingestion, skin and/or eye contact	Dermatitis; kidney damage; blood changes; [potential occupational carcinogen]; in animals: lung, lymph node damage [Potential for cancer is a result of alpha-emitting properties & radioactive decay products (e.g., radon).]	odorless	NA	NA
1-6	Uranium (soluble compounds)	0.05 mg/m3	0.05 mg/m3	0.2 mg/m3	N	inhalation, ingestion, skin and/or eye contact	Lacrimation (discharge of tears), conjunctivitis; shortness breath, cough, chest rales; nausea, vomiting; skin burns; red blood cell, casts in urine; proteinuria; high blood urea nitrogen; [potential occupational carcinogen] [Potential for cancer is a result of alpha-emitting properties & radioactive decay products (e.g., radon).]	odorless	NA	NA

Note: Use an asterisk (*) to indicate known or suspected carcinogens.

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	
2			X	
3		(X)	X	Based on experiences with air sampling for gross alpha/beta on other uranium mine sites in New Mexico (e.g., NECR and Skyline), air sampling results from high dust-generating activities such as vehicular traffic, soil excavation and loading, and grading were still orders of magnitude below the most conservative DAC. Dust generating activities will involve RAT work and soil sampling. If dust caused by high winds should impact work activities, it is likely that it would involve nuisance dust. Therefore, worker protection decisions can be managed visually.
4			X	
5			X	
6			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	Task Number/LOP					
	1/D	2/D	3/D	4/D	5/D	6/D
Full-face APR			(X)			
PAPR						
Cartridges:						
P100			(X)			
GMC-P100						
GME-P100			(X)			
Other:						
Positive-pressure, full-face SCBA						
Spare air tanks (Grade D air)						

PPE	Task Number/LOP					
	1/D	2/D	3/D	4/D	5/D	6/D
Positive-pressure, full-face, supplied-air system						
Cascade system (Grade D air)						
Manifold system						
5-Minute escape mask						
Safety glasses			X			
Monogoggles						
Coveralls/clothing			(X)			
Protective clothing:						
Tyvek		(X)	(X)	(X)		
Saranex						
Other:						
Splash apron						
Inner gloves:						
Cotton						
Nitrile		(X)	(X)	(X)		
Latex						
Other:						
Outer gloves:						
Viton						
Rubber						
Neoprene						
Nitrile		X	X	X		
Other:						
Work gloves		(X)	(X)	(X)		
Safety boots (as per ANSI Z41)	X	X	X	X	X	X
Neoprene safety boots (as per ANSI Z41)						
Boot covers (type: poly)		(X)	(X)	(X)	(X)	
Hearing protection (type: _____)						
Hard hat						
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 and personnel will be decontaminated, as necessary. Decontamination will be performed at each sample area if radiation levels exceeding the site action level (greater than 2-3 times background) are recorded. Specific procedures are described below.

Equipment/Material Decontamination Procedures (specified by work plan): Every effort will be made to prevent radiation survey instruments from contacting contaminated materials. When appropriate, instruments, probe handles (not probe faces), and other personal and work-related items will be covered in plastic to prevent surficial contamination. Nondisposable items that are radioactively contaminated as determined by direct and indirect monitoring (Sections 6.3.2 and 8) will be decontaminated using controlled dry or damp methods (e.g., Radiacwash towelettes or wet wipes) and remonitored when dry to ensure the contamination was removed. Disposable items that are contaminated will be directed to the proper waste stream.

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

Personnel Decontamination Procedures: Personnel radiation contamination monitoring will be performed in accordance with Sections 6.3.2 and 8. Disposable protective clothing will be directed to the proper waste stream and respirators will be directed to a respirator washing station. Contaminated areas on the skin or body will be decontaminated using controlled dry or damp methods and re-monitored when dry to ensure the contamination was removed. Significant or stubborn contamination will be decontaminated under the guidance of a health physicist. Contaminated areas on personal apparel will be decontaminated if possible; otherwise, the apparel will be directed to the proper waste stream. "Hot spot" decon is recommended to minimize the volume of waste generated. Practices such as cutting the hot spot out of the protective clothing or using duct tape to remove the contaminant will be employed as appropriate.

PPE Requirements for Personnel Performing Decontamination: Safety glasses and nitrile gloves

Personnel Decontamination in General: Following appropriate decontamination procedures, all field personnel will wash their hands and face 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.): Disposed of off-site by qualified disposal contractor if greater than 30 pCi/g (approximately 100 Kcpm gamma activity). Disposed of as municipal waste if less than 2-3 times background.

TABLE 8-1

HEALTH AND SAFETY MONITORING

Instrument	Task Number	Contaminant(s)	Monitoring Location	Monitoring Frequency	Action Levels[a]	
☐ PID (e.g., RAE mini RAE) ☐ FID (e.g., OVA 128-) ☐ TVA 1000				Continuous	**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					**General/Unknown** Evaluate health and safety measures when dust levels exceed 2.5 milligrams per cubic meter.	**Contaminant-Specific**
HCN/H_2S (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 (Ludlum 19) with Rapid Assessment Tool (RAT)		External gamma exposure	Work area	As necessary to characterize work area. Continuous when used.	<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.
Ion Chamber		External gamma exposure	Work area	As necessary to characterize work area. Continuous when used.	See micro R meter action levels above.

TABLE 8-1

HEALTH AND SAFETY MONITORING

Instrument	Task Number	Contaminant(s)	Monitoring Location	Monitoring Frequency	Action Levels[a]		
Radiation Survey Ratemeter/Scaler with External Detector(s) (Ludlum 2241, pancake GM detector)	1, 2, 3, 4, 5, 6	Gamma radiation	Work area	As necessary to characterize work area. Continuous when used.	**Detector** 3" x 3" NaI (gamma)	**Action Level** > 2 to 3 x Bkg	**Action** Consider radiation levels to be elevated.
		Radionuclides	Work area (sensitive measurement of hot spots and contaminated areas) as necessary	As necessary to characterize work area	GM, ZnS, or gas-flow proportional and/or swipe testing	General: > 2 to 3x Bkg.	Consider radioactive and/or contaminated.
		Radionuclices	Personnel and personal equipment/material contamination monitoring[b]	As necessary as personnel and personal equipment/ materials cross hotline	GM detector and/or swipe testing	> 2 to 3x Bkg	Consider radioactive and/or contaminated
Noise Dosimeter (Sound Level Meter)					≤85 decibels as measured using the A-weighed 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: Pocket Dosimeter	1, 2, 3, 4, 5, 6	Gamma radiation, Radionuclices	Personnel and personal equipment/material contamination monitoring[b]	As necessary as personnel and personal equipment/ materials cross hotline	Canberra	1 mRem in one day	In conjunction with a radiation safety specialist, continue work and perform stay-time calculations to ensure compliance with dose limits and ALARA policy.
Other:							

TABLE 8-1

HEALTH AND SAFETY MONITORING

Instrument	Task Number	Contaminant(s)	Monitoring Location	Monitoring Frequency	Action Levels[a]

[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 lower 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 ensure that applicable incidents are reported to appropriate E & E and client project personnel and government agencies.

SSO: The SSO will determine the emergency actions to be performed by E & E personnel and will direct these actions. The SSO will recommend health/safety and protective measures appropriate to the emergency.

Other: _____

10.2 LOCAL AND SITE RESOURCES (including phone numbers)

Ambulance: 911 (Gallup Metro Dispatch)

Hospital: Cibola General Hospital, 1016 E Roosevelt Ave, Grants, NM 87020 - (505) 287-4446

Directions to Hospital (map attached at the end of this plan): Head SW on Co Rd 19. Turn left onto NM-122E/Frontage Road for 18 miles. Continue onto W Santa Fe Ave for 1.4 miles. Turn left onto 1st St for 0.9 miles. Slight right onto W Roosevelt Ave. Hospital will be on the left in 0.7 miles.

Poison Control: 800-222-1222

Police Department: 911 (Gallup Metro Dispatch)

Fire Department: 911 (Gallup Metro Dispatch)

Client Contact: Randy Nattis, EPA FOSC; Phone (415) 940-1108

Site Contact: Randy Nattis, EPA FOSC; Phone (415) 940-1108

On-Site Telephone Number: NA

Cellular Telephone Number: NA

Radios Available: Yes

Other: _____

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)

Regional Office Contact: Cindy McLeod, START Program Manager 510/893-6700 (office)
415/238-3379 (cell)
510/654-6250 (home)

Other: START Oakland Office 510/893/6700 (office)

a. E & E Emergency Response Center:	716/684-8060
b. Corporate Health and Safety Director, Dr. Paul Jonmaire:	716/684-8060 (office) 716/655-1260 (home)
c. Assistant Corporate Safety Director, Tom Siener, CIH:	716/684-8060 (office) 716/662-4740 (home) 716/597-5868 (Cell)

10.4 OTHER EMERGENCY RESPONSE PROCEDURES

On-Site Evacuation Signal/Alarm (must be audible and perceptible above ambient noise and light levels): Three long blasts on car horn or air horn.

On-Site Assembly Area: An upwind location to be determined at the first Daily Safety Meeting

Emergency Egress Route to Get Off Site: To be determined at the first Daily Safety Meeting

Off-Site Assembly Area: To be determined at the first Daily Safety Meeting

Preferred Means of Reporting Emergencies: Report to FOSC Nattis and Call 911

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

Emergency Decontamination Procedures: Non-life-threatening: protective clothing will be removed and affected persons will be monitored for radiation, especially the hands and feet, to the extent practicable. Life-threatening: critically injured personnel will be wrapped in a blanket or plastic sheeting to prevent the spread of contamination. Plastic sheeting should be used in transport vehicle to prevent the spread of contamination. If time permits and necessary medical treatment will not be delayed, removal of protective clothing and monitoring for radiation can be performed. Emergency decontamination for other chemical hazards will include PPE removal and rinsing with water if applicable.

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: The SSO will notify the Regional Safety Coordinator and the EPA FOSC. Affected personnel will complete an Incident/Exposure Report within 24 hours and submit it to the Corporate Health and Safety Director.

ATTACHMENT 1

EQUIPMENT/SUPPLIES CHECKLIST

	No.
INSTRUMENTATION	
FID	
Thermal desorber	
O_2/explosimeter w/cal. Kit	
Photovac tip	
PID (probe: _____eV)	
Magnetometer	
Pipe locator	
Weather station	
Draeger tube kit (tubes: _____)	
Brunton compass	
Real-time cyanide monitor	
Real-time H_2S monitor	
Heat stress monitor	
Noise equipment	
Personal sampling pumps and supplies	
MiniRam dust monitor	
Mercury monitor	
Spare batteries (type: D)	
RADIATION EQUIPMENT/SUPPLIES	
Documentation forms	X
Portable ratemeter	X
Scaler/ratemeter	X
1" NaI gamma probe	
3" NaI gamma probe	X
ZnS alpha probe	
GM pancake probe	X
Tungsten-shielded GM probe	
Micro R meter	
Ion chamber	
Alert monitor	
Pocket dosimeter	X
Dosimeter charger	X
Radiation warning tape	

	No.
Radiation decon supplies	X
Spare batteries (type:D - rate meters and Micro R meter; AAA - pocket dosimeters	X
SAMPLING EQUIPMENT	
4oz. bottles	X
Half-gallon bottles	
VOA bottles	
String	
Hand bailers	
Thieving rods with bulbs	
Spoons	X
Knives	
Filter paper	
Bottle labels	X
Ziplock Bags 1 gallon	X
Ziplock Bags 2 gallon	
MISCELLANEOUS	
GPS	X
Surveyor's tape	X
100' Fiberglass tape	
300' Nylon rope	
Nylon string	X
Surveying flags	X
Camera	X
Film	
Bung wrench	
Soil auger	X
Pick	
Shovel	X
Catalytic heater	
Propane gas	
Banner tape	
Surveying meter stick	
Chaining pins and ring	

	No.
Logbooks (_____ large, __X__ small)	X
Required MSDSs	
Intrinsically safe flashlight	
Potable water	X
Gatorade or equivalent	X
Tables	
Chairs	
Weather radio	
Two-way radios	
Binoculars	
Megaphone	
Cooling vest	
EMERGENCY EQUIPMENT	
First aid kit	X
Stretcher	
Portable eye wash	
Blood pressure monitor	
Fire blanket	
Fire extinguisher	
Thermometer (medical)	
Spill kit	
DECONTAMINATION EQUIPMENT	
Wash tubs	
Buckets	
Scrub brushes	
Pressurized sprayer	
Spray bottle	X
Detergent (type: **:** RadiacWash or equivalent)	X
Solvent (type: _____)	
Plastic sheeting	
Tarps and poles	
Trash bags	X
Trash cans	
Masking tape	X

	No.
Duct tape	X
Paper towels	X
Face mask	
Face mask sanitizer	
Step ladders	
Distilled water	X
Deionized water	
SHIPPING EQUIPMENT	
Coolers	X
Paint cans with lids, 7 clips each	
Vermiculite	
Shipping labels	X
DOT labels:	
"Up"	
"Danger"	
"Inside Container Complies ..."	
Hazard Group	
Strapping tape	X
Baggies	X
Custody seals	X
Chain-of-custody forms	X
Express shipment forms	X
Clear packing tape	X
Permanent markers	X

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:			

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SEARCH

Enter search terms separated by spaces.

Uranium (soluble compounds, as U)

Synonyms & Trade Names Synonyms vary depending upon the specific soluble uranium compound.

CAS No.	RTECS No.	DOT ID & Guide
	Conversion	IDLH Ca [10 mg/m3 (as U)] See: uranium (/niosh/idlh/uranium.html)

Exposure Limits	Measurement Methods
NIOSH REL : Ca TWA 0.05 mg/m3 See Appendix A (nengapdxa.html) OSHA PEL : TWA 0.05 mg/m3	None available See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html)

Physical Description Appearance and odor vary depending upon the specific soluble uranium compound.

Properties vary depending upon the specific soluble uranium compound.					

Incompatibilities & Reactivities Uranyl nitrate: combustibles Uranium hexafluoride: water

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms lacrimation (discharge of tears), conjunctivitis; short breath, cough, chest rales; nausea, vomiting; skin burns; red blood cell, casts in urine; proteinuria; high blood urea nitrogen; [potential occupational carcinogen] Potential for cancer is a result of alpha-emitting properties & radioactive decay products (e.g., radon).

Target Organs respiratory system, blood, liver, kidneys, lymphatic system, skin, bone marrow

Cancer Site [lung cancer]

Personal Protection/Sanitation	First Aid
(See protection codes (protect.html)) **Skin:** Prevent skin contact **Eyes:** Prevent eye contact **Wash skin:** When contaminated/Daily **Remove:** When wet or contaminated **Change:** Daily **Provide:** Eyewash (UF_6), Quick drench	(See procedures (firstaid.html)) **Eye:** Irrigate immediately **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 (Halides):
(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 (pgintrod.html#nrp) for information on selection of N, R, or P filters.
Any appropriate escape-type, self-contained breathing apparatus

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

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See MEDICAL TESTS: 0239 (/niosh/docs/2005-110/nmed0239.html)

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SEARCH

Enter search terms separated by spaces.

Uranium (insoluble compounds, as U)

Synonyms & Trade Names **Uranium metal:** Uranium I
Synonyms of other insoluble uranium compounds vary depending upon the specific compound.

CAS No. 7440-61-1 (metal)	**RTECS No.** YR3490000 (metal) (/niosh-rtecs/YR3540D0.html)	**DOT ID & Guide** 2979 162 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=162) (metal, pyrophoric)
Formula U (metal)	**Conversion**	**IDLH** Ca [10 mg/m3 (as U)] See: 7440611 (/niosh/idlh/7440611.html)
Exposure Limits **NIOSH REL** : Ca TWA 0.2 mg/m3 ST 0.6 mg/m3 See Appendix A (nengapdxa.html) **OSHA PEL** † (nengapdxg.html) : TWA 0.25 mg/m3		**Measurement Methods** None available See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html)

Physical Description Metal: Silver-white, malleable, ductile, lustrous solid. [Note: Weakly radioactive.]

MW: 238.0	**BP:** 6895° F	MLT: 2097°F	**Sol:** Insoluble	**VP:** 0 mmHg (approx)	**IP:** NA
Sp.Gr: 19.05 (metal)	**Fl.P:** NA	**UEL:** NA	**LEL:** NA		**MEC:** 60 g/m3

Metal: Combustible Solid, especially turnings and powder.

Incompatibilities & Reactivities Carbon dioxide, carbon tetrachloride, nitric acid, fluorine [Note: Complete coverage of uranium metal scrap with oil is essential for prevention of fire.]

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms dermatitis; kidney damage; blood changes; [potential occupational carcinogen]; in animals: lung, lymph node damage; [potential occupational carcinogen] Potential for cancer is a result of alpha-emitting properties & radioactive decay products (e.g., radon).

Target Organs Skin, kidneys, bone marrow, lymphatic system

Cancer Site [lung cancer]

Personal Protection/Sanitation (See protection codes (protect.html)) **Skin:** Prevent skin contact **Eyes:** Prevent eye contact **Wash skin:** When contaminated/Daily	**First Aid** (See procedures (firstaid.html)) **Eye:** Irrigate immediately **Skin:** Soap wash promptly **Breathing:** Respiratory support **Swallow:** Medical attention immediately

Remove: When wet or contaminated
Change: Daily
Provide: Eyewash

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 (pgintrod.html#nrp) for information on selection of N, R, or P filters.
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 1251 (/niosh/ipcsneng/neng1251.html)
See MEDICAL TESTS: 0239 (/niosh/docs/2005-110/nmed0239.html)

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Occupational Safety and Health Guideline for Uranium and Insoluble Compounds

DISCLAIMER:

These guidelines were developed under contract using generally accepted secondary sources. The protocol used by the contractor for surveying these data sources was developed by the National Institute for Occupational Safety and Health (NIOSH), the Occupational Safety and Health Administration (OSHA), and the Department of Energy (DOE). The information contained in these guidelines is intended for reference purposes only. None of the agencies have conducted a comprehensive check of the information and data contained in these sources. It provides a summary of information about chemicals that workers may be exposed to in their workplaces. The secondary sources used for supplements III and IV were published before 1992 and 1993, respectively, and for the remainder of the guidelines the secondary sources used were published before September 1996. This information may be superseded by new developments in the field of industrial hygiene. Therefore readers are advised to determine whether new information is available.

Introduction | Applicability | Recognition | Evaluation | Controls | References | Bibliography | Reference Table

Introduction

This guideline summarizes pertinent information about uranium and insoluble uranium compounds (measured as uranium) for workers and employers as well as for physicians, industrial hygienists, and other occupational safety and health professionals who may need such information to conduct effective occupational safety and hea programs. Recommendations may be superseded by new developments in these fields; readers are therefore advised to regard these recommendations as general guidelines and to determine periodically whether new information is available.

Applicability

This guideline applies to metallic uranium and all insoluble uranium compounds; examples of such compounds include triuranium octaoxide, uranium dioxide, uranium hydride, uranium tetrafluoride, and uranium trioxide. The physical and chemical properties of uranium and of some insoluble uranium compounds are presented below fo illustrative purposes.

Recognition

Metallic uranium

SUBSTANCE IDENTIFICATION

* Formula
U
* Structure
(For Structure, see paper copy)
* Synonyms
U; Uranium metal, pyrophoric; uranium.
* Identifiers

1. CAS 7440-61-1.
2. RTECS YR3490000.
3. DOT UN: 2979 65 (for the pyrophoric forms of the metal).
4. DOT labels: Radioactive and Flammable Solid.

* Appearance and odor
Elemental uranium is a heavy, malleable, silvery white, lustrous, radioactive metal that is pyrophoric when finely divided. When uranium is obtained by reduction, it take the form of a black powder. In its natural state, uranium has three isotopes: (234)U, (235)U, and (238)U. U-238 has a half life of 4,510,000,000 years.

CHEMICAL AND PHYSICAL PROPERTIES

* Physical data

1. Atomic number: 92.
2. Atomic weight: 238.03.
3. Boiling point (760 torr): 3818 degrees C (6904 degrees F).
4. Specific gravity (water = 1): 19.05 + 0.02 at 20 degrees C (68 degrees F).
5. Vapor density: Not applicable.
6. Melting point: 1132.3 degrees C (2070 degrees F).
7. Vapor pressure at 20 degrees C (68 degrees F): Nearly zero.
8. Solubility: Insoluble in water, alcohol, and alkalies; soluble in acids.

9. Evaporation rate: Not applicable.

Triuranium Octaoxide

SUBSTANCE IDENTIFICATION

* Formula
U(3)O(8)
* Structure
(For Structure, see paper copy)
* Synonyms
Uranium oxide, pitchblende, nasturan, uraninite.
* Identifiers

1. CAS 1317-99-3.
2. RTECS YR3400000.
3. Specific DOT number: None.
4. Specific DOT label: None.

* Appearance and odor
Triuranium octaoxide is an olive green to black, odorless solid.

CHEMICAL AND PHYSICAL PROPERTIES

* Physical data

1. Molecular weight: 842.1.
2. Boiling point: Not applicable.
3. Specific gravity (water = 1): 8.30 at 20 degrees C (68 degrees F).
4. Vapor density: Not applicable.
5. Melting point: 1300 degrees C (2372 degrees F) (decomposes to uranium dioxide).
6. Vapor pressure at 20 degrees C (68 degrees F): Nearly zero.
7. Solubility: Insoluble in water; soluble in nitric and sulfuric acids.
8. Evaporation rate: Not applicable.

Uranium dioxide

SUBSTANCE IDENTIFICATION

* Formula
UO(2)
* Structure
(For Structure, see paper copy)
* Synonyms
Uranous oxide, black uranium oxide, uranium oxide, uranic oxide, urania, yellow cake.
* Identifiers

1. CAS 1344-57-6.
2. RTECS: None.
3. Specific DOT number: None.
4. Specific DOT label: None.

* Appearance and odor
Uranium dioxide is a pyrophoric, black, crystalline solid. It occurs naturally in various minerals including uraninite, pitchblende, and tyuyamunite. The latter is the most important mineral commercially.

CHEMICAL AND PHYSICAL PROPERTIES

* Physical data

1. Molecular weight: 270.03.
2. Boiling point: Data not available.
3. Specific gravity (water = 1): 10.96 at 20 degrees C (68 degrees F).
4. Vapor density: Not applicable.
5. Melting point: 2858-2898 degrees C (5176-5248 degrees F).
6. Vapor pressure: Not applicable.
7. Solubility: Insoluble in water; soluble in concentrated sulfuric acid and nitric acid.
8. Evaporation rate: Not applicable.

Uranium hydride

SUBSTANCE IDENTIFICATION

* Formula
UH(3)
* Structure
(For Structure, see paper copy)
* Synonyms
Uranium trihydride.
* Identifiers

1. CAS 13598-56-6.
2. RTECS: None.
3. Specific DOT number: None.
4. Specific DOT label: None.

* Appearance and odor

Uranium hydride is a brownish-black or brownish-gray, pyrophoric powder.

CHEMICAL AND PHYSICAL PROPERTIES

* Physical data

1. Molecular weight: 241.05.
2. Boiling point (760 torr): Not applicable.
3. Specific gravity (water = 1): 10.95 at 20 degrees C (68 degrees F).
4. Vapor density: Not applicable.
5. Melting point: Decomposes.
6. Vapor pressure at 20 degrees C (68 degrees F): Nearly zero.
7. Solubility: Insoluble in water, alcohol, acetone, or liquid ammonia; slightly soluble in dilute hydrogen chloride; decomposes in nitric acid.
8. Evaporation rate: Not applicable.

Uranium tetrafluoride

SUBSTANCE IDENTIFICATION

* Formula
UF(4)
* Structure
(For Structure, see paper copy)
* Synonyms
Green salt.
* Identifiers

1. CAS 10049-14-6.
2. RTECS: None.
3. Specific DOT number: None.
4. Specific DOT label: None.

* Appearance and odor
Uranium tetrafluoride is a nonvolatile, green, odorless, crystalline solid.

CHEMICAL AND PHYSICAL PROPERTIES

* Physical data

1. Molecular weight: 314.
2. Boiling point (760 torr): 1417 degrees C (2582 degrees F).
3. Specific gravity (water = 1): 6.7 at 20 degrees C (68 degrees F).
4. Vapor density: Not applicable.
5. Melting point: 955-965 degrees C (1751-1769 degrees F).
6. Vapor pressure at 20 degrees C (68 degrees F): Nearly zero.
7. Solubility: Insoluble in water; soluble (decomposes) in concentrated acids and alkalies.
8. Evaporation rate: Not applicable.

* Reactivity

1. Conditions contributing to instability: Heat, flame, or exposure to air. Uranium metal reacts with nearly all nonmetals. Uranium turnings and fines stored out-of-doors in closed containers under water or water-soluble oil will convert partially to the hydride and will eventually ignite during hot weather.
2. Incompatibilities: Pure uranium is very reactive and is a strong reducing agent. Clean uranium turnings or chips oxidize readily in air. Contact of uranium with carbon dioxide, carbon tetrachloride, or nitric acid causes fires or explosions. Uranium hydride is spontaneously flammable in air, and contact of the hydride with strong oxidizers may cause fires and explosions. Contact of uranium hydride with water forms flammable and explosive hydrogen gas, and contact of the hydride with halogenated hydrocarbons can cause violent reactions. In finely divided form, uranium dioxide ignites spontaneously in air.
3. Hazardous decomposition products: Toxic particulates, gases, and vapors (such as uranium metal fume, oxides of uranium, hydrogen fluoride, carbon monoxide, and dangerous radioactive materials) may be released when uranium or an insoluble uranium compound decomposes.
4. Special precautions: Uranium is radioactive and highly reactive and should be handled with extreme caution at all times. Uranium tetrafluoride is highly corrosive.

* Flammability
The National Fire Protection Association has not assigned a flammability rating to uranium or the insoluble uranium compounds. Other sources rate uranium in solid or powder form as a very dangerous fire hazard when this substance is exposed to heat or open flame.

1. Flash point: Data not available.
   Autoignition temperature: The ignition temperature depends on the extent to which the metal is subdivided. The ignition temperature of the metal is 170 degrees C (338 degrees F) (if oxygen is present); finely divided uranium metal (dust) ignites at room temperature (20 degrees C (68 degrees F)).
2. Flammable limits in air: Not applicable.
3. Minimum explosive concentration: 60 g/m(3).
4. Extinguishant: Use graphite chips, carbon dust, asbestos blankets, or flooding with water to extinguish small uranium fires. There is no effective way to extinguish large uranium fires.

   Fires involving uranium or an insoluble uranium compound should be fought upwind and from the maximum distance possible. Keep unnecessary people away; isolate hazard area and deny entry. Emergency personnel should stay out of low areas and ventilate closed spaces before entering. Finely divided uranium (chips, turnings, shavings, etc.) are much more reactive than uranium in bulk form. If these are present during a fire, do not disperse them into a dust cloud, which may be explosive. Uranium metal may ignite spontaneously if exposed to air or other substances, may burn rapidly with a flare-burning effect, and may re-ignite after the fire has been extinguished. Containers of uranium or an insoluble uranium compound may explode in the heat of the fire and should be moved from the fire area if it is possible to do so safely. If this is not possible, cool containers from the sides with water until well after the fire is out. Stay away from the ends of containers. Personnel should withdraw immediately if a rising sound from a venting safety device is heard or if there is discoloration of a container due to fire. Dikes should be used to contain fire-control water for later disposal. If a tank car or truck is involved in a fire, personnel should isolate an area of a half a mile in all directions. Delay cleanup until arrival of, or instruction from, a qualified radiation authority. Firefighters should wear a full set of protective clothing, including a self-contained breathing apparatus, when fighting fires involving uranium or an insoluble uranium compound. Firefighters' protective clothing may provide limited protection against fires involving uranium or an insoluble uranium compound.

* Warning properties
No quantitative data are available on the odor threshold for uranium or insoluble uranium compounds; several of these substances are odorless. For the purpose of selecting appropriate respiratory protection, these substances are therefore considered to have inadequate odor warning properties.

* Eye irritation properties
No quantitative data are available on the eye irritation threshold for uranium or the insoluble uranium compounds.

EXPOSURE LIMITS

The current Occupational Safety and Health Administration (OSHA) permissible exposure limits (PELs) for uranium and the insoluble uranium compounds (measured as uranium) are 0.2 milligram per cubic meter (mg/m(3)) of air as an 8-hour time-weighted average (TWA) concentration and 0.6 mg/m(3) as a 15-minute TWA short-terr exposure limit (STEL). A STEL is the maximum 15-minute concentration to which workers may be exposed during any 15-minute period of the working day [29 CFR 1910.1000, Table Z-1-A]. The National Institute for Occupational Safety and Health (NIOSH) has not issued a recommended exposure limit (REL) for uranium or its insol uranium compounds; however, NIOSH concurs with the PEL established for this substance by OSHA [NIOSH 1988]. The American Conference of Governmental Industria Hygienists (ACGIH) has assigned uranium and the insoluble uranium compounds a threshold limit value (TLV) of 0.2 mg/m(3) as a TWA for a normal 8-hour workday an 40-hour workweek and a short-term exposure limit (STEL) of 0.6 mg/m(3) for periods not to exceed 15 minutes [ACGIH 1988, p. 37]. The OSHA and ACGIH limits are b on the risk of kidney and blood disorders and on the radiological damage associated with exposure to uranium or an insoluble uranium compound.

Evaluation

HEALTH HAZARD INFORMATION

* Routes of Exposure
Exposure to uranium or an insoluble uranium compound can occur via inhalation, ingestion, and eye or skin contact. Exposure to uranium trioxide can occur by absorptic through the skin, eyes, and mucous membranes.

* Summary of toxicology

1. Effects on Animals: Metallic uranium and insoluble uranium compounds may produce both chemical poisoning and radiation injury to the kidneys and lungs of exposed animals [Clayton and Clayton 1981, p. 1996]. The insoluble uranium compounds are less toxic chemically than the soluble compounds, but uranium and uranium compounds have the potential to cause radiation damage [Clayton and Clayton 1981, p. 2000; Klaassen, Amdur, and Doull 1986, p. 695]. The inhalation toxicity of uranium and the insoluble compounds of uranium is much greater than their oral toxicity [Clayton and Clayton 1981, p. 2000]. No dietary amount of insoluble uranium compounds acceptable to rats was lethal, and no evidence of systemic poisoning developed after the application of an insoluble compound to rabbit skin [Clayton and Clayton 1981, p. 2000]. However, uranium trioxide is lethal when placed in the conjunctival sac of rabbits' eyes, and uranium tetrafluorid causes direct eye injury [Grant 1986, p. 965]. Acute inhalation exposure to 20-mg/m(3) concentrations of uranium tetrafluoride, uranium dioxide, or high-grade uranium ore was occasionally fatal to some laboratory animals; exposure to a 2.5-mg/m(3) concentration of uranium tetrafluoride, uranium dioxide, or high-grade uranium ore caused mild or no renal damage and no fatalities in these animals [Clayton and Clayton 1981, p. 2001]. Chronic inhalation exposure to an insoluble uranium compound may produce radiation injury. In dogs and monkeys exposed to 5 mg/m(3) uranium dioxide for 6 hours/day, 5 days/week for up to 5 years, fibrotic changes suggestive of radiation injury were found in the tracheobronchial lymph nodes of both species and in the lungs of monkeys. No kidney damage w observed in these animals [Clayton and Clayton 1981, p. 2002]. Dogs tolerated inhalation of a 10-mg/m(3) concentration of uranium dioxide every day for 1 year dietary exposure to 10 g/kg/day for 1 year [Clayton and Clayton 1981, pp. 2001-2002]. Rats injected with metallic uranium in the femoral bone marrow and ches wall developed site-of-contact sarcomas; in these cases, the effects of chemical injury could not be distinguished from those of radiation damage [Clayton and Clayton 1981, p. 2003].
2. Effects on Humans: Metallic uranium and insoluble uranium compounds may produce both chemical poisoning and radiation injury [Clayton and Clayton 1981, p. 1996]. The insoluble uranium compounds are less toxic chemically than the soluble compounds, but uranium and all uranium compounds have the potential to ca radiation damage [Clayton and Clayton 1981, p. 2000; Klaassen, Amdur, and Doull 1986, p. 695]. Exposure to the dusts of uranium or to an insoluble uranium compound may cause respiratory irritation, cough, and shortness of breath [Genium MSDS 1988, No. 238]. Dermatitis has also been reported, and prolonged skir contact causes radiation injury to the basal cells [Proctor, Hughes, and Fischman 1988, p. 502]. Studies have shown that uranium workers are at increased risk o death from respiratory, lymphatic, and hematopoietic cancers; these deaths are presumed to be caused by radiation injury from radon gas, a byproduct of uraniu decay [Rom 1983, p. 688]. A study of the risk of respiratory deaths among uranium miners in the United States showed the following dose-response: miners exp occupationally for 5 to 9.9 years had a 2-fold increase in risk; miners exposed for 10 to 24.9 years had a 3.6-fold increase in risk; and those exposed for greater t 24.9 years had a 3.75-fold increase in risk. Smoking was shown both to increase the risk of death from respiratory disease and to shorten the neoplastic latency period [Clayton and Clayton 1981, pp. 2010-2011].

* Signs and symptoms of exposure

1. Acute exposure: The signs and symptoms of acute exposure to uranium or an insoluble uranium compound include respiratory irritation, cough, and shortness of breath.
2. Chronic exposure: 2. Chronic exposure: The signs and symptoms of chronic exposure to uranium or an insoluble uranium compound include those of lung damag shortness of breath, dry or productive cough, rales, cyanosis, and clubbing of the fingers. Long-term exposure also may cause cancer of the blood-forming syster the lymph system, and the respiratory tract, as well as anemia and leukopenia. The signs and symptoms of uranium-induced dermatitis may include irritation, redness, blistering, thickening, or hyperpigmentation of the skin.

* Emergency procedures:
In the event of an emergency, remove the victim from further exposure, send for medical assistance, and initiate the following emergency procedures:

1. Eye exposure: If uranium or an insoluble uranium compound gets into the eyes, immediately flush the eyes with large amounts of water for a minimum of 15 minutes, lifting the lower and upper lids occasionally. If irritation persists, get medical attention as soon as possible.
2. Skin exposure: If uranium or an insoluble uranium compound contacts the skin, the contaminated skin should be washed with soap and water. Contaminated bod surfaces should immediately be decontaminated in accordance with radiation procedures. Get medical attention.
3. Inhalation: If uranium or an insoluble uranium compound is inhaled, move the victim at once to fresh air and get medical care as soon as possible. If the victim is breathing, perform cardiopulmonary resuscitation; if breathing is difficult, give oxygen. Keep the victim warm and quiet until medical help arrives.
4. Ingestion: If uranium or an insoluble uranium compound is ingested, give the victim several glasses of water to drink and then induce vomiting by having the vict touch the back of the throat with the finger or by giving syrup of ipecac as directed on the package. Do not force an unconscious or convulsing person to drink liquids or to vomit. Get medical help immediately. Keep the victim warm and quiet until medical help arrives.
5. Rescue: Remove an incapacitated worker from further exposure and implement appropriate emergency procedures (e.g., those listed on the Material Safety Data Sheet required by OSHA's Hazard Communication Standard, 29 CFR 1910.1200). All workers should be familiar with emergency procedures and the location and proper use of emergency equipment.

EXPOSURE SOURCES AND CONTROL METHODS

The following operations may involve uranium and insoluble uranium compounds and lead to worker exposures to these substances:

- Mining, grinding, and milling of uranium ores
- Use in nuclear reactors as fuel and to pack nuclear fuel rods and in the production of nuclear weapons
- Burning of uranium metal chips and smelting operations
- Use in the ceramics industry for pigments, coloring porcelain, painting on porcelain, and enamelling

- Use as catalysts for many reactions, in gas manufacture, and in production of fluorescent glass
- Use in photographic processes, for alloying steel, in radiation shielding, and in aircraft counterweights
- Use as a source of plutonium and radium salts

Uranium hydride:

* Use as a lab source for pure hydrogen, for separation of hydrogen isotopes, and as a reducing agent
Methods that are effective in controlling worker exposures to uranium and insoluble uranium compounds, depending on the feasibility of implementation, are

- Process enclosure,
- Local exhaust ventilation,
- General dilution ventilation, and
- Personal protective equipment.

The following publications are good sources of information on control methods:

1. ACGIH [1986]. Industrial ventilation--a manual of recommended practice. Cincinnati, OH: American Conference of Governmental Industrial Hygienists.
2. Burton DJ [1986]. Industrial ventilation--a self study companion. Cincinnati, OH: American Conference of Governmental Industrial Hygienists.
3. Alden JL, Kane JM [1982]. Design of industrial ventilation systems. New York, NY: Industrial Press, Inc.
4. Wadden RA, Scheff PA [1987]. Engineering design for control of workplace hazards. New York, NY: McGraw-Hill.
5. Plog BA [1988]. Fundamentals of industrial hygiene. Chicago, IL: National Safety Council.

MEDICAL MONITORING

Workers who may be exposed to chemical and radiation hazards should be monitored in a systematic program of medical surveillance that is intended to prevent occupational injury and disease. The program should include education of employers and workers about work-related hazards, placement of workers in jobs that do not jeopardize their safety or health, early detection of adverse health effects, and referral of workers for diagnosis and treatment. The occurrence of disease or other work-related adverse health effects should prompt immediate evaluation of primary preventive measures (e.g., industrial hygiene monitoring, engineering controls, and perso protective equipment). A medical monitoring program is intended to supplement, not replace, such measures. To place workers effectively and to detect and control wor related health effects, medical evaluations should be performed (1) before job placement, (2) periodically during the period of employment, and (3) at the time of job transfer or termination.

* Preplacement medical evaluation
Before a worker is placed in a job with a potential for exposure to uranium or an insoluble uranium compound, the examining physician should evaluate and document tl worker's baseline health status with thorough medical, environmental, and occupational histories, a physical examination, and physiologic and laboratory tests appropria for the anticipated occupational risks. These should concentrate on the function and integrity of the kidneys, respiratory system, blood, liver, bone marrow, skin, and lymphatics. Medical monitoring for respiratory disease should be conducted using the principles and methods recommended by NIOSH and the American Thoracic Societ

A preplacement medical evaluation is recommended to assess an individual's suitability for employment at a specific job and to detect and assess medical conditions tha may be aggravated or may result in increased risk when a worker is exposed to uranium or an insoluble uranium compound at or below the prescribed exposure limit. Tl examining physician should consider the probable frequency, intensity, and duration of exposure as well as the nature and degree of any applicable medical condition. S conditions (which should not be regarded as absolute contraindications to job placement) include a history and other findings consistent with diseases of the kidneys, respiratory system, blood, liver, bone marrow, skin, or lymphatics.

* Periodic medical examinations and biological monitoring
Occupational health interviews and physical examinations should be performed at regular intervals during the employment period, as mandated by any applicable Federa State, or local standard. Where no standard exists and the hazard is minimal, evaluations should be conducted every 3 to 5 years or as frequently as recommended by a experienced occupational health physician. Additional examinations may be necessary if a worker develops symptoms attributable to uranium exposure. The interviews, examinations, and medical screening tests should focus on identifying the adverse effects of uranium on the kidneys, respiratory system, blood, liver, bone marrow, skin lymphatics. Current health status should be compared with the baseline health status of the individual worker or with expected values for a suitable reference populatior

Biological monitoring involves sampling and analyzing body tissues or fluids to provide an index of exposure to a toxic substance or metabolite. Urinary uranium concentrations correlate well with airborne uranium levels. Some sources report that urinary concen-trations of 50 þg uranium per liter of urine or 100 þg uranium per lit of urine correspond to constant daily exposures of approximately 0.05 mg/m(3) or 0.25 mg/m(3), respectively. Because there is great interindividual and intraindividual variability in urinary uranium concentrations, a pattern of urinary uranium excretion should be established for every exposed worker by sampling individuals at the same time on several different shifts and by sampling frequently.

* Medical examinations recommended at the time of job transfer or termination
The medical, environmental, and occupational history interviews, the physical examination, and selected physiologic or laboratory tests that were conducted at the time placement should be repeated at the time of job transfer or termination to determine the worker's medical status at the end of his or her employment. Any changes in tl worker's health status should be compared with those expected for a suitable reference population. Because occupational exposure to uranium or an insoluble uranium compound may cause diseases with prolonged latent periods, the need for medical monitoring may extend well beyond the termination of employment.

WORKPLACE MONITORING AND MEASUREMENT PROCEDURES

Determination of a worker's exposure to airborne uranium or an insoluble uranium compound (measured as uranium) is made using a mixed cellulose ester filter (0.8 micron). Samples are collected at a maximum flow rate of 2 liters per minute until a maximum air volume of 960 liters is collected. Analysis is conducted by neutron activation. This method is included in the OSHA In-House Methods File.

Controls

PERSONAL HYGIENE PROCEDURES

If uranium or an insoluble uranium compound contacts the skin, workers should immediately wash the affected areas with soap and water. Contaminated body surfaces should immediately be decontaminated in accordance with radiation procedures.
Clothing contaminated with uranium or an insoluble uranium compound should be removed immediately, and provisions should be made for the safe removal of the chemical from the clothing. Persons laundering the clothes should be informed of the toxic and radioactive hazards of uranium.
A worker who handles uranium or an insoluble uranium compound should thoroughly wash hands, forearms, and face with soap and water before eating, using tobacco products, or using toilet facilities.
Workers should not eat, drink, or use tobacco products in areas where uranium or an insoluble uranium compound is handled, processed, or stored.

STORAGE

Uranium and insoluble uranium compounds should be stored in a cool, dry, well-ventilated area in tightly sealed containers that are labeled in accordance with OSHA's Hazard Communication Standard [29 CFR 1910.1200]. Containers of uranium or of insoluble uranium compounds should be protected from physical damage and should

stored separately from carbon dioxide, carbon tetra-chloride, nitric acid, air, nonmetals, heat, sparks, and open flame. Uranium hydride should not be allowed to contact water, strong oxidizers, or halogenated hydrocarbons. Because empty containers that formerly contained uranium or a uranium compound may still hold product residue they should be handled appropriately.

SPILLS AND LEAKS

In the event of a spill or leak involving uranium or an insoluble uranium compound, persons not wearing protective equipment and clothing should be restricted from contaminated areas until cleanup has been completed. A clean-up plan must be available to address an accidental leak or spill of uranium or an insoluble uranium compo because special radiation procedures are required and professional assistance is needed. The following steps should be undertaken following a spill or leak:

1. Do not touch the spilled material; stop the leak if it is possible to do so without risk.
2. Notify safety personnel.
3. Remove all sources of heat and ignition.
4. Ventilate the area of the spill or leak.
5. Protect cleanup personnel from contact with or inhalation of uranium dust.

EMERGENCY PLANNING, COMMUNITY RIGHT-TO-KNOW, AND HAZARDOUS WASTE MANAGEMENT REQUIREMENTS

The Environmental Protection Agency's (EPA's) regulatory requirements for emergency planning, community right-to-know, and hazardous waste management may vary over time. Users are therefore advised to determine periodically whether new information is available.

* Emergency planning requirements
Uranium and insoluble uranium compounds are not subject to EPA emergency planning requirements under the Superfund Amendments and Reauthorization Act (Title I

* Reportable quantity requirements for hazardous releases
Employers are not required by the emergency release notification provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) [CFR Part 355.40] to notify the National Response Center of an accidental release of uranium or an insoluble uranium compound; there is no reportable quantity for these substances.

* Community right-to-know requirements
Employers are not required by Section 313 of the Superfund Amendments and Reauthorization Act (SARA) to submit a Toxic Chemical Release Inventory form (Form R) EPA reporting the amount of uranium or an insoluble uranium compound emitted or released from their facility annually.

* Hazardous waste management requirements
EPA considers a waste to be hazardous if it exhibits any of the following characteristics: ignitability, corrosivity, reactivity, or toxicity, as defined in 40 CFR 261.21-261.24 Under the Resource Conservation and Recovery Act (RCRA), EPA has specifically listed many chemical wastes as hazardous. Although uranium and insoluble uranium compounds are not specifically listed as a hazardous waste under RCRA, EPA requires employers to treat any waste as hazardous if it exhibits any of the characteristics discussed above.

Providing more information about the removal and disposal of specific chemicals is beyond the scope of this guideline. EPA, U.S. Department of Transportation, and Stat and local regulations should be followed to ensure that removal, transport, and disposal of this substance are conducted in accordance with existing regulations. To be certain that chemical waste disposal meets EPA regulatory requirements, employers should address any questions to the RCRA hotline at (202) 382-3000 (in Washingtor D.C.) or toll-free at (800) 424-9346 (outside Washington, D.C.). In addition, relevant State and local authorities should be contacted for information on any requirements they may have for the waste removal and disposal of this substance.

RESPIRATORY PROTECTION

* Conditions for respirator use
Good industrial hygiene practice requires that engineering controls be used where feasible to reduce workplace concentrations of hazardous materials to the prescribed exposure limit. However, some situations may require the use of respirators to control exposure. Respirators must be worn if the ambient concentration of uranium or ar insoluble uranium compound exceeds prescribed exposure limits. Respirators may be used (1) before engineering controls have been installed, (2) during work operatior such as maintenance or repair activities that involve unknown exposures, (3) during operations that require entry into tanks or closed vessels, and (4) during emergency situations. If the use of respirators is necessary, the only respirators permitted are those that have been approved by NIOSH and the Mine Safety and Health Administrat (MSHA).

* Respiratory protection program
Employers should institute a complete respiratory protection program that, at a minimum, complies with the requirements of OSHA's Respiratory Protection Standard [29 CFR 1910.134]. Such a program must include respirator selection (see Table 1), an evaluation of the worker's ability to perform the work while wearing a respirator, the regular training of personnel, fit testing, periodic workplace monitoring, and regular respirator maintenance, inspection, and cleaning. The implementation of an adequat respiratory protection program (including selection of the correct respirator) requires that a knowledgeable person be in charge of the program and that the program be evaluated regularly. For additional information on the selection and use of respirators and on the medical screening of respirator users, consult the **NIOSH Respirator Decision Logic** and the **NIOSH Guide to Industrial Respiratory Protection**.

Table 1 lists the respiratory protection that NIOSH recommends for workers exposed to uranium or an insoluble uranium compound. The recommended protection may over time because of changes in the exposure limit for uranium or the insoluble uranium compounds or in respirator certification requirements. Users are therefore advis to determine periodically whether new information is available.

PERSONAL PROTECTIVE EQUIPMENT

Protective clothing should be worn to prevent skin contact with uranium or an insoluble uranium compound. Impervious gloves, boots, and aprons should be worn as appropriate when handling any of these substances. Chemical protective clothing should be selected on the basis of available performance data, manufacturers' recommendations, and evaluation of the clothing under actual conditions of use. No reports have been published on the resistance of various protective clothing materia permeation by uranium or an insoluble uranium compound; however, one source recommends natural rubber, neoprene, or polyvinyl chloride as a protective clothing material. If permeability data are not readily available, protective clothing manufacturers should be requested to provide information on the best chemical protective clothing for workers to wear when they are exposed to uranium or an insoluble uranium compound.

If uranium or an insoluble uranium compound is dissolved in an organic solvent, the permeation properties of both the solvent and the mixture must be considered wher selecting personal protective equipment and clothing.

Safety glasses, goggles, or faceshields should be worn during operations in which uranium or an insoluble uranium compound might contact the eyes. Eyewash fountain and emergency showers should be available within the immediate work area whenever the potential exists for eye or skin contact with uranium or its insoluble compoun Contact lenses should not be worn if the potential exists for exposure to any of these substances.

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Reference Table

Table 1
NIOSH recommended respiratory protection for workers exposed to uranium or an insoluble uranium compound*

Condition	Minimum respiratory protection**
Airborne concentration of uranium or an insoluble uranium compound:	
0.2 to 2 mg/m(3) (10 X PEL)	Single-use or quarter mask respirator
5 to 50 mg/m(3) (10 X PEL)	Any air-purifying, half-mask respirator equipped with a fume or high-efficiency filter approved for radon daughters or radionuclides, or Any air-purifying, full-facepiece respirator equipped with a fume filter approved for radon daughters, or Any supplied-air respirator equipped with a half mask and operated in a

	demand (negative-pressure) mode
0.2 to 5 mg/m(3) (25 X PEL)	Any powered, air-purifying respirator equipped with a hood or helmet and a fume or high-efficiency filter approved for radon daughters or radio-nuclides, or Any supplied-air respirator equipped with a hood or helmet and operated in a continuous-flow mode
0.2 to 10 mg/m(3) (50 X PEL)	Any air-purifying, full-facepiece respirator equipped with a high-efficiency filter approved for radon daughters or radio-nuclides, or Any powered, air-purifying respirator equipped with a tight-fitting facepiece and a high-efficiency filter approved for radon daughters or radio-nuclides, or Any supplied-air respirator equipped with a full facepiece and operated in a demand (negative-pressure) mode, or Any supplied-air respirator equipped with a tight-fitting facepiece and operated in a continuous-flow mode, or Any self-contained respirator equipped with a full facepiece and operated in a demand (negative-pressure) mode
0.2 to 30 mg/m(3) (150 X PEL)	Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode
Entry into IDLH(+) or unknown concentrations	Any self-contained respirator equipped with a full facepiece and operated in a pressure-demand or other positive-pressure mode, or Any supplied-air respirator equipped with a full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode
Firefighting	Any self-contained respirator equipped with a full facepiece and operated in a pressure-demand or other positive-pressure mode
Escape	Any air-purifying, full-facepiece respirator equipped with a high-efficiency filter approved for radon daughters or radionuclides, or Any escape-type, self-contained breathing apparatus with a suitable service life (number of minutes required to escape the environment)

* The OSHA PEL is 0.2 mg/m(3) as an 8-hour TWA. No NIOSH REL has been issued.

** Only NIOSH/MSHA-approved equipment should be used. Also note the following:

1. Respirators accepted for use at higher concentrations may be used at lower concentrations; respirators must not, however, be used at concentrations higher than those for which they are approved.
2. Air-purifying respirators may not be used in oxygen-deficient atmospheres or in airborne concentrations that are immediately dangerous to life or health (IDLH).

(+) The uranium or an insoluble uranium compound concentration that is immediately dangerous to life and health (IDLH) is 30 mg/m(3) [NIOSH 1987b].

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www.OSHA.gov

HEAT STRESS PREVENTION AND TREATMENT

Elevated temperatures are potentially hazardous, especially when work is conducted without appropriate precautions. The following sections describe heat stress prevention and the recognition and treatment of heat emergencies.

Effects of Heat

A predictable amount of heat is generated as a result of normal oxidation processes within the body. If heat is liberated rapidly, the body cools to a point at which the production of heat is accelerated, and the excess heat brings the body temperature back to normal.

Interference with the elimination of heat leads to its accumulation and to the elevation of body temperature. This condition produces a vicious cycle in which certain body processes accelerate and generate additional heat. Afterward, the body must eliminate not only the heat that is normally generated but also the additional quantities of heat.

Most body heat is brought to the surface by the bloodstream and escapes to cooler surroundings by conduction and radiation. If moving air or a breeze strikes the body, additional heat is lost by convection. When the temperature of the surrounding air becomes equal to or rises above the body temperature, all the heat must be lost by vaporization of the moisture or sweat from skin surfaces. As the air becomes more humid (contains more moisture), vaporization from the skin decreases. Weather conditions including high temperatures (90 to 100 degrees F), high humidity, and little or no breeze cause the retention of body heat. Such conditions or a succession of such days (a heat wave) increase the chances of a medical emergency due to heat.

Preventing Emergencies Due to Heat

When working in situations where the ambient temperatures and humidity are high, and especially in situations where protection levels A, B, or C are required, the site safety officer should:

- Ensure that all employees drink plenty of fluids (Gatorade or its equivalent);
- Ensure that frequent breaks are scheduled so overheating does not occur; and
- Revise work schedules, when necessary, to take advantage of the cooler parts of the day (i.e., 5:00 a.m. to 11:00 a.m. and 6:00 p.m. to nightfall).

When protective clothing is required, the suggested guidelines correlating ambient temperature and maximum wearing time per excursion are:

Ambient Temperature	Maximum Wearing Time per Excursion
Above 90 degrees F	15 minutes
85 to 90 degrees F	30 minutes
80 to 85 degrees F	60 minutes
70 to 80 degrees F	90 minutes
60 to 70 degrees F	120 minutes
50 to 60 degrees F	180 minutes

One method of measuring the effectiveness of an employee's rest-recovery regime is by monitoring the heart rate. The "Brouha guideline" is one such method and is performed as follows:

- Count the pulse rate for the **last** 30 seconds of the first minute of a 3-minute period, the **last** 30 seconds of the second minute, and the **last** 30 seconds of the third minute; and

- Double each result to yield beats per minute.

If the recovery pulse rate during the last 30 seconds of the first minute is 110 beats/minute or less, and the deceleration between the first, second, and third minutes is **at least** 10 beats/minute, then the work-recovery regime is acceptable. If the employee's rate is above the rate specified, a longer rest period will be required, accompanied by an increased intake of fluids.

Heat Emergencies

Heat Cramps. Heat cramps usually affect people who work in hot environments and perspire a great deal. Loss of salt from the body causes very painful cramps in leg and abdominal muscles. Heat cramps may also result from drinking iced water or other drinks either too quickly or in too large a quantity. The symptoms of heat cramps are:

- Painful muscle cramps in legs and abdomen;

- Faintness; and

- Profuse perspiration.

To provide emergency care for heat cramps, move the patient to a cool place. Give him or her sips of liquids such as Gatorade or its equivalent. Apply manual pressure to the cramped muscle. Move the patient to a hospital if there is any indication of a more serious problem.

Heat Exhaustion. Heat exhaustion also may occur in individuals working in hot environments and may be associated with heat cramps. Heat exhaustion is caused by the pooling of blood in the vessels of the skin. The heat is transported from the interior of the body to the surface by the blood. The skin vessels become dilated and a large amount of blood is pooled in the skin. This condition, plus the blood that is pooled in the lower extremities when in an upright position, may lead to an inadequate return of blood to the heart and eventual physical collapse. The symptoms of heat exhaustion are:

- Weak pulse;

- Rapid and usually shallow breathing;
- Generalized weakness;
- Pale, clammy skin;
- Profuse perspiration;
- Dizziness/faintness; and
- Unconsciousness.

To provide emergency care for heat exhaustion, move the patient to a cool place and remove as much clothing as possible. Have the patient drink cool water, Gatorade, or its equivalent. If possible, fan the patient continually to remove heat by convection, but do not allow chilling or overcooling. Treat the patient for shock and move him or her to a medical facility if there is any indication of a more serious problem.

Heat Stroke. Heat stroke is a profound disturbance of the heat-regulating mechanism and is associated with high fever and collapse. It is a serious threat to life and carries a 20% mortality rate. Sometimes this condition results in convulsions, unconsciousness, and even death. Direct exposure to sun, poor air circulation, poor physical condition, and advanced age (over 40) increase the chance of heat stroke. Alcoholics are extremely susceptible. The symptoms of heat stroke are:

- Sudden onset;
- Dry, hot, and flushed skin;
- Dilated pupils;
- Early loss of consciousness;
- Full and fast pulse;
- Deep breathing at first, followed by shallow or faint breathing;
- Muscle twitching, growing into convulsions; and
- Body temperature reaching 105 to 106 degrees F or higher.

When providing emergency care for heat stroke, remember that it is a life-threatening emergency. Transportation to a medical facility should not be delayed. Move the patient to a cool environment, if possible, and remove as much clothing as possible. Ensure an open airway. Reduce body temperature promptly by dousing the body with water or, preferably, by wrapping the patient in a wet sheet. If cold packs are available, place them under the arms, around the neck, at the ankles, or any place where blood vessels that lie close to the skin can be cooled. Protect the patient from injury during convulsions.

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OSHA QUICK CARD™

Rodents, Snakes and Insects

Insects, Spiders and Ticks

- To protect yourself from biting and stinging insects, wear long pants, socks, and long-sleeved shirts.
- Use insect repellents that contain DEET or Picaridin.
- Treat bites and stings with over-the-counter products that relieve pain and prevent infection.
- Avoid fire ants; their bites are painful and cause blisters.
- Severe reactions to fire ant bites (chest pain, nausea, sweating, loss of breath, serious swelling or slurred speech) require immediate medical treatment.

Rodents and Wild or Stray Animals

- Dead and live animals can spread diseases such as Rat Bite Fever and Rabies.
- Avoid contact with wild or stray animals.
- Avoid contact with rats or rat-contaminated buildings. If you can't avoid contact, wear protective gloves and wash your hands regularly.
- Get rid of dead animals as soon as possible.
- If bitten/scratched, get medical attention immediately.

Snakes

- Watch where you place your hands and feet when removing debris. If possible, don't place your fingers under debris you are moving. Wear heavy gloves.
- If you see a snake, step back and allow it to proceed.
- Wear boots at least 10 inches high.
- Watch for snakes sunning on fallen trees, limbs or other debris.
- A snake's striking distance is about 1/2 the total length of the snake.
- If bitten, note the color and shape of the snake's head to help with treatment.
- Keep bite victims still and calm to slow the spread of venom in case the snake is poisonous. Seek medical attention as soon as possible.
- Do not cut the wound or attempt to suck out the venom. Apply first aid: lay the person down so that the bite is below the level of the heart, and cover the bite with a clean, dry dressing.

For more complete information:

OSHA® Occupational Safety and Health Administration

U.S. Department of Labor
www.osha.gov (800) 321-OSHA

OSHA 3274-09N-05

OSHA FactSheet

Protect Yourself! Workers may be exposed to

Black Widow Spider

The black widow belongs to a group of spiders commonly known as cobweb spiders. The characteristic hourglass is located on the underside of the abdomen. Female black widows are dangerous and can bite and inject toxic venom.

Identification

- The female black widow is normally shiny black, with a red hourglass marking (see photo) on the underside of the abdomen.
- The abdominal marking may range in color from yellowish orange to red and its shape may range from an hourglass to a dot.
- The body of an adult black widow female is about 1/2 inch long.

Photo: Extension Entomology, Texas A&M University

Photo: University of Missouri Extension

Habitat

The black widow is commonly found in the following places:

- Outdoors - woodpiles, rubble piles, under stones, in hollow stumps, and in rodent burrows, privies, sheds and garages.
- Indoors - undisturbed, cluttered areas in basements and crawl spaces.

Symptons

- The bite of the black widow may be painful or it may go unnoticed.
- The skin may display one or two bite marks with local swelling. Pain usually progresses from the bite site and eventually to the abdomen and back.
- Severe cramping or rigidity may occur in the abdominal muscles.
- Symptoms may include nausea, profuse perspiration, tremors, labored breathing, restlessness, increased blood pressure and fever.
- The pain from the bite will usually persist for the first 8-12 hours.
- Symptoms may continue for several days.

Protection

- Wear a long-sleeved shirt, hat, gloves, and boots when handling boxes, firewood, lumber, and rocks, etc.
- Inspect and shake out clothing and shoes before getting dressed.
- Use insect repellants, such as DEET or Picaridin, on clothing and footwear.

Treatment

- Clean the bite area with soap and water.
- Apply ice to the bite area to slow absorption of the venom.
- Elevate and immobilize the extremity.
- Capture the spider, if at all possible, for identification purposes.
- Seek medical attention immediately.
- If you have a heart condition or other heart problem, you may need hospitalization.

This is one in a series of informational fact sheets highlighting OSHA programs, policies or standards. It does not impose any new compliance requirements. For a comprehensive list of compliance requirements of OSHA standards or regulations, refer to Title 29 of the Code of Federal Regulations. This information will be made available to sensory impaired individuals upon request. The voice phone is (202) 693-1999; teletypewriter (TTY) number: (877) 889-5627.

For more complete information:

OSHA Occupational Safety and Health Administration

U.S. Department of Labor

www.osha.gov

(800) 321-OSHA

DSG 10/2005

OSHA FactSheet

Protect Yourself! Workers may be exposed to

Brown Recluse Spider

The brown recluse belongs to a group of spiders commonly known as violin spiders or fiddlebacks. The characteristic fiddle-shaped pattern is located on the top of the leg attachment region (cephalothorax). Because they are secluded and withdrawn, as their name implies, the brown recluse avoids open spaces. Brown recluse spiders are dangerous and they can bite and inject toxic venom.

Identification

- Body size: 1/4 to 3/4 inch (6.4-19.1mm)
- Color: Golden brown
- A dark violin/fiddle shape (see top photo) is located on the top of the leg attachment region (cephalothorax) with the neck of the violin/fiddle pointing backward toward the abdomen.
- Unlike most spiders that have 8 eyes, the brown recluse has 6 eyes. The eyes, arranged in pairs – one pair in front and a pair on either side – can be readily seen under low magnification.

Habitat

The Brown Recluse Spider builds small retreat webs behind objects of any type.

Symptoms

- The severity of the bite may vary. Symptoms may vary from none to very severe.
- The bite generally becomes reddened within several hours.

Photo: R. Bessin, University of Kentucky

Photo: creatures.ifas.ufl.edu

- There is often a systemic reaction within 24-36 hours characterized by restlessness, fever, chills, nausea, weakness and joint pain.
- Tissue at the site of the bite and the surrounding area dies and eventually sheds.

Protection

- Wear a long-sleeved shirt, hat, gloves, and boots when handling stored boxes, firewood, lumber and rocks, etc.
- Inspect and shake out clothing and shoes before getting dressed.
- Use insect repellants, such as DEET or Picaridin, on clothing and footwear.

Treatment

- Clean the bite area with soap and water.
- Apply ice to the bite area to slow absorption of the venom.
- Elevate and immobilize the bitten extremity.
- Capture the spider, if at all possible, for identification purposes.
- Seek medical attention.

This is one in a series of informational fact sheets highlighting OSHA programs, policies or standards. It does not impose any new compliance requirements. For a comprehensive list of compliance requirements of OSHA standards or regulations, refer to Title 29 of the Code of Federal Regulations. This information will be made available to sensory impaired individuals upon request. The voice phone is (202) 693-1999; teletypewriter (TTY) number: (877) 889-5627.

For more complete information:

OSHA Occupational Safety and Health Administration

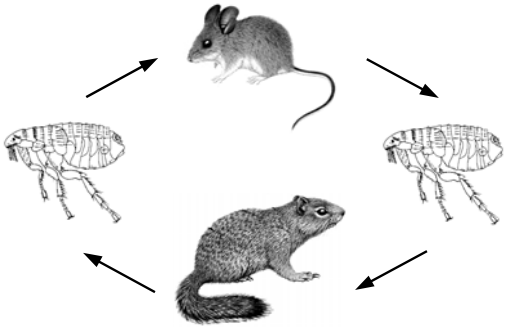
U.S. Department of Labor

www.osha.gov

(800) 321-OSHA

DSG 10/2005

What is Plague?

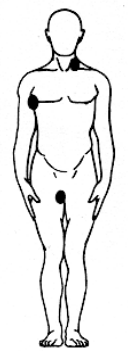


Plague is a disease of wild rodents and rabbits caused by the bacterium *Yersinia pestis*. It is spread among animals and to humans by the bites of infected fleas. Animals most often infected include rock squirrels, prairie dogs, pack rats, chipmunks, rabbits and mice.

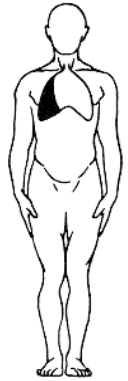
When an animal with plague dies, the infected fleas must find a new host. This may be another rodent, a pet or a person.

Although most human plague cases result from flea bites, people have also contracted the disease by coming into direct contact with an infected animal's blood or tissues, such as when skinning a rabbit or other game.

People can also get plague by inhaling infectious droplets expelled by a person or cat with pneumonic plague.



BUBONIC



PNEUMONIC FORM

The three forms of plague are bubonic ...

Symptoms usually develop within two to six days after a flea bite or contact with an infected animal and include high fever, chills, weakness, headache and muscle aches. In bubonic plague, a lymph node in the groin, armpit or neck becomes swollen and very painful.

... septicemic ...

Sometimes the bacteria go directly into the blood and there are no swollen lymph nodes, just fever and severe flu-like symptoms. Secondary septicemic plague can result from untreated bubonic plague.

... and pneumonic.

If the bacteria invade the lungs, pneumonia may develop and the disease may be spread to other people when the patient coughs or sneezes. For plague pneumonia patients, the death rate is over 50%.

Plague is curable if treated in time.

See your doctor immediately about any illness having sudden onset of high fever. Report if you have had flea bites, have handled any wild rodents or rabbits, or have a pet that hunts. Plague is curable with antibiotics if promptly diagnosed and treated.

Pets that hunt may bring plague-infected fleas into the home and can also become infected with plague. Cats are more likely than dogs to get sick, and can spread the disease to their owners through biting, coughing, or draining abscesses. Take your pet to the vet immediately if it has had contact with rodents and develops symptoms of fever, lethargy, and loss of appetite.

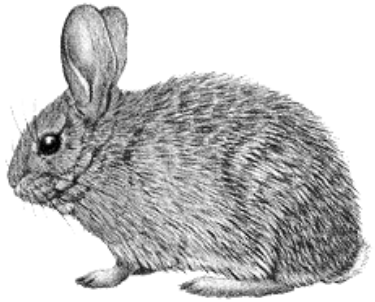
Preventing Plague

- Avoid contact with wild rodents and their fleas, nests and burrows.
- Prevent pets from hunting.
- Treat outdoor pets with flea control products regularly.
- Wear rubber gloves when handling game.
- Eliminate rodent shelter around the home:
- Stack woodpiles at least 12" above the ground and 100 feet from the house;
- Keep animal feed in rodent-proof containers;
- Get rid of junk piles and abandoned vehicles around the home.
- Report sick or dead rodents and rabbits (in the absence of poisoning or trauma) to the Zoonoses Program in the New Mexico Department of Health. (Within Bernalillo County, contact the Albuquerque Environmental Health Dept.)

For more information, contact:

Zoonoses Program
Epidemiology & Response
NM Department of Health
1190 St. Francis Dr.
Santa Fe, NM 87505

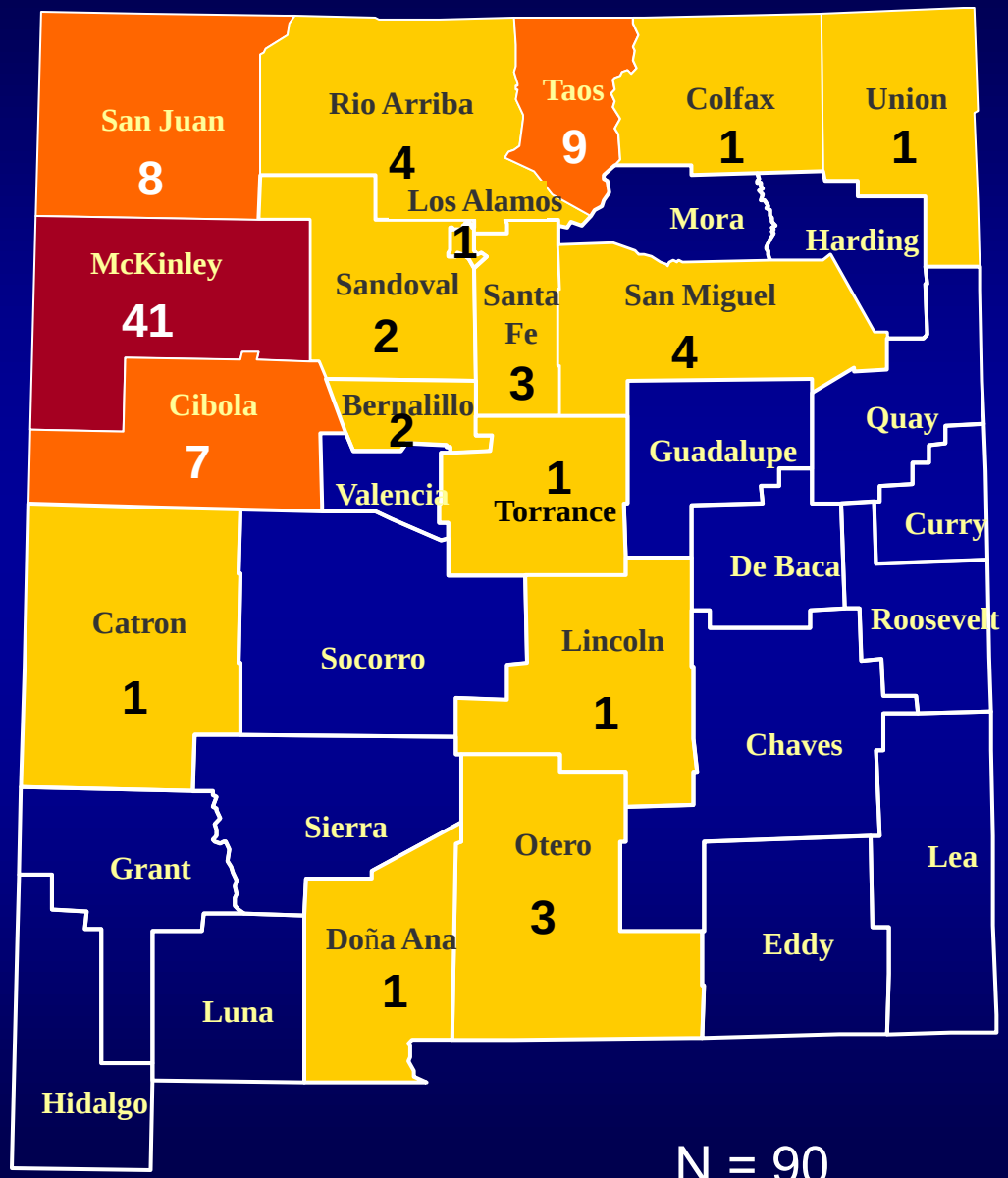
(505) 827-0006



PLAGUE IN NEW MEXICO

New Mexico Department of Health
Epidemiology and Response Division

HPS Cases in New Mexico by County, 1975 – 2011



Number of Cases

- >10
- 6-10
- 1-5
- 0

N = 90

12/31/2011

Mobil

Notes From the Road

Off-Road Driving and Safety Tips

By: Mac Demere/autoMedia.com

Speed is Not Your Friend -

Going off roading? Here are your choices: Carry your stuff on your back; walk beside a mule with your stuff on its back; ride in comfort with your stuff in the back of a four-wheel-drive.

The speed will be about the same. If you drive much faster than a walking pace there's a chance you'll be forced into the first option.

As a teenager, I wanted to cross a muddy section of field in a two-wheel-drive pickup on near-bald tires. I assessed that my only hope was speed. (If you ever say, "My only hope is ... " know that the rest of the sentence is "a miracle.") When the old Ford hit the swampy strip, it sunk floorboard-deep into the mud and came to a near-instant stop. The rear tires must have come off the ground because I feared it was about to flip forward.

Here are the lessons I should have learned, but didn't because I was a teenager:

Speed is not your friend.
The off-road driver's mantra is "As Slow As Possible, As Fast As Necessary." (The original author of this quote is uncertain, but I first heard it at a Land Rover driving school.) Sometimes a little speed may be required to climb a hill or conquer a hazard. However, if you think the obstacle requires even 10 mph, you're probably not going to make it. And you're going to damage something or get stuck.

Sometimes you can't get there from here.
This is true even with a well-equipped vehicle and a skilled driver—and was certainly true of an unskilled teenager in a poorly equipped vehicle. It's far easier to discover an alternate route than to find someone willing and able to come to your rescue. Walking the rest of the way is better than walking home.

Stay on the trail.
Trying to blaze my own trail not only got me stuck, but it left ruts that remained for years. Drive on previously used paths: You'll know it's possible to make it through there and you'll do less damage to the environment. A warning: Just because somebody else made it doesn't guarantee you will. Maybe they had a better vehicle, were a more skilled driver or went through before it rained.

Walk it first.
If you can't negotiate mud, sand or other obstacles on foot, it's highly unlikely your vehicle can make it. It's critical to check out a water-covered route: Unless you've seen another vehicle go through it, you can't be certain it doesn't hide a huge hole.

Be willing to walk back.
Never tackle a questionable obstacle unless you're able to walk back to where help awaits. If you're going off road, your cell phone will be useless. Even if there is coverage, there's nobody to call unless you've made a prior arrangement. The road-service tow-truck driver won't leave the pavement, the farmer with the tractor might not be home, and the guy in the SUV you wave down on the highway may not be able or willing to help. Not all SUVs have four-wheel-drive and a tow

strap.

Re-tire to succeed.
Even the most technologically advanced four-wheel-drive system can't make up for tires that are not meant for the job or lack adequate tread depth. Some original equipment tires on SUVs and pickups can't conquer anything more rigorous than wet grass. Also, even the best mud tires become useless off road well before they run out of tread.

Help yourself.
If you're planning to regularly travel the road less paved, bring along some things that'll help you out of small jams: a hand winch (a.k.a. "come-along"), tow strap, high-lift jack, shovel, some wood blocks, and a first-aid kit. If you're going further than you can walk out, bring enough stuff (extra clothes, water, sleeping bag) to survive until somebody finds you.

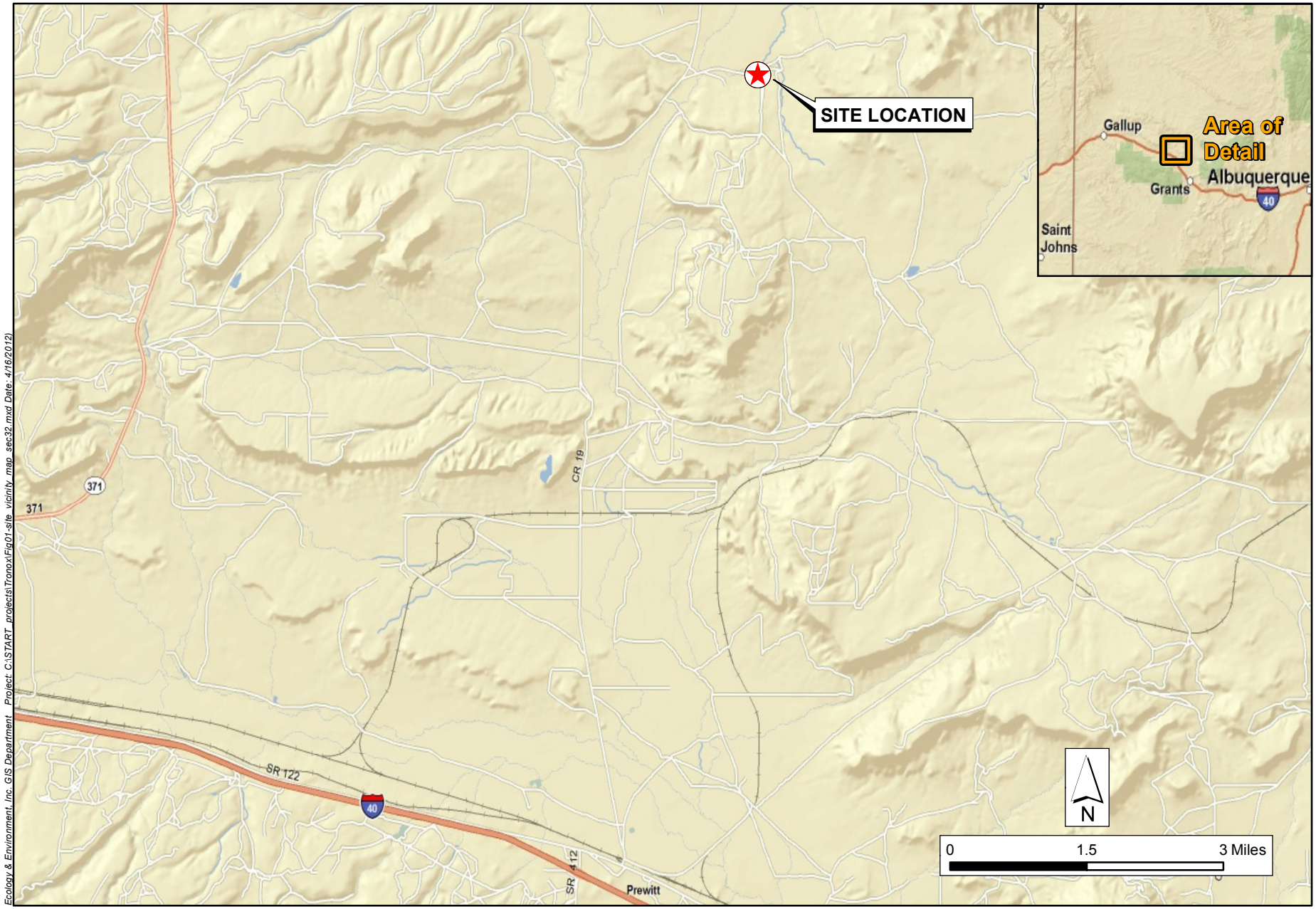
Tell somebody.
Tell somebody where you're going and when you expect to be back. At least they'll know when and where to start searching.

I got out of that ancient incident unscathed, largely because within a short hike there was a tractor with the keys in it and a long chain. Bringing along some luck never hurts.

About the Author
Mac Demere is a writer, vehicle tester and race driver who competed in the NASCAR Southwest Tour and Rolex 24 Hours at Daytona.

Project# 002693.2164.01RA
TDD# TO2 09-11-10-0004

Source: ESRI Streetmaps



Ecology & Environment, Inc. GIS Department Project: C:\START_projects\Tronox\Fig01-site_vicinity_map_sec32.mxd Date: 4/16/2012

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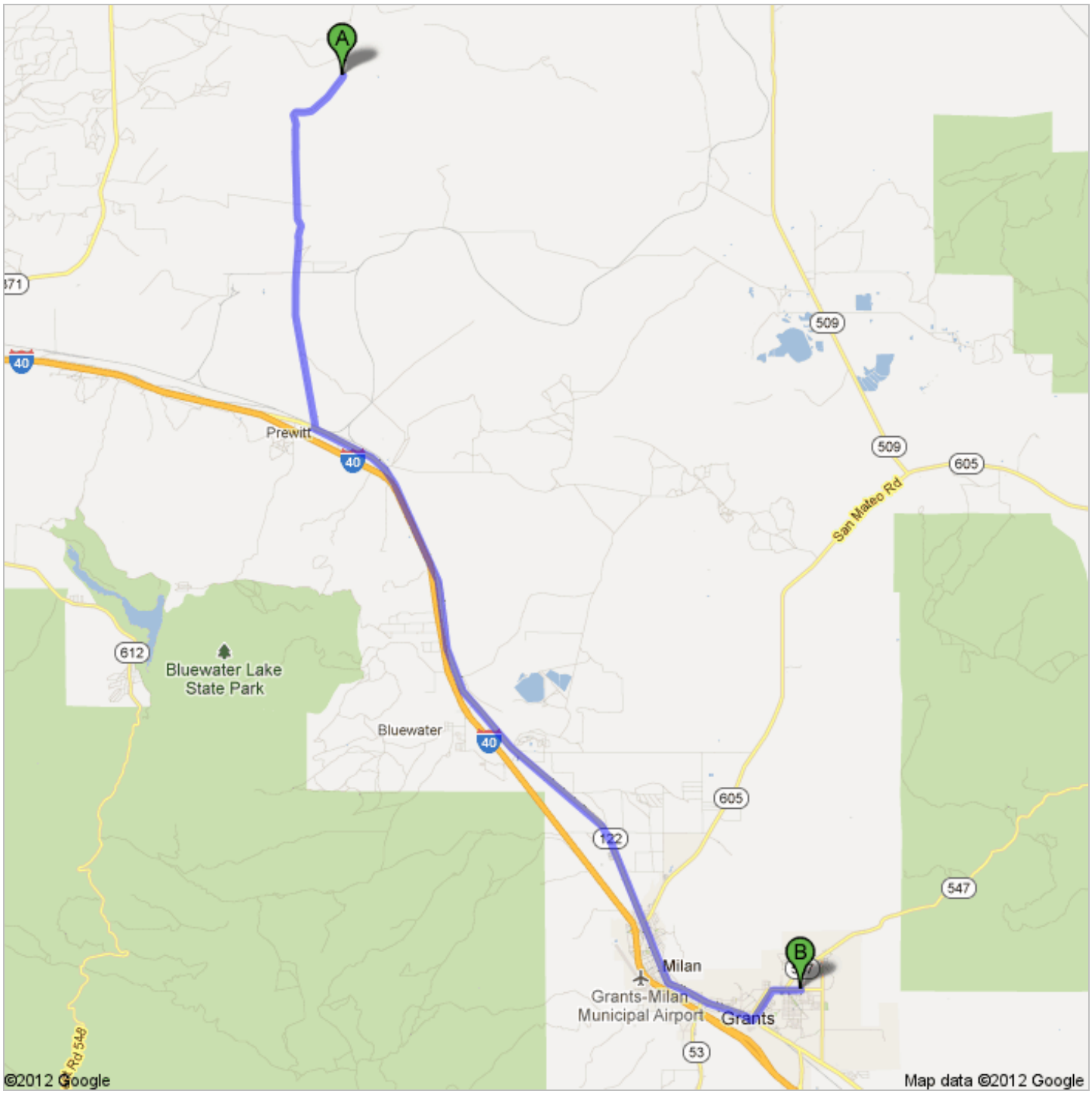
Figure 1

Site Vicinity Map
Tronox AUM Section 32

Casamero Lake Chapter, Navajo Nation, Prewitt, New Mexico

Directions to Cibola General Hospital
1016 E Roosevelt Ave, Grants, NM 87020 - (505) 287-4446
30.8 mi – about **49 mins**



Co Rd 19

1.	Head **southwest** on **Co Rd 19** About 24 mins	go 9.7 mi total 9.7 mi
2.	Turn left onto **NM-122 E/Frontage Rd** Continue to follow NM-122 E About 20 mins	go 18.1 mi total 27.8 mi
3.	Continue onto **W Santa Fe Ave** About 2 mins	go 1.4 mi total 29.2 mi
4.	Turn left onto **1st St** About 2 mins	go 0.9 mi total 30.0 mi
5.	Slight right onto **W Roosevelt Ave** Destination will be on the left About 2 mins	go 0.7 mi total 30.8 mi

Cibola General Hospital
1016 E Roosevelt Ave, Grants, NM 87020 - (505) 287-4446

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.

Map data ©2012 Google

Directions weren't right? Please find your route on maps.google.com and click "Report a problem" at the bottom left.

ECOLOGY AND ENVIRONMENT, INC.

SITE-SPECIFIC
HEALTH AND SAFETY PLAN

Project: Tronox AUM: Section 33, Eastern Agency, Removal Assessment

Project No.: 002693.2165.01RA

TDD/PAN No.: TO2-09-11-10-0005

Project Location: Prewitt, New Mexico
Casamero Lake Chapter, Navajo Nation

Proposed Date of Field Activities:

Site Walk – April 22, 2012
Survey and Sampling – June 2012

Project Director: Cindy McLeod

Project Manager: Aileen Mendoza

Prepared by: Aileen Mendoza Date Prepared: 4/16/12

Approved by: Cindy McLeod Date Approved: _____

Revised by: Bill Sass Date Revised: 6/7/12

Revision Approved by: Sara Dwight Date Approved: 6/7/12

2012 Ecology and Environment, Inc.

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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 Site-Specific Health and Safety Plan 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 (HAZWOPER)
Other:

1.2 SCOPE OF WORK

Description of Work: E & E was tasked by U.S. EPA under the Superfund Technical Assistance and Response Team (START) contract to conduct a removal assessment to delineate the extent of contamination at the Tronox abandoned uranium mine (AUM): Section 33, Eastern Agency located in Prewitt, McKinley County, New Mexico. Under this task order, E & E will perform a site walk with federal on-scene coordinator (FOSC) Randy Nattis, radiation scan/survey of surface soils, soil sampling from known areas of contamination based on previous investigation (Weston Solutions, Inc. [Weston] 2009) and radiation scan/survey results, and collect survey information for a background study.

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	Site walk
2	Surface radiation scan/survey of known areas of contamination to delineate removal area
3	Collection of soil samples
4	Surface radiation scan/survey for background study
5	Documentation (global positioning system [GPS], photographs, logs)
6	Homesite Investigation

1.3 SITE DESCRIPTION

Site Map: See Attachment 2.

Site History/Description (see project work plan for detailed description):

Tronox AUM: Section 33 (site) is located 1 mile east of County Road 19, in Prewitt, McKinley County, New Mexico (Latitude: 35° 29' 26.1972" N, Longitude: -108° 0' 59.8583" W). The site consists of an area of 11,005 square meters and an undetermined extent of underground workings (Weston 2009). The site is classified as private land owned by Lynn "Buddy" Elkins.

The site consists of a mine which was reportedly owned by Cobb Nuclear and was closed due to a fatality (Weston 2009). No other information on historical ownership of the mine and mining operations were available. No residences, public structures, water sources or sensitive environment were found within 0.25 miles of the site. The nearest resident is Lucita Sardo who lives to the west of the mine and had relatives who formerly worked for Cobb Nuclear. The residential property had some materials (tarps and lumber) obtained from the mine and had gamma radiation measurements of approximately 12,000 counts per minute (cpm). Gamma radiation measured at the site ranged from 14,322 cpm to 140,917 cpm. Gamma radiation measured at background locations ranged from 16,630 cpm to 17,128 cpm. Numerous waste piles were observed at AUM 33 and some former unidentified workings. No visible signs of reclamation were reported.

Is the site currently in operation? ☐ Yes ☒ No

Locations of Contaminants/Wastes: Naturally occurring uranium ore and mine waste is present at the site.

Types and Characteristics of Contaminants/Wastes:

☐ Liquid ☒ Solid ☐ Sludge ☐ Gas/Vapor

☐ Flammable/Ignitable ☐ Volatile ☐ Corrosive ☐ Acutely Toxic

☐ Explosive ☐ Reactive ☒ Carcinogenic ☒ Radioactive

☐ Medical/Pathogenic Other: _____

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
Aileen Mendoza	Project Manager, Field Team Leader
Craig Tiballi	Site Safety Officer, Sample Collection, Radiation Survey
E & E START Field Team	Sample Collection, Radiation Survey, Documentation

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
40-Hour Radiation Protection Procedures and Investigative Methods	
8-Hour General Radiation Health and Safety	X

Training	Required
Radiation Refresher	X
DOT and Biannual Refresher	X
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 (HSR) 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 for 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 at the site and when radiation exposure is anticipated.

Pocket Dosimeters: Electronic or pocket dosimeters will be worn to determine real-time personnel doses if there is a potential for an E & E worker to receive at least 1 milliroentgen (mR) in one day.

Other: _____

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 and presented in Table 4-1 below.

Site-Specific Dose Limits: **:** As a general guidance, if site work will continue for more than one quarter, limit weekly doses to approximately 80 mrem to ensure that quarterly dose limits are not exceeded.

ALARA Policy: Radiation doses to E & E personnel shall be maintained 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.

Table 4-1
E & E Radiation Dose Limits

Part of Body	Quarterly Limit (rems)	Annual Limit (rems)	Dost Limit Description
Whole body[a]	1	4	Total effective dose equivalent[b]
Any individual organ or tissue other than the lens of the eye[a]	10	40	Sum of deep-dose equivalent[c] and committed dose equivalent[d]
Lens of the eye	3	12	Lens dose equivalent[e]
Skin of whole body or skin of any extremity	10	40	Shallow-dose equivalent[f]

Notes:

a Precedence given to the more limiting dose.

b The sum of the deep-dose equivalent (for external exposures) and the committed effective dose equivalent (for internal exposure).

c The dose equivalent at a tissue depth of 1 cm; applies to external whole-body exposure and must be for the part of the body receiving the highest exposure.

d The dose equivalent to organs or tissues that will be received from an intake of radioactive material by an individual during the 50-year period following the intake.

e The external exposure of the lens of the eye, taken as the dose equivalent at a tissue depth of 0.3 cm.

f The external exposure of the skin of the whole body or the skin of an extremity; taken as the dose equivalent at a tissue depth of 0.007 cm averaged over the contiguous 10 square centimeters of skin receiving the highest exposure.

5. SITE CONTROL

5.1 SITE LAYOUT AND WORK ZONES

Site Work Zones: A site map is included as Attachment 2. The work zones will be determined and documented on site. In general, surface gamma activity counts will be used to delineate exclusion zones. Contaminant reduction (Decon) zones will be established at the entry/exits point of the exclusion zone(s). Personnel will need to pass through the Decon area to shed PPE and get checked for radiation contamination when exiting the exclusion zone(s).

Site Access Requirements and Special Considerations: Site access will be arranged by U.S. EPA.

Illumination Requirements: Work will be conducted in daylight hours unless prior approval is obtained and the illumination requirements in 29 CFR 1910.120(m) are satisfied.

Sanitary Facilities (e.g., toilet, shower, potable water): Sanitary facilities will be arranged on site. Bottled water and/or electrolyte beverages will be available.

On-Site Communications: Primary method: verbal; Secondary method: radios/cell phones

Other Site-Control Requirements: _____

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.

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

Other Work Limitations: _____

_____

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.

Vermiculite Handling: It is against E&E policy to use vermiculite; therefore, bubble wrap will be used to cushion sample containers for shipment.

Other Safe Work Practices: Cold drinks and a shaded area will be provided to prevent heat stress.

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, 5, 6	■ Potential hazard: feral dogs, prairie dogs (plague carriers), snakes, spiders, poisonous plants ■ Establish site-specific procedures for working around identified hazards. ■ Other: See attachments
Cold Stress (Promarily in early morning hours)	1, 2, 3, 4, 5, 6	■ Provide warm break area and adequate breaks. ■ Provide warm noncaffeinated beverages. ■ Promote cold stress awareness. ■ See *Cold Stress Prevention and Treatment* (attached at the end of this plan if cold stress is a potential hazard).
Compressed Gas Cylinders	N/A	■ 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:

Hazard	Task Number	Hazard Control Measures
Confined Space	N/A	■ Ensure compliance with 29 CFR 1910.146. ■ See SOP for Confined Space Entry. Additional documentation is required. ■ Other:
Drilling	N/A	■ See SOP for Health and Safety on Drilling Rig 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	N/A	■ 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:
Electrical	N/A	■ 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	N/A	■ 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	1, 2, 3, 4, 5, 6	■ Other: Avoid parking vehicles on tall, dry vegetation. ■ 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. ■ 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.
Heat Stress	1, 2, 3, 4, 5, 6	■ Provide cool break area and adequate breaks.

Hazard	Task Number	Hazard Control Measures
		■ Provide cool noncaffeinated beverages. ■ Promote heat stress awareness. ■ Use active cooling devices (e.g., cooling vests) where specified. ■ See *Heat Stress Prevention and Treatment* (See Attachment 3).
Heavy Equipment Operation	N/A	■ 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: Site personnel to wear reflective safety vests
Heights (Scaffolding, Ladders, etc.)	N/A	■ Ensure compliance with applicable subparts of 29 CFR 1910. ■ Identify special PPE needs (e.g., lanyards, safety nets, etc.) ■ Other: Use of fall protection: body harness and lanyard
Noise	N/A	■ 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	N/A	■ Wear hard hat. ■ Other:
Power Tools	N/A	■ Ensure compliance with 29 CFR 1910 Subpart P. ■ Other:
Sunburn	1, 2, 3, 4, 5, 6	■ Apply sunscreen. ■ Wear hats/caps and long sleeves. ■ Other:
Utility Lines	N/A	■ 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, 5, 6	■ Potential hazards: ■ Establish site-specific contingencies for severe weather situations. ■ Provide for frequent weather broadcasts. ■ Weatherize safety gear, as necessary (e.g., ensure eye wash units cannot freeze, etc.). ■ Identify special PPE (Section 7) needs. ■ Discontinue work during severe weather. ■ Other:
Other: Uneven Terrain: Slips, trips & falls	1, 2, 3, 4, 5, 6	■ Use three points of contact on steep or rocky slopes and use a backpack to carry tools/supplies so that at least one hand is always free.
Other: Burns, Shock, Fire, Noise and heavy lifting hazards from using portable gas-powered	N/A	■ Use proper PPE (Level D w/safety goggles, hardhat, work gloves, ear plugs, etc). ■ Wait 20 minutes before refueling hot equipment. Use a funnel and safety gas can to avoid spilling.

Hazard	Task Number	Hazard Control Measures
Auger		■ Always have two persons around when lifting auger
Off-road driving	1, 2,3,4,5,6	■ Drive as slow as possible, and as fast as necessary. ■ Sometimes you cannot drive to your desired destination, so don't push it if conditions are hazardous. ■ Stay on the trail. ■ Walk it first if you cannot see the ground or if conditions are wet. **See attachment for Off-road driving safety.**

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: Work upwind if possible. Wear PPE appropriate for each task (e.g. Level C in exclusion zone, as defined by elevated surface gamma activity. Avoid soil coming in contact with skin or clothing).

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
1-6	Uranium, natural (primarily U-238) and daughter radionuclides	Various (most conservative is 3E-12 for Th-230)	INH, ING, external radiation exposure	Alpha, beta, gamma, depending on the radionuclide	Various	Various (from seconds to 4.5E09 yrs for U-238)
1-6	Radium-226 (a key U-238 daughter) Ra-226 daughters	3E-10 Various	INH, ING, external radiation exposure	Alpha Gamma Alpha, beta, gamma	4.8 0.186 Various	1,600 yrs Various
1-6	Radon-222 (direct daughter of Ra-226)	4E-06 (daughters removed) 3E-08 or 0.33 WL (daughters present)	INH	Alpha	5,49	3.8 days
1-6	Thorium, natural (primarily Th-232) and daughter radionuclides	Various (most conservative is 5E-13 for Th-232)	INH, ING, external radiation exposure	Alpha, beta, gamma, depending on the radionuclide	Various	Various (from seconds to 1.4E10 yrs for Th-232)

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: Ensure support zone is in an uncontaminated background radiation area. Decrease time in radiation areas; increase distance; increase shielding as needed. Avoid unprotected contact with site materials. Use dust suppression during sampling activities as required. Radiation monitoring equipment will be protected from contamination by placing it in plastic bags (leaving probe areas uncovered). If applicable, ventilate indoor areas (open windows and doors) in order to dissipate any radon buildup.

Radiation Surveying: (This section is intended to apply work-area radiation surveying for worker health and safety purposes. The surveying being conducted for work Task 1 in this safety plan will also suffice to be work-area radiation surveying for worker health and safety purposes.) The work area will be continually surveyed as appropriate to determine radiation exposure rates, areas of elevated radiation, and the location and magnitude of radioactive contamination, in order to ensure and guide worker health and safety. Surveys for gamma exposure will be conducted using a micro R meter (or ion chamber, if the micro R meter goes off-scale [5 mR/hr]) and a survey ratemeter with an attached 3-inch by 3-inch sodium iodide (NaI) (gamma) probe in accordance with established procedures. Off-site background measurements for portable survey instruments will be obtained from locations previously identified by EPA. Radiation levels exceeding approximately 2 times background will indicate radiation contamination and/or radiation areas and will be marked using surveying flags or equivalent. Previous investigations indicate that some areas exceed the action level of 2-3 times background and marking will be required. Workers performing dust generating activites in areas with elevated gamma activity will be required to use Level C PPE, including respirator, tyvek, nitrile gloves, booties, etc. Workers will also don Level C PPE if wind speeds increase to the point that visible dust is present (approx. 20 mph). Although previous data indicate they are not present, a corporate health physicist will be consulted if exposure rates $\geq$ 2 mR/hr are encountered.

Radiation Contamination Monitoring -Personnel: Personnel will be monitored for radioactive contamination at each work area if gamma activity levels exceeding the site action level (greater than approximately 2-3 times background) are measured. The monitoring will be performed using a survey ratemeter with an attached detector such as a pancake GM detector in accordance with E&E's procedure *Radiation Contamination Monitoring of Personnel*. The relative response of the different detectors to site materials will be determined during initial phases of the work in order to select the best detector for contamination monitoring. Radiation contamination monitoring will be performed of protective clothing and respirators as necessary to help with waste disposition decisions and if there is a suspicion of gross contamination that should be controlled before the protective clothing/respirator is removed (to ensure that loose contamination is not transferred to personnel). Otherwise, the protective clothing/respirator can be carefully removed without being monitored and the monitoring will focus on the person in his/her street clothes. Contamination results exceeding approximately 2 to 3 times background indicate contamination and that decontamination or disposal as a contaminated waste must be performed (see Section 9).

Radiation Contamination Monitoring - Personal and Work-Related Items, Equipment, and Materials: (This section refers to radiation contamination monitoring of personal and work-related items for health and safety purposes. Examples include monitoring instruments, personal gear, tools, and laptop computers. This does not apply to the free release of non-E & E items.) Radiation contamination monitoring will be performed for personal and work-related items, equipment, and materials as they cross the hotline into the contamination reduction area. The monitoring will be performed using a survey ratemeter with an attached detector such as a pancake GM detector in accordance with established procedures. The relative response of the different detectors to site materials will be determined during initial phases of the work in order to select the best detector for contamination monitoring. Swipe testing will be used for contamination monitoring when direct monitoring is not effective (e.g., small surface areas, nooks and crannies). Swipes will be counted by instruments suitable for the contaminant (typically, fixed-geometry, thin-window counters for uranium and its daughters). Contamination results exceeding approximately 2 to 3 times background indicate contamination and that decontamination or disposal as a contaminated waste must be performed (see Section 9).

Air Monitoring and Sampling: In leiu of performing air sampling, personnel will don Level C PPE during dust generating activities (e.g. soil sampling and auger boring) that are performed in areas with elevated gamma activity.

PPE: See Section 7.

TABLE 6-1

CHEMICAL HAZARD EVALUATION

Task Number	Compound	Exposure Limits (TWA)			Dermal Hazard (Y/N)	Route(s) of Exposure	Acute Symptoms	Odor Threshold/ Description	FID/PID	
		PEL	REL	TLV					Relative Response	Ioniz. Poten. (eV)
1-6	Uranium (insoluble compounds)	0.25 mg/m3	0.2 mg/m3	0.2 mg/m3	N	inhalation, ingestion, skin and/or eye contact	Dermatitis; kidney damage; blood changes; [potential occupational carcinogen]; in animals: lung, lymph node damage [Potential for cancer is a result of alpha-emitting properties & radioactive decay products (e.g., radon).]	odorless	NA	NA
1-6	Uranium (soluble compounds)	0.05 mg/m3	0.05 mg/m3	0.2 mg/m3	N	inhalation, ingestion, skin and/or eye contact	Lacrimation (discharge of tears), conjunctivitis; shortness breath, cough, chest rales; nausea, vomiting; skin burns; red blood cell, casts in urine; proteinuria; high blood urea nitrogen; [potential occupational carcinogen] [Potential for cancer is a result of alpha-emitting properties & radioactive decay products (e.g., radon).]	odorless	NA	NA

Note: Use an asterisk (*) to indicate known or suspected carcinogens.

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	
2			X	
3		(X)	X	Based on experiences with air sampling for gross alpha/beta on other uranium mine sites in New Mexico (e.g., NECR and Skyline), air sampling results from high dust-generating activities such as vehicular traffic, soil excavation and loading, and grading were still orders of magnitude below the most conservative DAC. Dust generating activities will involve RAT work and soil sampling. If dust caused by high winds should impact work activities, it is likely that it would involve nuisance dust. Therefore, worker protection decisions can be managed visually.
4			X	
5			X	
6			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	Task Number/LOP					
	1/D	2/D	3/D	4/D	5/D	6/D
Full-face APR			(X)			
PAPR						
Cartridges:						
P100			(X)			
GMC-P100						
GME-P100			(X)			
Other:						
Positive-pressure, full-face SCBA						

PPE	Task Number/LOP					
	1/D	2/D	3/D	4/D	5/D	6/D
Spare air tanks (Grade D air)						
Positive-pressure, full-face, supplied-air system						
Cascade system (Grade D air)						
Manifold system						
5-Minute escape mask						
Safety glasses			X			
Monogoggles						
Coveralls/clothing			(X)			
Protective clothing:						
Tyvek		(X)	(X)	(X)		
Saranex						
Other:						
Splash apron						
Inner gloves:						
Cotton						
Nitrile		(X)	(X)	(X)		
Latex						
Other:						
Outer gloves:						
Viton						
Rubber						
Neoprene						
Nitrile		X	X	X		
Other:						
Work gloves		(X)	(X)	(X)		
Safety boots (as per ANSI Z41)	X	X	X	X	X	X
Neoprene safety boots (as per ANSI Z41)						
Boot covers (type: poly)		(X)	(X)	(X)	(X)	
Hearing protection (type: _____)						
Hard hat						
Face shield						
Other:						

PPE	Task Number/LOP					
	1/D	2/D	3/D	4/D	5/D	6/D
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 and personnel will be decontaminated, as necessary. Decontamination will be performed at each sample area if radiation levels exceeding the site action level (greater than 2-3 times background) are recorded. Specific procedures are described below.

Equipment/Material Decontamination Procedures (specified by work plan): Every effort will be made to prevent radiation survey instruments from contacting contaminated materials. When appropriate, instruments, probe handles (not probe faces), and other personal and work-related items will be covered in plastic to prevent surficial contamination. Nondisposable items that are radioactively contaminated as determined by direct and indirect monitoring (Sections 6.3.2 and 8) will be decontaminated using controlled dry or damp methods (e.g., Radiacwash towelettes or wet wipes) and remonitored when dry to ensure the contamination was removed. Disposable items that are contaminated will be directed to the proper waste stream.

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

Personnel Decontamination Procedures: Personnel radiation contamination monitoring will be performed in accordance with Sections 6.3.2 and 8. Disposable protective clothing will be directed to the proper waste stream and respirators will be directed to a respirator washing station. Contaminated areas on the skin or body will be decontaminated using controlled dry or damp methods and re-monitored when dry to ensure the contamination was removed. Significant or stubborn contamination will be decontaminated under the guidance of a health physicist. Contaminated areas on personal apparel will be decontaminated if possible; otherwise, the apparel will be directed to the proper waste stream. "Hot spot" decon is recommended to minimize the volume of waste generated. Practices such as cutting the hot spot out of the protective clothing or using duct tape to remove the contaminant will be employed as appropriate.

PPE Requirements for Personnel Performing Decontamination: Safety glasses and nitrile gloves

Personnel Decontamination in General: Following appropriate decontamination procedures, all field personnel will wash their hands and face 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.): Disposed of off-site by qualified disposal contractor if greater than 30 pCi/g (approximately 100 Kcpm gamma activity). Disposed of as municipal waste if less than 2-3 times background.

TABLE 8-1

HEALTH AND SAFETY MONITORING

Instrument	Task Number	Contaminant(s)	Monitoring Location	Monitoring Frequency	Action Levels[a]	
☐ PID (e.g., RAE mini RAE) ☐ FID (e.g., OVA 128-) ☐ TVA 1000				Continuous	**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					**General/Unknown** Evaluate health and safety measures when dust levels exceed 2.5 milligrams per cubic meter.	**Contaminant-Specific**
HCN/H_2S (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 (Ludlum 19) with Rapid Assessment Tool (RAT)		External gamma exposure	Work area	As necessary to characterize work area. Continuous when used.	<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.
Ion Chamber		External gamma exposure	Work area	As necessary to characterize work area. Continuous when used.	See micro R meter action levels above.

TABLE 8-1

HEALTH AND SAFETY MONITORING

Instrument	Task Number	Contaminant(s)	Monitoring Location	Monitoring Frequency	Action Levels[a]		
					Detector	**Action Level**	**Action**
Radiation Survey Ratemeter/Scaler with External Detector(s) (Ludlum 2241, pancake GM detector)	1, 2, 3, 4, 5, 6	Gamma radiation	Work area	As necessary to characterize work area. Continuous when used.	3” x 3” NaI (gamma)	> 2 to 3 x Bkg	Consider radiation levels to be elevated.
		Radionuclides	Work area (sensitive measurement of hot spots and contaminated areas) as necessary	As necessary to characterize work area	GM, ZnS, or gas-flow proportional and/or swipe testing	General: > 2 to 3x Bkg.	Consider radioactive and/or contaminated.
		Radionuclices	Personnel and personal equipment/material contamination monitoring[b]	As necessary as personnel and personal equipment/ materials cross hotline	GM detector and/or swipe testing	> 2 to 3x Bkg	Consider radioactive and/or contaminated
Noise Dosimeter (Sound Level Meter)					≤85 decibels as measured using the A-weighed 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: Pocket Dosimeter	1, 2, 3, 4, 5, 6	Gamma radiation, Radionuclices	Personnel and personal equipment/ material contamination monitoring[b]	As necessary as personnel and personal equipment/ materials cross hotline	Canberra	1 mRem in one day	In conjunction with a radiation safety specialist, continue work and perform stay-time calculations to ensure compliance with dose limits and ALARA policy.
Other:							

TABLE 8-1

HEALTH AND SAFETY MONITORING

Instrument	Task Number	Contaminant(s)	Monitoring Location	Monitoring Frequency	Action Levels[a]

[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 lower 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 ensure that applicable incidents are reported to appropriate E & E and client project personnel and government agencies.

SSO: The SSO will determine the emergency actions to be performed by E & E personnel and will direct these actions. The SSO will recommend health/safety and protective measures appropriate to the emergency.

Other: _____

10.2 LOCAL AND SITE RESOURCES (including phone numbers)

Ambulance: 911 (Gallup Metro Dispatch)

Hospital: Cibola General Hospital, 1016 E Roosevelt Ave, Grants, NM 87020 - (505) 287-4446

Directions to Hospital (map attached at the end of this plan): Head SW on Co Rd 19. Turn left onto NM-122E/Frontage Road for 18 miles. Continue onto W Santa Fe Ave for 1.4 miles. Turn left onto 1st St for 0.9 miles. Slight right onto W Roosevelt Ave. Hospital will be on the left in 0.7 miles.

Poison Control: 800-222-1222

Police Department: 911 (Gallup Metro Dispatch)

Fire Department: 911 (Gallup Metro Dispatch)

Client Contact: Randy Nattis, EPA FOSC; Phone (415) 940-1108

Site Contact: Randy Nattis, EPA FOSC; Phone (415) 940-1108

On-Site Telephone Number: NA

Cellular Telephone Number: NA

Radios Available: Yes

Other: _____

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)

Regional Office Contact: Cindy McLeod, START Program Manager 510/893-6700 (office)
415/238-3379 (cell)
510/654-6250 (home)

Other: START Oakland Office 510/893/6700 (office)

a. E & E Emergency Response Center: 716/684-8060

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

c. Assistant Corporate Safety Director, Tom Siener, CIH: 716/684-8060 (office)
716/662-4740 (home)
716/597-5868 (Cell)

10.4 OTHER EMERGENCY RESPONSE PROCEDURES

On-Site Evacuation Signal/Alarm (must be audible and perceptible above ambient noise and light levels): Three long blasts on car horn or air horn.

On-Site Assembly Area: An upwind location to be determined at the first Daily Safety Meeting

Emergency Egress Route to Get Off Site: To be determined at the first Daily Safety Meeting

Off-Site Assembly Area: To be determined at the first Daily Safety Meeting

Preferred Means of Reporting Emergencies: Report to FOSC Nattis and Call 911

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

Emergency Decontamination Procedures: Non-life-threatening: protective clothing will be removed and affected persons will be monitored for radiation, especially the hands and feet, to the extent practicable. Life-threatening: critically injured personnel will be wrapped in a blanket or plastic sheeting to prevent the spread of contamination. Plastic sheeting should be used in transport vehicle to prevent the spread of contamination. If time permits and necessary medical treatment will not be delayed, removal of protective clothing and monitoring for radiation can be performed. Emergency decontamination for other chemical hazards will include PPE removal and rinsing with water if applicable.

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: The SSO will notify the Regional Safety Coordinator and the EPA FOSC. Affected personnel will complete an Incident/Exposure Report within 24 hours and submit it to the Corporate Health and Safety Director.

ATTACHMENT 1

EQUIPMENT/SUPPLIES CHECKLIST

	No.
INSTRUMENTATION	
FID	
Thermal desorber	
O_2/explosimeter w/cal. Kit	
Photovac tip	
PID (probe: _____eV)	
Magnetometer	
Pipe locator	
Weather station	
Draeger tube kit (tubes: _____)	
Brunton compass	
Real-time cyanide monitor	
Real-time H_2S monitor	
Heat stress monitor	
Noise equipment	
Personal sampling pumps and supplies	
MiniRam dust monitor	
Mercury monitor	
Spare batteries (type: D)	
RADIATION EQUIPMENT/SUPPLIES	
Documentation forms	X
Portable ratemeter	X
Scaler/ratemeter	X
1" NaI gamma probe	
3" NaI gamma probe	X
ZnS alpha probe	
GM pancake probe	X
Tungsten-shielded GM probe	
Micro R meter	
Ion chamber	
Alert monitor	
Pocket dosimeter	X
Dosimeter charger	X
Radiation warning tape	

	No.
Radiation decon supplies	X
Spare batteries (type:D - rate meters and Micro R meter; AAA - pocket dosimeters	X
SAMPLING EQUIPMENT	
4oz. bottles	X
Half-gallon bottles	
VOA bottles	
String	
Hand bailers	
Thieving rods with bulbs	
Spoons	X
Knives	
Filter paper	
Bottle labels	X
Ziplock Bags 1 gallon	X
Ziplock Bags 2 gallon	
MISCELLANEOUS	
GPS	X
Surveyor's tape	X
100' Fiberglass tape	
300' Nylon rope	
Nylon string	X
Surveying flags	X
Camera	X
Film	
Bung wrench	
Soil auger	X
Pick	
Shovel	X
Catalytic heater	
Propane gas	
Banner tape	
Surveying meter stick	
Chaining pins and ring	

	No.
Logbooks (_____ large, __X___ small)	X
Required MSDSs	
Intrinsically safe flashlight	
Potable water	X
Gatorade or equivalent	X
Tables	
Chairs	
Weather radio	
Two-way radios	
Binoculars	
Megaphone	
Cooling vest	
EMERGENCY EQUIPMENT	
First aid kit	X
Stretcher	
Portable eye wash	
Blood pressure monitor	
Fire blanket	
Fire extinguisher	
Thermometer (medical)	
Spill kit	
DECONTAMINATION EQUIPMENT	
Wash tubs	
Buckets	
Scrub brushes	
Pressurized sprayer	
Spray bottle	X
Detergent (type: **:** _RadiacWash or equivalent_____)	X
Solvent (type: _____)	
Plastic sheeting	
Tarps and poles	
Trash bags	X
Trash cans	
Masking tape	X

	No.
Duct tape	X
Paper towels	X
Face mask	
Face mask sanitizer	
Step ladders	
Distilled water	X
Deionized water	
SHIPPING EQUIPMENT	
Coolers	X
Paint cans with lids, 7 clips each	
Vermiculite	
Shipping labels	X
DOT labels:	
"Up"	
"Danger"	
"Inside Container Complies ..."	
Hazard Group	
Strapping tape	X
Baggies	X
Custody seals	X
Chain-of-custody forms	X
Express shipment forms	X
Clear packing tape	X
Permanent markers	X

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D A I L Y S A F E T Y M E E T I N G R E C O R D

GENERAL INFORMATION

Project:		
Project No:	TDD/PAN No.:	
Project Location:		
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:

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:			

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SEARCH

Enter search terms separated by spaces.

Uranium (soluble compounds, as U)

Synonyms & Trade Names Synonyms vary depending upon the specific soluble uranium compound.

CAS No.	RTECS No.	DOT ID & Guide
	Conversion	IDLH Ca [10 mg/m3 (as U)] See: uranium (/niosh/idlh/uranium.html)

Exposure Limits	Measurement Methods
NIOSH REL : Ca TWA 0.05 mg/m3 See Appendix A (nengapdxa.html) OSHA PEL : TWA 0.05 mg/m3	None available See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html)

Physical Description Appearance and odor vary depending upon the specific soluble uranium compound.

Properties vary depending upon the specific soluble uranium compound.					

Incompatibilities & Reactivities Uranyl nitrate: combustibles Uranium hexafluoride: water

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms lacrimation (discharge of tears), conjunctivitis; short breath, cough, chest rales; nausea, vomiting; skin burns; red blood cell, casts in urine; proteinuria; high blood urea nitrogen; [potential occupational carcinogen] Potential for cancer is a result of alpha-emitting properties & radioactive decay products (e.g., radon).

Target Organs respiratory system, blood, liver, kidneys, lymphatic system, skin, bone marrow

Cancer Site [lung cancer]

Personal Protection/Sanitation	First Aid
(See protection codes (protect.html)) **Skin:** Prevent skin contact **Eyes:** Prevent eye contact **Wash skin:** When contaminated/Daily **Remove:** When wet or contaminated **Change:** Daily **Provide:** Eyewash (UF_6), Quick drench	(See procedures (firstaid.html)) **Eye:** Irrigate immediately **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 (Halides):
(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 (pgintrod.html#nrp) for information on selection of N, R, or P filters.
Any appropriate escape-type, self-contained breathing apparatus

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

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See MEDICAL TESTS: 0239 (/niosh/docs/2005-110/nmed0239.html)

Page last reviewed: April 4, 2011
Page last updated: November 18, 2010
Content source: National Institute for Occupational Safety and Health (NIOSH) Education and Information Division

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SEARCH

Enter search terms separated by spaces.

Uranium (insoluble compounds, as U)

Synonyms & Trade Names **Uranium metal:** Uranium I
Synonyms of other insoluble uranium compounds vary depending upon the specific compound.

CAS No. 7440-61-1 (metal)	**RTECS No.** YR3490000 (metal) (/niosh-rtecs/YR3540D0.html)	**DOT ID & Guide** 2979 162 (http://wwwapps.tc.gc.ca/saf-sec-sur/3/erg-gmu/erg/guidepage.aspx?guide=162) (metal, pyrophoric)
Formula U (metal)	**Conversion**	**IDLH** Ca [10 mg/m3 (as U)] See: 7440611 (/niosh/idlh/7440611.html)
Exposure Limits **NIOSH REL** : Ca TWA 0.2 mg/m3 ST 0.6 mg/m3 See Appendix A (nengapdxa.html) **OSHA PEL** † (nengapdxg.html) : TWA 0.25 mg/m3		**Measurement Methods** None available See: NMAM (/niosh/docs/2003-154/) or OSHA Methods (http://www.osha.gov/dts/sltc/methods/index.html)

Physical Description Metal: Silver-white, malleable, ductile, lustrous solid. [Note: Weakly radioactive.]

MW: 238.0	**BP:** 6895° F	MLT: 2097°F	**Sol:** Insoluble	**VP:** 0 mmHg (approx)	**IP:** NA
Sp.Gr: 19.05 (metal)	**Fl.P:** NA	**UEL:** NA	**LEL:** NA		**MEC:** 60 g/m3

Metal: Combustible Solid, especially turnings and powder.

Incompatibilities & Reactivities Carbon dioxide, carbon tetrachloride, nitric acid, fluorine [Note: Complete coverage of uranium metal scrap with oil is essential for prevention of fire.]

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms dermatitis; kidney damage; blood changes; [potential occupational carcinogen]; in animals: lung, lymph node damage; [potential occupational carcinogen] Potential for cancer is a result of alpha-emitting properties & radioactive decay products (e.g., radon).

Target Organs Skin, kidneys, bone marrow, lymphatic system

Cancer Site [lung cancer]

Personal Protection/Sanitation (See protection codes (protect.html)) **Skin:** Prevent skin contact **Eyes:** Prevent eye contact **Wash skin:** When contaminated/Daily	**First Aid** (See procedures (firstaid.html)) **Eye:** Irrigate immediately **Skin:** Soap wash promptly **Breathing:** Respiratory support **Swallow:** Medical attention immediately

Remove: When wet or contaminated
Change: Daily
Provide: Eyewash

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 (pgintrod.html#nrp) for information on selection of N, R, or P filters.
Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection (pgintrod.html#mustread)

See also: INTRODUCTION (/niosh/npg/pgintrod.html) See ICSC CARD: 1251 (/niosh/ipcsneng/neng1251.html)
See MEDICAL TESTS: 0239 (/niosh/docs/2005-110/nmed0239.html)

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Occupational Safety and Health Guideline for Uranium and Insoluble Compounds

DISCLAIMER:

These guidelines were developed under contract using generally accepted secondary sources. The protocol used by the contractor for surveying these data sources was developed by the National Institute for Occupational Safety and Health (NIOSH), the Occupational Safety and Health Administration (OSHA), and the Department of Energy (DOE). The information contained in these guidelines is intended for reference purposes only. None of the agencies have conducted a comprehensive check of the information and data contained in these sources. It provides a summary of information about chemicals that workers may be exposed to in their workplaces. The secondary sources used for supplements III and IV were published before 1992 and 1993, respectively, and for the remainder of the guidelines the secondary sources used were published before September 1996. This information may be superseded by new developments in the field of industrial hygiene. Therefore readers are advised to determine whether new information is available.

Introduction | Applicability | Recognition | Evaluation | Controls | References | Bibliography | Reference Table

Introduction

This guideline summarizes pertinent information about uranium and insoluble uranium compounds (measured as uranium) for workers and employers as well as for physicians, industrial hygienists, and other occupational safety and health professionals who may need such information to conduct effective occupational safety and hea programs. Recommendations may be superseded by new developments in these fields; readers are therefore advised to regard these recommendations as general guidelines and to determine periodically whether new information is available.

Applicability

This guideline applies to metallic uranium and all insoluble uranium compounds; examples of such compounds include triuranium octaoxide, uranium dioxide, uranium hydride, uranium tetrafluoride, and uranium trioxide. The physical and chemical properties of uranium and of some insoluble uranium compounds are presented below fo illustrative purposes.

Recognition

Metallic uranium

SUBSTANCE IDENTIFICATION

* Formula
U
* Structure
(For Structure, see paper copy)
* Synonyms
U; Uranium metal, pyrophoric; uranium.
* Identifiers

1. CAS 7440-61-1.
2. RTECS YR3490000.
3. DOT UN: 2979 65 (for the pyrophoric forms of the metal).
4. DOT labels: Radioactive and Flammable Solid.

* Appearance and odor
Elemental uranium is a heavy, malleable, silvery white, lustrous, radioactive metal that is pyrophoric when finely divided. When uranium is obtained by reduction, it take the form of a black powder. In its natural state, uranium has three isotopes: (234)U, (235)U, and (238)U. U-238 has a half life of 4,510,000,000 years.

CHEMICAL AND PHYSICAL PROPERTIES

* Physical data

1. Atomic number: 92.
2. Atomic weight: 238.03.
3. Boiling point (760 torr): 3818 degrees C (6904 degrees F).
4. Specific gravity (water = 1): 19.05 + 0.02 at 20 degrees C (68 degrees F).
5. Vapor density: Not applicable.
6. Melting point: 1132.3 degrees C (2070 degrees F).
7. Vapor pressure at 20 degrees C (68 degrees F): Nearly zero.
8. Solubility: Insoluble in water, alcohol, and alkalies; soluble in acids.

9. Evaporation rate: Not applicable.

Triuranium Octaoxide

SUBSTANCE IDENTIFICATION

* Formula
U(3)O(8)
* Structure
(For Structure, see paper copy)
* Synonyms
Uranium oxide, pitchblende, nasturan, uraninite.
* Identifiers

1. CAS 1317-99-3.
2. RTECS YR3400000.
3. Specific DOT number: None.
4. Specific DOT label: None.

* Appearance and odor
Triuranium octaoxide is an olive green to black, odorless solid.

CHEMICAL AND PHYSICAL PROPERTIES

* Physical data

1. Molecular weight: 842.1.
2. Boiling point: Not applicable.
3. Specific gravity (water = 1): 8.30 at 20 degrees C (68 degrees F).
4. Vapor density: Not applicable.
5. Melting point: 1300 degrees C (2372 degrees F) (decomposes to uranium dioxide).
6. Vapor pressure at 20 degrees C (68 degrees F): Nearly zero.
7. Solubility: Insoluble in water; soluble in nitric and sulfuric acids.
8. Evaporation rate: Not applicable.

Uranium dioxide

SUBSTANCE IDENTIFICATION

* Formula
UO(2)
* Structure
(For Structure, see paper copy)
* Synonyms
Uranous oxide, black uranium oxide, uranium oxide, uranic oxide, urania, yellow cake.
* Identifiers

1. CAS 1344-57-6.
2. RTECS: None.
3. Specific DOT number: None.
4. Specific DOT label: None.

* Appearance and odor
Uranium dioxide is a pyrophoric, black, crystalline solid. It occurs naturally in various minerals including uraninite, pitchblende, and tyuyamunite. The latter is the most important mineral commercially.

CHEMICAL AND PHYSICAL PROPERTIES

* Physical data

1. Molecular weight: 270.03.
2. Boiling point: Data not available.
3. Specific gravity (water = 1): 10.96 at 20 degrees C (68 degrees F).
4. Vapor density: Not applicable.
5. Melting point: 2858-2898 degrees C (5176-5248 degrees F).
6. Vapor pressure: Not applicable.
7. Solubility: Insoluble in water; soluble in concentrated sulfuric acid and nitric acid.
8. Evaporation rate: Not applicable.

Uranium hydride

SUBSTANCE IDENTIFICATION

* Formula
UH(3)
* Structure
(For Structure, see paper copy)
* Synonyms
Uranium trihydride.
* Identifiers

1. CAS 13598-56-6.
2. RTECS: None.
3. Specific DOT number: None.
4. Specific DOT label: None.

* Appearance and odor

Uranium hydride is a brownish-black or brownish-gray, pyrophoric powder.

CHEMICAL AND PHYSICAL PROPERTIES

* Physical data

1. Molecular weight: 241.05.
2. Boiling point (760 torr): Not applicable.
3. Specific gravity (water = 1): 10.95 at 20 degrees C (68 degrees F).
4. Vapor density: Not applicable.
5. Melting point: Decomposes.
6. Vapor pressure at 20 degrees C (68 degrees F): Nearly zero.
7. Solubility: Insoluble in water, alcohol, acetone, or liquid ammonia; slightly soluble in dilute hydrogen chloride; decomposes in nitric acid.
8. Evaporation rate: Not applicable.

Uranium tetrafluoride

SUBSTANCE IDENTIFICATION

* Formula
UF(4)
* Structure
(For Structure, see paper copy)
* Synonyms
Green salt.
* Identifiers

1. CAS 10049-14-6.
2. RTECS: None.
3. Specific DOT number: None.
4. Specific DOT label: None.

* Appearance and odor
Uranium tetrafluoride is a nonvolatile, green, odorless, crystalline solid.

CHEMICAL AND PHYSICAL PROPERTIES

* Physical data

1. Molecular weight: 314.
2. Boiling point (760 torr): 1417 degrees C (2582 degrees F).
3. Specific gravity (water = 1): 6.7 at 20 degrees C (68 degrees F).
4. Vapor density: Not applicable.
5. Melting point: 955-965 degrees C (1751-1769 degrees F).
6. Vapor pressure at 20 degrees C (68 degrees F): Nearly zero.
7. Solubility: Insoluble in water; soluble (decomposes) in concentrated acids and alkalies.
8. Evaporation rate: Not applicable.

* Reactivity

1. Conditions contributing to instability: Heat, flame, or exposure to air. Uranium metal reacts with nearly all nonmetals. Uranium turnings and fines stored out-of-doors in closed containers under water or water-soluble oil will convert partially to the hydride and will eventually ignite during hot weather.
2. Incompatibilities: Pure uranium is very reactive and is a strong reducing agent. Clean uranium turnings or chips oxidize readily in air. Contact of uranium with carbon dioxide, carbon tetrachloride, or nitric acid causes fires or explosions. Uranium hydride is spontaneously flammable in air, and contact of the hydride with strong oxidizers may cause fires and explosions. Contact of uranium hydride with water forms flammable and explosive hydrogen gas, and contact of the hydride with halogenated hydrocarbons can cause violent reactions. In finely divided form, uranium dioxide ignites spontaneously in air.
3. Hazardous decomposition products: Toxic particulates, gases, and vapors (such as uranium metal fume, oxides of uranium, hydrogen fluoride, carbon monoxide, and dangerous radioactive materials) may be released when uranium or an insoluble uranium compound decomposes.
4. Special precautions: Uranium is radioactive and highly reactive and should be handled with extreme caution at all times. Uranium tetrafluoride is highly corrosive.

* Flammability
The National Fire Protection Association has not assigned a flammability rating to uranium or the insoluble uranium compounds. Other sources rate uranium in solid or powder form as a very dangerous fire hazard when this substance is exposed to heat or open flame.

1. Flash point: Data not available.
   Autoignition temperature: The ignition temperature depends on the extent to which the metal is subdivided. The ignition temperature of the metal is 170 degrees C (338 degrees F) (if oxygen is present); finely divided uranium metal (dust) ignites at room temperature (20 degrees C (68 degrees F)).
2. Flammable limits in air: Not applicable.
3. Minimum explosive concentration: 60 g/m(3).
4. Extinguishant: Use graphite chips, carbon dust, asbestos blankets, or flooding with water to extinguish small uranium fires. There is no effective way to extinguish large uranium fires.

   Fires involving uranium or an insoluble uranium compound should be fought upwind and from the maximum distance possible. Keep unnecessary people away; isolate hazard area and deny entry. Emergency personnel should stay out of low areas and ventilate closed spaces before entering. Finely divided uranium (chips, turnings, shavings, etc.) are much more reactive than uranium in bulk form. If these are present during a fire, do not disperse them into a dust cloud, which may be explosive. Uranium metal may ignite spontaneously if exposed to air or other substances, may burn rapidly with a flare-burning effect, and may re-ignite after the fire has been extinguished. Containers of uranium or an insoluble uranium compound may explode in the heat of the fire and should be moved from the fire area if it is possible to do so safely. If this is not possible, cool containers from the sides with water until well after the fire is out. Stay away from the ends of containers. Personnel should withdraw immediately if a rising sound from a venting safety device is heard or if there is discoloration of a container due to fire. Dikes should be used to contain fire-control water for later disposal. If a tank car or truck is involved in a fire, personnel should isolate an area of a half a mile in all directions. Delay cleanup until arrival of, or instruction from, a qualified radiation authority. Firefighters should wear a full set of protective clothing, including a self-contained breathing apparatus, when fighting fires involving uranium or an insoluble uranium compound. Firefighters' protective clothing may provide limited protection against fires involving uranium or an insoluble uranium compound.

* Warning properties
No quantitative data are available on the odor threshold for uranium or insoluble uranium compounds; several of these substances are odorless. For the purpose of selecting appropriate respiratory protection, these substances are therefore considered to have inadequate odor warning properties.

* Eye irritation properties
No quantitative data are available on the eye irritation threshold for uranium or the insoluble uranium compounds.

EXPOSURE LIMITS

The current Occupational Safety and Health Administration (OSHA) permissible exposure limits (PELs) for uranium and the insoluble uranium compounds (measured as uranium) are 0.2 milligram per cubic meter (mg/m(3)) of air as an 8-hour time-weighted average (TWA) concentration and 0.6 mg/m(3) as a 15-minute TWA short-terr exposure limit (STEL). A STEL is the maximum 15-minute concentration to which workers may be exposed during any 15-minute period of the working day [29 CFR 1910.1000, Table Z-1-A]. The National Institute for Occupational Safety and Health (NIOSH) has not issued a recommended exposure limit (REL) for uranium or its insol uranium compounds; however, NIOSH concurs with the PEL established for this substance by OSHA [NIOSH 1988]. The American Conference of Governmental Industria Hygienists (ACGIH) has assigned uranium and the insoluble uranium compounds a threshold limit value (TLV) of 0.2 mg/m(3) as a TWA for a normal 8-hour workday an 40-hour workweek and a short-term exposure limit (STEL) of 0.6 mg/m(3) for periods not to exceed 15 minutes [ACGIH 1988, p. 37]. The OSHA and ACGIH limits are b on the risk of kidney and blood disorders and on the radiological damage associated with exposure to uranium or an insoluble uranium compound.

Evaluation

HEALTH HAZARD INFORMATION

* Routes of Exposure
Exposure to uranium or an insoluble uranium compound can occur via inhalation, ingestion, and eye or skin contact. Exposure to uranium trioxide can occur by absorptic through the skin, eyes, and mucous membranes.

* Summary of toxicology

1. Effects on Animals: Metallic uranium and insoluble uranium compounds may produce both chemical poisoning and radiation injury to the kidneys and lungs of exposed animals [Clayton and Clayton 1981, p. 1996]. The insoluble uranium compounds are less toxic chemically than the soluble compounds, but uranium and uranium compounds have the potential to cause radiation damage [Clayton and Clayton 1981, p. 2000; Klaassen, Amdur, and Doull 1986, p. 695]. The inhalation toxicity of uranium and the insoluble compounds of uranium is much greater than their oral toxicity [Clayton and Clayton 1981, p. 2000]. No dietary amount of insoluble uranium compounds acceptable to rats was lethal, and no evidence of systemic poisoning developed after the application of an insoluble compound to rabbit skin [Clayton and Clayton 1981, p. 2000]. However, uranium trioxide is lethal when placed in the conjunctival sac of rabbits' eyes, and uranium tetrafluorid causes direct eye injury [Grant 1986, p. 965]. Acute inhalation exposure to 20-mg/m(3) concentrations of uranium tetrafluoride, uranium dioxide, or high-grade uranium ore was occasionally fatal to some laboratory animals; exposure to a 2.5-mg/m(3) concentration of uranium tetrafluoride, uranium dioxide, or high-grade uranium ore caused mild or no renal damage and no fatalities in these animals [Clayton and Clayton 1981, p. 2001]. Chronic inhalation exposure to an insoluble uranium compound may produce radiation injury. In dogs and monkeys exposed to 5 mg/m(3) uranium dioxide for 6 hours/day, 5 days/week for up to 5 years, fibrotic changes suggestive of radiation injury were found in the tracheobronchial lymph nodes of both species and in the lungs of monkeys. No kidney damage w observed in these animals [Clayton and Clayton 1981, p. 2002]. Dogs tolerated inhalation of a 10-mg/m(3) concentration of uranium dioxide every day for 1 year dietary exposure to 10 g/kg/day for 1 year [Clayton and Clayton 1981, pp. 2001-2002]. Rats injected with metallic uranium in the femoral bone marrow and ches wall developed site-of-contact sarcomas; in these cases, the effects of chemical injury could not be distinguished from those of radiation damage [Clayton and Clayton 1981, p. 2003].
2. Effects on Humans: Metallic uranium and insoluble uranium compounds may produce both chemical poisoning and radiation injury [Clayton and Clayton 1981, p. 1996]. The insoluble uranium compounds are less toxic chemically than the soluble compounds, but uranium and all uranium compounds have the potential to ca radiation damage [Clayton and Clayton 1981, p. 2000; Klaassen, Amdur, and Doull 1986, p. 695]. Exposure to the dusts of uranium or to an insoluble uranium compound may cause respiratory irritation, cough, and shortness of breath [Genium MSDS 1988, No. 238]. Dermatitis has also been reported, and prolonged skir contact causes radiation injury to the basal cells [Proctor, Hughes, and Fischman 1988, p. 502]. Studies have shown that uranium workers are at increased risk o death from respiratory, lymphatic, and hematopoietic cancers; these deaths are presumed to be caused by radiation injury from radon gas, a byproduct of uraniu decay [Rom 1983, p. 688]. A study of the risk of respiratory deaths among uranium miners in the United States showed the following dose-response: miners exp occupationally for 5 to 9.9 years had a 2-fold increase in risk; miners exposed for 10 to 24.9 years had a 3.6-fold increase in risk; and those exposed for greater t 24.9 years had a 3.75-fold increase in risk. Smoking was shown both to increase the risk of death from respiratory disease and to shorten the neoplastic latency period [Clayton and Clayton 1981, pp. 2010-2011].

* Signs and symptoms of exposure

1. Acute exposure: The signs and symptoms of acute exposure to uranium or an insoluble uranium compound include respiratory irritation, cough, and shortness of breath.
2. Chronic exposure: 2. Chronic exposure: The signs and symptoms of chronic exposure to uranium or an insoluble uranium compound include those of lung damag shortness of breath, dry or productive cough, rales, cyanosis, and clubbing of the fingers. Long-term exposure also may cause cancer of the blood-forming syster the lymph system, and the respiratory tract, as well as anemia and leukopenia. The signs and symptoms of uranium-induced dermatitis may include irritation, redness, blistering, thickening, or hyperpigmentation of the skin.

* Emergency procedures:
In the event of an emergency, remove the victim from further exposure, send for medical assistance, and initiate the following emergency procedures:

1. Eye exposure: If uranium or an insoluble uranium compound gets into the eyes, immediately flush the eyes with large amounts of water for a minimum of 15 minutes, lifting the lower and upper lids occasionally. If irritation persists, get medical attention as soon as possible.
2. Skin exposure: If uranium or an insoluble uranium compound contacts the skin, the contaminated skin should be washed with soap and water. Contaminated bod surfaces should immediately be decontaminated in accordance with radiation procedures. Get medical attention.
3. Inhalation: If uranium or an insoluble uranium compound is inhaled, move the victim at once to fresh air and get medical care as soon as possible. If the victim is breathing, perform cardiopulmonary resuscitation; if breathing is difficult, give oxygen. Keep the victim warm and quiet until medical help arrives.
4. Ingestion: If uranium or an insoluble uranium compound is ingested, give the victim several glasses of water to drink and then induce vomiting by having the vict touch the back of the throat with the finger or by giving syrup of ipecac as directed on the package. Do not force an unconscious or convulsing person to drink liquids or to vomit. Get medical help immediately. Keep the victim warm and quiet until medical help arrives.
5. Rescue: Remove an incapacitated worker from further exposure and implement appropriate emergency procedures (e.g., those listed on the Material Safety Data Sheet required by OSHA's Hazard Communication Standard, 29 CFR 1910.1200). All workers should be familiar with emergency procedures and the location and proper use of emergency equipment.

EXPOSURE SOURCES AND CONTROL METHODS

The following operations may involve uranium and insoluble uranium compounds and lead to worker exposures to these substances:

- Mining, grinding, and milling of uranium ores
- Use in nuclear reactors as fuel and to pack nuclear fuel rods and in the production of nuclear weapons
- Burning of uranium metal chips and smelting operations
- Use in the ceramics industry for pigments, coloring porcelain, painting on porcelain, and enamelling

- Use as catalysts for many reactions, in gas manufacture, and in production of fluorescent glass
- Use in photographic processes, for alloying steel, in radiation shielding, and in aircraft counterweights
- Use as a source of plutonium and radium salts

Uranium hydride:

* Use as a lab source for pure hydrogen, for separation of hydrogen isotopes, and as a reducing agent
Methods that are effective in controlling worker exposures to uranium and insoluble uranium compounds, depending on the feasibility of implementation, are

- Process enclosure,
- Local exhaust ventilation,
- General dilution ventilation, and
- Personal protective equipment.

The following publications are good sources of information on control methods:

1. ACGIH [1986]. Industrial ventilation--a manual of recommended practice. Cincinnati, OH: American Conference of Governmental Industrial Hygienists.
2. Burton DJ [1986]. Industrial ventilation--a self study companion. Cincinnati, OH: American Conference of Governmental Industrial Hygienists.
3. Alden JL, Kane JM [1982]. Design of industrial ventilation systems. New York, NY: Industrial Press, Inc.
4. Wadden RA, Scheff PA [1987]. Engineering design for control of workplace hazards. New York, NY: McGraw-Hill.
5. Plog BA [1988]. Fundamentals of industrial hygiene. Chicago, IL: National Safety Council.

MEDICAL MONITORING

Workers who may be exposed to chemical and radiation hazards should be monitored in a systematic program of medical surveillance that is intended to prevent occupational injury and disease. The program should include education of employers and workers about work-related hazards, placement of workers in jobs that do not jeopardize their safety or health, early detection of adverse health effects, and referral of workers for diagnosis and treatment. The occurrence of disease or other work-related adverse health effects should prompt immediate evaluation of primary preventive measures (e.g., industrial hygiene monitoring, engineering controls, and perso protective equipment). A medical monitoring program is intended to supplement, not replace, such measures. To place workers effectively and to detect and control wor related health effects, medical evaluations should be performed (1) before job placement, (2) periodically during the period of employment, and (3) at the time of job transfer or termination.

* Preplacement medical evaluation
Before a worker is placed in a job with a potential for exposure to uranium or an insoluble uranium compound, the examining physician should evaluate and document tl worker's baseline health status with thorough medical, environmental, and occupational histories, a physical examination, and physiologic and laboratory tests appropria for the anticipated occupational risks. These should concentrate on the function and integrity of the kidneys, respiratory system, blood, liver, bone marrow, skin, and lymphatics. Medical monitoring for respiratory disease should be conducted using the principles and methods recommended by NIOSH and the American Thoracic Societ

A preplacement medical evaluation is recommended to assess an individual's suitability for employment at a specific job and to detect and assess medical conditions tha may be aggravated or may result in increased risk when a worker is exposed to uranium or an insoluble uranium compound at or below the prescribed exposure limit. Tl examining physician should consider the probable frequency, intensity, and duration of exposure as well as the nature and degree of any applicable medical condition. S conditions (which should not be regarded as absolute contraindications to job placement) include a history and other findings consistent with diseases of the kidneys, respiratory system, blood, liver, bone marrow, skin, or lymphatics.

* Periodic medical examinations and biological monitoring
Occupational health interviews and physical examinations should be performed at regular intervals during the employment period, as mandated by any applicable Federa State, or local standard. Where no standard exists and the hazard is minimal, evaluations should be conducted every 3 to 5 years or as frequently as recommended by a experienced occupational health physician. Additional examinations may be necessary if a worker develops symptoms attributable to uranium exposure. The interviews, examinations, and medical screening tests should focus on identifying the adverse effects of uranium on the kidneys, respiratory system, blood, liver, bone marrow, skin lymphatics. Current health status should be compared with the baseline health status of the individual worker or with expected values for a suitable reference populatior

Biological monitoring involves sampling and analyzing body tissues or fluids to provide an index of exposure to a toxic substance or metabolite. Urinary uranium concentrations correlate well with airborne uranium levels. Some sources report that urinary concen-trations of 50 þg uranium per liter of urine or 100 þg uranium per lit of urine correspond to constant daily exposures of approximately 0.05 mg/m(3) or 0.25 mg/m(3), respectively. Because there is great interindividual and intraindividual variability in urinary uranium concentrations, a pattern of urinary uranium excretion should be established for every exposed worker by sampling individuals at the same time on several different shifts and by sampling frequently.

* Medical examinations recommended at the time of job transfer or termination
The medical, environmental, and occupational history interviews, the physical examination, and selected physiologic or laboratory tests that were conducted at the time placement should be repeated at the time of job transfer or termination to determine the worker's medical status at the end of his or her employment. Any changes in tl worker's health status should be compared with those expected for a suitable reference population. Because occupational exposure to uranium or an insoluble uranium compound may cause diseases with prolonged latent periods, the need for medical monitoring may extend well beyond the termination of employment.

WORKPLACE MONITORING AND MEASUREMENT PROCEDURES

Determination of a worker's exposure to airborne uranium or an insoluble uranium compound (measured as uranium) is made using a mixed cellulose ester filter (0.8 micron). Samples are collected at a maximum flow rate of 2 liters per minute until a maximum air volume of 960 liters is collected. Analysis is conducted by neutron activation. This method is included in the OSHA In-House Methods File.

Controls

PERSONAL HYGIENE PROCEDURES

If uranium or an insoluble uranium compound contacts the skin, workers should immediately wash the affected areas with soap and water. Contaminated body surfaces should immediately be decontaminated in accordance with radiation procedures.
Clothing contaminated with uranium or an insoluble uranium compound should be removed immediately, and provisions should be made for the safe removal of the chemical from the clothing. Persons laundering the clothes should be informed of the toxic and radioactive hazards of uranium.
A worker who handles uranium or an insoluble uranium compound should thoroughly wash hands, forearms, and face with soap and water before eating, using tobacco products, or using toilet facilities.
Workers should not eat, drink, or use tobacco products in areas where uranium or an insoluble uranium compound is handled, processed, or stored.

STORAGE

Uranium and insoluble uranium compounds should be stored in a cool, dry, well-ventilated area in tightly sealed containers that are labeled in accordance with OSHA's Hazard Communication Standard [29 CFR 1910.1200]. Containers of uranium or of insoluble uranium compounds should be protected from physical damage and should

stored separately from carbon dioxide, carbon tetra-chloride, nitric acid, air, nonmetals, heat, sparks, and open flame. Uranium hydride should not be allowed to contact water, strong oxidizers, or halogenated hydrocarbons. Because empty containers that formerly contained uranium or a uranium compound may still hold product residue they should be handled appropriately.

SPILLS AND LEAKS

In the event of a spill or leak involving uranium or an insoluble uranium compound, persons not wearing protective equipment and clothing should be restricted from contaminated areas until cleanup has been completed. A clean-up plan must be available to address an accidental leak or spill of uranium or an insoluble uranium compo because special radiation procedures are required and professional assistance is needed. The following steps should be undertaken following a spill or leak:

1. Do not touch the spilled material; stop the leak if it is possible to do so without risk.
2. Notify safety personnel.
3. Remove all sources of heat and ignition.
4. Ventilate the area of the spill or leak.
5. Protect cleanup personnel from contact with or inhalation of uranium dust.

EMERGENCY PLANNING, COMMUNITY RIGHT-TO-KNOW, AND HAZARDOUS WASTE MANAGEMENT REQUIREMENTS

The Environmental Protection Agency's (EPA's) regulatory requirements for emergency planning, community right-to-know, and hazardous waste management may vary over time. Users are therefore advised to determine periodically whether new information is available.

* Emergency planning requirements
Uranium and insoluble uranium compounds are not subject to EPA emergency planning requirements under the Superfund Amendments and Reauthorization Act (Title I

* Reportable quantity requirements for hazardous releases
Employers are not required by the emergency release notification provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) [CFR Part 355.40] to notify the National Response Center of an accidental release of uranium or an insoluble uranium compound; there is no reportable quantity for these substances.

* Community right-to-know requirements
Employers are not required by Section 313 of the Superfund Amendments and Reauthorization Act (SARA) to submit a Toxic Chemical Release Inventory form (Form R) EPA reporting the amount of uranium or an insoluble uranium compound emitted or released from their facility annually.

* Hazardous waste management requirements
EPA considers a waste to be hazardous if it exhibits any of the following characteristics: ignitability, corrosivity, reactivity, or toxicity, as defined in 40 CFR 261.21-261.24 Under the Resource Conservation and Recovery Act (RCRA), EPA has specifically listed many chemical wastes as hazardous. Although uranium and insoluble uranium compounds are not specifically listed as a hazardous waste under RCRA, EPA requires employers to treat any waste as hazardous if it exhibits any of the characteristics discussed above.

Providing more information about the removal and disposal of specific chemicals is beyond the scope of this guideline. EPA, U.S. Department of Transportation, and Stat and local regulations should be followed to ensure that removal, transport, and disposal of this substance are conducted in accordance with existing regulations. To be certain that chemical waste disposal meets EPA regulatory requirements, employers should address any questions to the RCRA hotline at (202) 382-3000 (in Washingtor D.C.) or toll-free at (800) 424-9346 (outside Washington, D.C.). In addition, relevant State and local authorities should be contacted for information on any requirements they may have for the waste removal and disposal of this substance.

RESPIRATORY PROTECTION

* Conditions for respirator use
Good industrial hygiene practice requires that engineering controls be used where feasible to reduce workplace concentrations of hazardous materials to the prescribed exposure limit. However, some situations may require the use of respirators to control exposure. Respirators must be worn if the ambient concentration of uranium or ar insoluble uranium compound exceeds prescribed exposure limits. Respirators may be used (1) before engineering controls have been installed, (2) during work operatior such as maintenance or repair activities that involve unknown exposures, (3) during operations that require entry into tanks or closed vessels, and (4) during emergency situations. If the use of respirators is necessary, the only respirators permitted are those that have been approved by NIOSH and the Mine Safety and Health Administrat (MSHA).

* Respiratory protection program
Employers should institute a complete respiratory protection program that, at a minimum, complies with the requirements of OSHA's Respiratory Protection Standard [29 CFR 1910.134]. Such a program must include respirator selection (see Table 1), an evaluation of the worker's ability to perform the work while wearing a respirator, the regular training of personnel, fit testing, periodic workplace monitoring, and regular respirator maintenance, inspection, and cleaning. The implementation of an adequat respiratory protection program (including selection of the correct respirator) requires that a knowledgeable person be in charge of the program and that the program be evaluated regularly. For additional information on the selection and use of respirators and on the medical screening of respirator users, consult the **NIOSH Respirator Decision Logic** and the **NIOSH Guide to Industrial Respiratory Protection**.

Table 1 lists the respiratory protection that NIOSH recommends for workers exposed to uranium or an insoluble uranium compound. The recommended protection may over time because of changes in the exposure limit for uranium or the insoluble uranium compounds or in respirator certification requirements. Users are therefore advis to determine periodically whether new information is available.

PERSONAL PROTECTIVE EQUIPMENT

Protective clothing should be worn to prevent skin contact with uranium or an insoluble uranium compound. Impervious gloves, boots, and aprons should be worn as appropriate when handling any of these substances. Chemical protective clothing should be selected on the basis of available performance data, manufacturers' recommendations, and evaluation of the clothing under actual conditions of use. No reports have been published on the resistance of various protective clothing materia permeation by uranium or an insoluble uranium compound; however, one source recommends natural rubber, neoprene, or polyvinyl chloride as a protective clothing material. If permeability data are not readily available, protective clothing manufacturers should be requested to provide information on the best chemical protective clothing for workers to wear when they are exposed to uranium or an insoluble uranium compound.

If uranium or an insoluble uranium compound is dissolved in an organic solvent, the permeation properties of both the solvent and the mixture must be considered wher selecting personal protective equipment and clothing.

Safety glasses, goggles, or faceshields should be worn during operations in which uranium or an insoluble uranium compound might contact the eyes. Eyewash fountain and emergency showers should be available within the immediate work area whenever the potential exists for eye or skin contact with uranium or its insoluble compoun Contact lenses should not be worn if the potential exists for exposure to any of these substances.

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Reference Table

Table 1
NIOSH recommended respiratory protection for workers exposed to uranium or an insoluble uranium compound*

Condition	Minimum respiratory protection**
Airborne concentration of uranium or an insoluble uranium compound:	
0.2 to 2 mg/m(3) (10 X PEL)	Single-use or quarter mask respirator
5 to 50 mg/m(3) (10 X PEL)	Any air-purifying, half-mask respirator equipped with a fume or high-efficiency filter approved for radon daughters or radionuclides, or Any air-purifying, full-facepiece respirator equipped with a fume filter approved for radon daughters, or Any supplied-air respirator equipped with a half mask and operated in a

	demand (negative-pressure) mode
0.2 to 5 mg/m(3) (25 X PEL)	Any powered, air-purifying respirator equipped with a hood or helmet and a fume or high-efficiency filter approved for radon daughters or radio-nuclides, or Any supplied-air respirator equipped with a hood or helmet and operated in a continuous-flow mode
0.2 to 10 mg/m(3) (50 X PEL)	Any air-purifying, full-facepiece respirator equipped with a high-efficiency filter approved for radon daughters or radio-nuclides, or Any powered, air-purifying respirator equipped with a tight-fitting facepiece and a high-efficiency filter approved for radon daughters or radio-nuclides, or Any supplied-air respirator equipped with a full facepiece and operated in a demand (negative-pressure) mode, or Any supplied-air respirator equipped with a tight-fitting facepiece and operated in a continuous-flow mode, or Any self-contained respirator equipped with a full facepiece and operated in a demand (negative-pressure) mode
0.2 to 30 mg/m(3) (150 X PEL)	Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode
Entry into IDLH(+) or unknown concentrations	Any self-contained respirator equipped with a full facepiece and operated in a pressure-demand or other positive-pressure mode, or Any supplied-air respirator equipped with a full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode
Firefighting	Any self-contained respirator equipped with a full facepiece and operated in a pressure-demand or other positive-pressure mode
Escape	Any air-purifying, full-facepiece respirator equipped with a high-efficiency filter approved for radon daughters or radionuclides, or Any escape-type, self-contained breathing apparatus with a suitable service life (number of minutes required to escape the environment)

* The OSHA PEL is 0.2 mg/m(3) as an 8-hour TWA. No NIOSH REL has been issued.

** Only NIOSH/MSHA-approved equipment should be used. Also note the following:

1. Respirators accepted for use at higher concentrations may be used at lower concentrations; respirators must not, however, be used at concentrations higher than those for which they are approved.
2. Air-purifying respirators may not be used in oxygen-deficient atmospheres or in airborne concentrations that are immediately dangerous to life or health (IDLH).

(+) The uranium or an insoluble uranium compound concentration that is immediately dangerous to life and health (IDLH) is 30 mg/m(3) [NIOSH 1987b].

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www.OSHA.gov

HEAT STRESS PREVENTION AND TREATMENT

Elevated temperatures are potentially hazardous, especially when work is conducted without appropriate precautions. The following sections describe heat stress prevention and the recognition and treatment of heat emergencies.

Effects of Heat

A predictable amount of heat is generated as a result of normal oxidation processes within the body. If heat is liberated rapidly, the body cools to a point at which the production of heat is accelerated, and the excess heat brings the body temperature back to normal.

Interference with the elimination of heat leads to its accumulation and to the elevation of body temperature. This condition produces a vicious cycle in which certain body processes accelerate and generate additional heat. Afterward, the body must eliminate not only the heat that is normally generated but also the additional quantities of heat.

Most body heat is brought to the surface by the bloodstream and escapes to cooler surroundings by conduction and radiation. If moving air or a breeze strikes the body, additional heat is lost by convection. When the temperature of the surrounding air becomes equal to or rises above the body temperature, all the heat must be lost by vaporization of the moisture or sweat from skin surfaces. As the air becomes more humid (contains more moisture), vaporization from the skin decreases. Weather conditions including high temperatures (90 to 100 degrees F), high humidity, and little or no breeze cause the retention of body heat. Such conditions or a succession of such days (a heat wave) increase the chances of a medical emergency due to heat.

Preventing Emergencies Due to Heat

When working in situations where the ambient temperatures and humidity are high, and especially in situations where protection levels A, B, or C are required, the site safety officer should:

- Ensure that all employees drink plenty of fluids (Gatorade or its equivalent);
- Ensure that frequent breaks are scheduled so overheating does not occur; and
- Revise work schedules, when necessary, to take advantage of the cooler parts of the day (i.e., 5:00 a.m. to 11:00 a.m. and 6:00 p.m. to nightfall).

When protective clothing is required, the suggested guidelines correlating ambient temperature and maximum wearing time per excursion are:

Ambient Temperature	Maximum Wearing Time per Excursion
Above 90 degrees F	15 minutes
85 to 90 degrees F	30 minutes
80 to 85 degrees F	60 minutes
70 to 80 degrees F	90 minutes
60 to 70 degrees F	120 minutes
50 to 60 degrees F	180 minutes

One method of measuring the effectiveness of an employee's rest-recovery regime is by monitoring the heart rate. The "Brouha guideline" is one such method and is performed as follows:

- Count the pulse rate for the **last** 30 seconds of the first minute of a 3-minute period, the **last** 30 seconds of the second minute, and the **last** 30 seconds of the third minute; and

- Double each result to yield beats per minute.

If the recovery pulse rate during the last 30 seconds of the first minute is 110 beats/minute or less, and the deceleration between the first, second, and third minutes is **at least** 10 beats/minute, then the work-recovery regime is acceptable. If the employee's rate is above the rate specified, a longer rest period will be required, accompanied by an increased intake of fluids.

Heat Emergencies

Heat Cramps. Heat cramps usually affect people who work in hot environments and perspire a great deal. Loss of salt from the body causes very painful cramps in leg and abdominal muscles. Heat cramps may also result from drinking iced water or other drinks either too quickly or in too large a quantity. The symptoms of heat cramps are:

- Painful muscle cramps in legs and abdomen;

- Faintness; and

- Profuse perspiration.

To provide emergency care for heat cramps, move the patient to a cool place. Give him or her sips of liquids such as Gatorade or its equivalent. Apply manual pressure to the cramped muscle. Move the patient to a hospital if there is any indication of a more serious problem.

Heat Exhaustion. Heat exhaustion also may occur in individuals working in hot environments and may be associated with heat cramps. Heat exhaustion is caused by the pooling of blood in the vessels of the skin. The heat is transported from the interior of the body to the surface by the blood. The skin vessels become dilated and a large amount of blood is pooled in the skin. This condition, plus the blood that is pooled in the lower extremities when in an upright position, may lead to an inadequate return of blood to the heart and eventual physical collapse. The symptoms of heat exhaustion are:

- Weak pulse;

- Rapid and usually shallow breathing;
- Generalized weakness;
- Pale, clammy skin;
- Profuse perspiration;
- Dizziness/faintness; and
- Unconsciousness.

To provide emergency care for heat exhaustion, move the patient to a cool place and remove as much clothing as possible. Have the patient drink cool water, Gatorade, or its equivalent. If possible, fan the patient continually to remove heat by convection, but do not allow chilling or overcooling. Treat the patient for shock and move him or her to a medical facility if there is any indication of a more serious problem.

Heat Stroke. Heat stroke is a profound disturbance of the heat-regulating mechanism and is associated with high fever and collapse. It is a serious threat to life and carries a 20% mortality rate. Sometimes this condition results in convulsions, unconsciousness, and even death. Direct exposure to sun, poor air circulation, poor physical condition, and advanced age (over 40) increase the chance of heat stroke. Alcoholics are extremely susceptible. The symptoms of heat stroke are:

- Sudden onset;
- Dry, hot, and flushed skin;
- Dilated pupils;
- Early loss of consciousness;
- Full and fast pulse;
- Deep breathing at first, followed by shallow or faint breathing;
- Muscle twitching, growing into convulsions; and
- Body temperature reaching 105 to 106 degrees F or higher.

When providing emergency care for heat stroke, remember that it is a life-threatening emergency. Transportation to a medical facility should not be delayed. Move the patient to a cool environment, if possible, and remove as much clothing as possible. Ensure an open airway. Reduce body temperature promptly by dousing the body with water or, preferably, by wrapping the patient in a wet sheet. If cold packs are available, place them under the arms, around the neck, at the ankles, or any place where blood vessels that lie close to the skin can be cooled. Protect the patient from injury during convulsions.

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OSHA QUICK CARD™

Rodents, Snakes and Insects

Insects, Spiders and Ticks

- To protect yourself from biting and stinging insects, wear long pants, socks, and long-sleeved shirts.
- Use insect repellents that contain DEET or Picaridin.
- Treat bites and stings with over-the-counter products that relieve pain and prevent infection.
- Avoid fire ants; their bites are painful and cause blisters.
- Severe reactions to fire ant bites (chest pain, nausea, sweating, loss of breath, serious swelling or slurred speech) require immediate medical treatment.

Rodents and Wild or Stray Animals

- Dead and live animals can spread diseases such as Rat Bite Fever and Rabies.
- Avoid contact with wild or stray animals.
- Avoid contact with rats or rat-contaminated buildings. If you can't avoid contact, wear protective gloves and wash your hands regularly.
- Get rid of dead animals as soon as possible.
- If bitten/scratched, get medical attention immediately.

Snakes

- Watch where you place your hands and feet when removing debris. If possible, don't place your fingers under debris you are moving. Wear heavy gloves.
- If you see a snake, step back and allow it to proceed.
- Wear boots at least 10 inches high.
- Watch for snakes sunning on fallen trees, limbs or other debris.
- A snake's striking distance is about 1/2 the total length of the snake.
- If bitten, note the color and shape of the snake's head to help with treatment.
- Keep bite victims still and calm to slow the spread of venom in case the snake is poisonous. Seek medical attention as soon as possible.
- Do not cut the wound or attempt to suck out the venom. Apply first aid: lay the person down so that the bite is below the level of the heart, and cover the bite with a clean, dry dressing.

For more complete information:

OSHA® Occupational Safety and Health Administration

U.S. Department of Labor
www.osha.gov (800) 321-OSHA

OSHA 3274-09N-05

OSHA FactSheet

Protect Yourself! Workers may be exposed to

Black Widow Spider

The black widow belongs to a group of spiders commonly known as cobweb spiders. The characteristic hourglass is located on the underside of the abdomen. Female black widows are dangerous and can bite and inject toxic venom.

Identification

- The female black widow is normally shiny black, with a red hourglass marking (see photo) on the underside of the abdomen.
- The abdominal marking may range in color from yellowish orange to red and its shape may range from an hourglass to a dot.
- The body of an adult black widow female is about 1/2 inch long.

Photo: Extension Entomology, Texas A&M University

Photo: University of Missouri Extension

Habitat

The black widow is commonly found in the following places:

- Outdoors - woodpiles, rubble piles, under stones, in hollow stumps, and in rodent burrows, privies, sheds and garages.
- Indoors - undisturbed, cluttered areas in basements and crawl spaces.

Symptons

- The bite of the black widow may be painful or it may go unnoticed.
- The skin may display one or two bite marks with local swelling. Pain usually progresses from the bite site and eventually to the abdomen and back.
- Severe cramping or rigidity may occur in the abdominal muscles.
- Symptoms may include nausea, profuse perspiration, tremors, labored breathing, restlessness, increased blood pressure and fever.
- The pain from the bite will usually persist for the first 8-12 hours.
- Symptoms may continue for several days.

Protection

- Wear a long-sleeved shirt, hat, gloves, and boots when handling boxes, firewood, lumber, and rocks, etc.
- Inspect and shake out clothing and shoes before getting dressed.
- Use insect repellants, such as DEET or Picaridin, on clothing and footwear.

Treatment

- Clean the bite area with soap and water.
- Apply ice to the bite area to slow absorption of the venom.
- Elevate and immobilize the extremity.
- Capture the spider, if at all possible, for identification purposes.
- Seek medical attention immediately.
- If you have a heart condition or other heart problem, you may need hospitalization.

This is one in a series of informational fact sheets highlighting OSHA programs, policies or standards. It does not impose any new compliance requirements. For a comprehensive list of compliance requirements of OSHA standards or regulations, refer to Title 29 of the Code of Federal Regulations. This information will be made available to sensory impaired individuals upon request. The voice phone is (202) 693-1999; teletypewriter (TTY) number: (877) 889-5627.

For more complete information:

OSHA Occupational Safety and Health Administration

U.S. Department of Labor

www.osha.gov

(800) 321-OSHA

DSG 10/2005

OSHA FactSheet

Protect Yourself! Workers may be exposed to

Brown Recluse Spider

The brown recluse belongs to a group of spiders commonly known as violin spiders or fiddlebacks. The characteristic fiddle-shaped pattern is located on the top of the leg attachment region (cephalothorax). Because they are secluded and withdrawn, as their name implies, the brown recluse avoids open spaces. Brown recluse spiders are dangerous and they can bite and inject toxic venom.

Identification

- Body size: 1/4 to 3/4 inch (6.4-19.1mm)
- Color: Golden brown
- A dark violin/fiddle shape (see top photo) is located on the top of the leg attachment region (cephalothorax) with the neck of the violin/fiddle pointing backward toward the abdomen.
- Unlike most spiders that have 8 eyes, the brown recluse has 6 eyes. The eyes, arranged in pairs – one pair in front and a pair on either side – can be readily seen under low magnification.

Habitat

The Brown Recluse Spider builds small retreat webs behind objects of any type.

Symptoms

- The severity of the bite may vary. Symptoms may vary from none to very severe.
- The bite generally becomes reddened within several hours.

Photo: R. Bessin, University of Kentucky

Photo: creatures.ifas.ufl.edu

- There is often a systemic reaction within 24-36 hours characterized by restlessness, fever, chills, nausea, weakness and joint pain.
- Tissue at the site of the bite and the surrounding area dies and eventually sheds.

Protection

- Wear a long-sleeved shirt, hat, gloves, and boots when handling stored boxes, firewood, lumber and rocks, etc.
- Inspect and shake out clothing and shoes before getting dressed.
- Use insect repellants, such as DEET or Picaridin, on clothing and footwear.

Treatment

- Clean the bite area with soap and water.
- Apply ice to the bite area to slow absorption of the venom.
- Elevate and immobilize the bitten extremity.
- Capture the spider, if at all possible, for identification purposes.
- Seek medical attention.

This is one in a series of informational fact sheets highlighting OSHA programs, policies or standards. It does not impose any new compliance requirements. For a comprehensive list of compliance requirements of OSHA standards or regulations, refer to Title 29 of the Code of Federal Regulations. This information will be made available to sensory impaired individuals upon request. The voice phone is (202) 693-1999; teletypewriter (TTY) number: (877) 889-5627.

For more complete information:

OSHA Occupational Safety and Health Administration

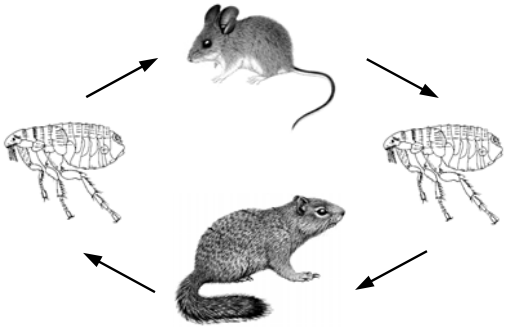
U.S. Department of Labor

www.osha.gov

(800) 321-OSHA

DSG 10/2005

What is Plague?

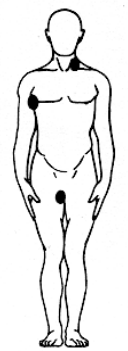


Plague is a disease of wild rodents and rabbits caused by the bacterium *Yersinia pestis*. It is spread among animals and to humans by the bites of infected fleas. Animals most often infected include rock squirrels, prairie dogs, pack rats, chipmunks, rabbits and mice.

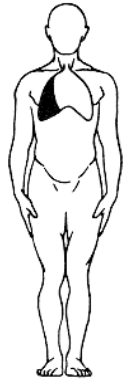
When an animal with plague dies, the infected fleas must find a new host. This may be another rodent, a pet or a person.

Although most human plague cases result from flea bites, people have also contracted the disease by coming into direct contact with an infected animal's blood or tissues, such as when skinning a rabbit or other game.

People can also get plague by inhaling infectious droplets expelled by a person or cat with pneumonic plague.



BUBONIC



PNEUMONIC FORM

The three forms of plague are bubonic ...

Symptoms usually develop within two to six days after a flea bite or contact with an infected animal and include high fever, chills, weakness, headache and muscle aches. In bubonic plague, a lymph node in the groin, armpit or neck becomes swollen and very painful.

... septicemic ...

Sometimes the bacteria go directly into the blood and there are no swollen lymph nodes, just fever and severe flu-like symptoms. Secondary septicemic plague can result from untreated bubonic plague.

... and pneumonic.

If the bacteria invade the lungs, pneumonia may develop and the disease may be spread to other people when the patient coughs or sneezes. For plague pneumonia patients, the death rate is over 50%.

Plague is curable if treated in time.

See your doctor immediately about any illness having sudden onset of high fever. Report if you have had flea bites, have handled any wild rodents or rabbits, or have a pet that hunts. Plague is curable with antibiotics if promptly diagnosed and treated.

Pets that hunt may bring plague-infected fleas into the home and can also become infected with plague. Cats are more likely than dogs to get sick, and can spread the disease to their owners through biting, coughing, or draining abscesses. Take your pet to the vet immediately if it has had contact with rodents and develops symptoms of fever, lethargy, and loss of appetite.

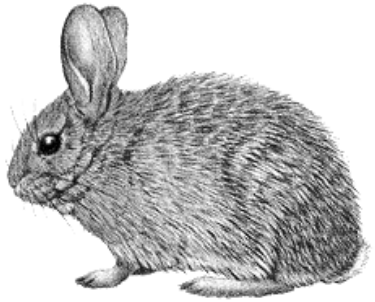
Preventing Plague

- Avoid contact with wild rodents and their fleas, nests and burrows.
- Prevent pets from hunting.
- Treat outdoor pets with flea control products regularly.
- Wear rubber gloves when handling game.
- Eliminate rodent shelter around the home:
- Stack woodpiles at least 12" above the ground and 100 feet from the house;
- Keep animal feed in rodent-proof containers;
- Get rid of junk piles and abandoned vehicles around the home.
- Report sick or dead rodents and rabbits (in the absence of poisoning or trauma) to the Zoonoses Program in the New Mexico Department of Health. (Within Bernalillo County, contact the Albuquerque Environmental Health Dept.)

For more information, contact:

Zoonoses Program
Epidemiology & Response
NM Department of Health
1190 St. Francis Dr.
Santa Fe, NM 87505

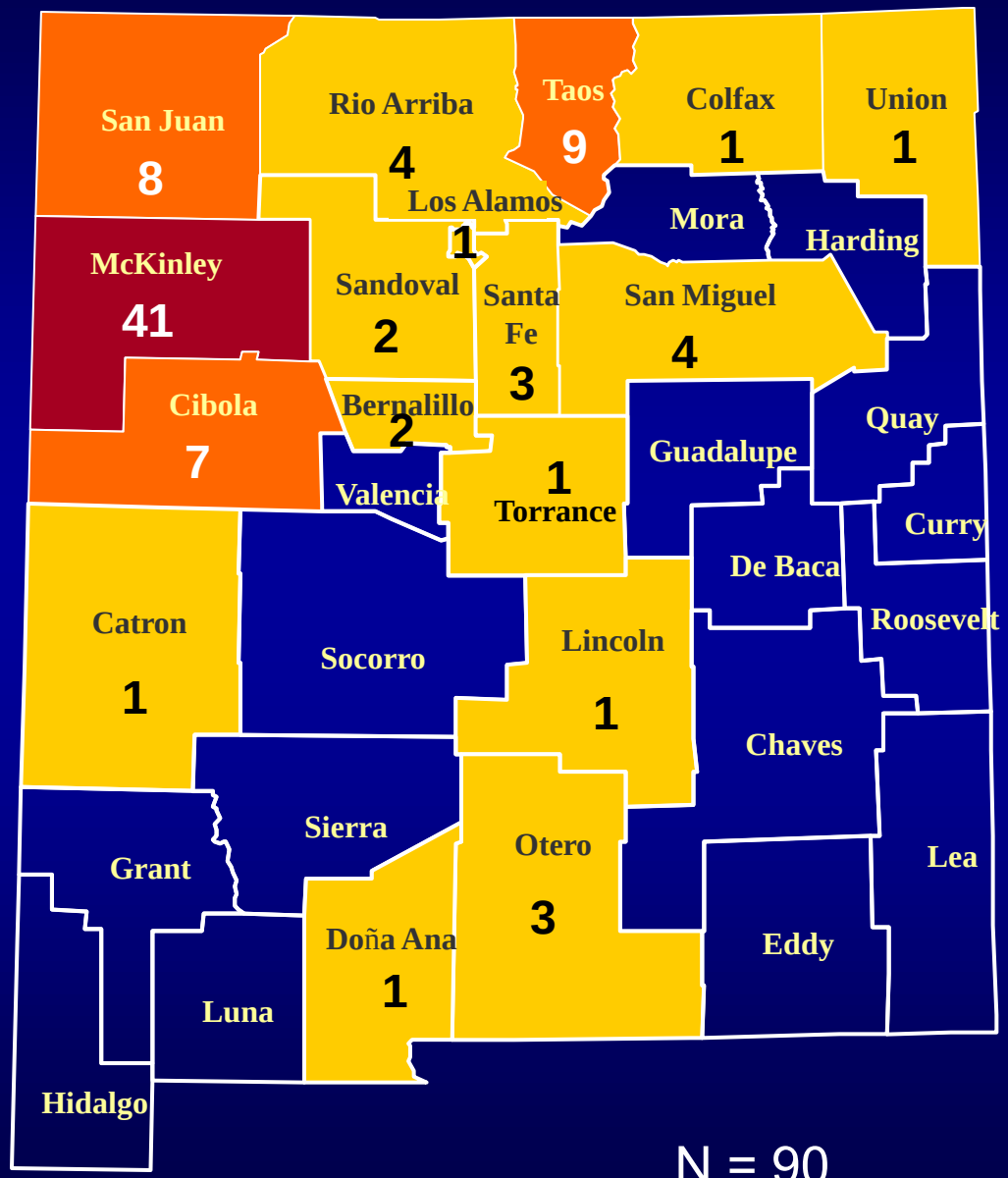
(505) 827-0006



PLAGUE IN NEW MEXICO

New Mexico Department of Health
Epidemiology and Response Division

HPS Cases in New Mexico by County, 1975 – 2011



Number of Cases

- >10
- 6-10
- 1-5
- 0

N = 90

12/31/2011

Mobil

Notes From the Road

Off-Road Driving and Safety Tips

By: Mac Demere/autoMedia.com

Speed is Not Your Friend -

Going off roading? Here are your choices: Carry your stuff on your back; walk beside a mule with your stuff on its back; ride in comfort with your stuff in the back of a four-wheel-drive.

The speed will be about the same. If you drive much faster than a walking pace there's a chance you'll be forced into the first option.

As a teenager, I wanted to cross a muddy section of field in a two-wheel-drive pickup on near-bald tires. I assessed that my only hope was speed. (If you ever say, "My only hope is ... " know that the rest of the sentence is "a miracle.") When the old Ford hit the swampy strip, it sunk floorboard-deep into the mud and came to a near-instant stop. The rear tires must have come off the ground because I feared it was about to flip forward.

Here are the lessons I should have learned, but didn't because I was a teenager:

Speed is not your friend.
The off-road driver's mantra is "As Slow As Possible, As Fast As Necessary." (The original author of this quote is uncertain, but I first heard it at a Land Rover driving school.) Sometimes a little speed may be required to climb a hill or conquer a hazard. However, if you think the obstacle requires even 10 mph, you're probably not going to make it. And you're going to damage something or get stuck.

Sometimes you can't get there from here.
This is true even with a well-equipped vehicle and a skilled driver—and was certainly true of an unskilled teenager in a poorly equipped vehicle. It's far easier to discover an alternate route than to find someone willing and able to come to your rescue. Walking the rest of the way is better than walking home.

Stay on the trail.
Trying to blaze my own trail not only got me stuck, but it left ruts that remained for years. Drive on previously used paths: You'll know it's possible to make it through there and you'll do less damage to the environment. A warning: Just because somebody else made it doesn't guarantee you will. Maybe they had a better vehicle, were a more skilled driver or went through before it rained.

Walk it first.
If you can't negotiate mud, sand or other obstacles on foot, it's highly unlikely your vehicle can make it. It's critical to check out a water-covered route: Unless you've seen another vehicle go through it, you can't be certain it doesn't hide a huge hole.

Be willing to walk back.
Never tackle a questionable obstacle unless you're able to walk back to where help awaits. If you're going off road, your cell phone will be useless. Even if there is coverage, there's nobody to call unless you've made a prior arrangement. The road-service tow-truck driver won't leave the pavement, the farmer with the tractor might not be home, and the guy in the SUV you wave down on the highway may not be able or willing to help. Not all SUVs have four-wheel-drive and a tow

strap.

Re-tire to succeed.
Even the most technologically advanced four-wheel-drive system can't make up for tires that are not meant for the job or lack adequate tread depth. Some original equipment tires on SUVs and pickups can't conquer anything more rigorous than wet grass. Also, even the best mud tires become useless off road well before they run out of tread.

Help yourself.
If you're planning to regularly travel the road less paved, bring along some things that'll help you out of small jams: a hand winch (a.k.a. "come-along"), tow strap, high-lift jack, shovel, some wood blocks, and a first-aid kit. If you're going further than you can walk out, bring enough stuff (extra clothes, water, sleeping bag) to survive until somebody finds you.

Tell somebody.
Tell somebody where you're going and when you expect to be back. At least they'll know when and where to start searching.

I got out of that ancient incident unscathed, largely because within a short hike there was a tractor with the keys in it and a long chain. Bringing along some luck never hurts.

About the Author
Mac Demere is a writer, vehicle tester and race driver who competed in the NASCAR Southwest Tour and Rolex 24 Hours at Daytona.

Project# 002693.2165.01RA
TDD# TO2 09-11-10-0005

Source: ESRI Streetmaps

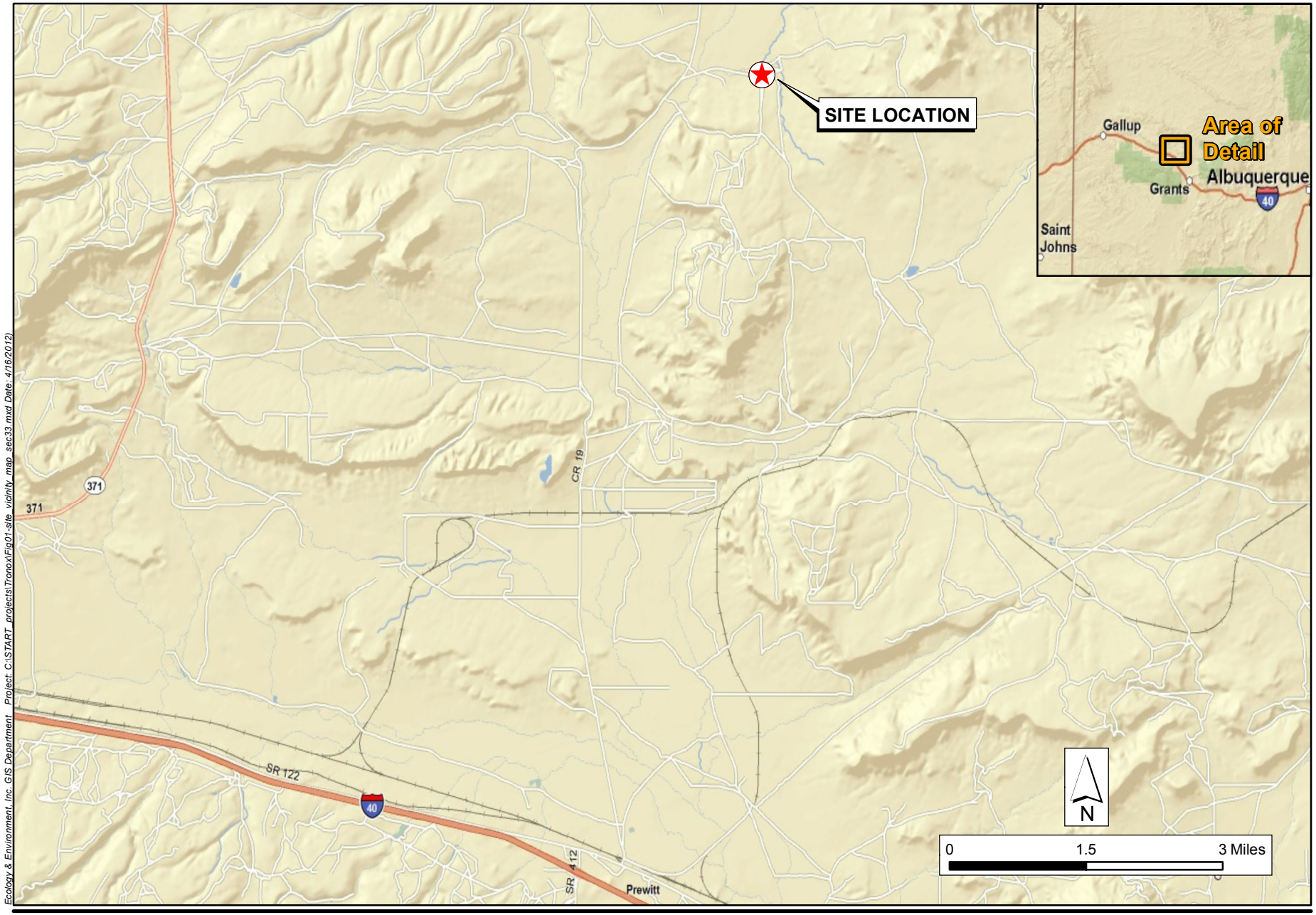


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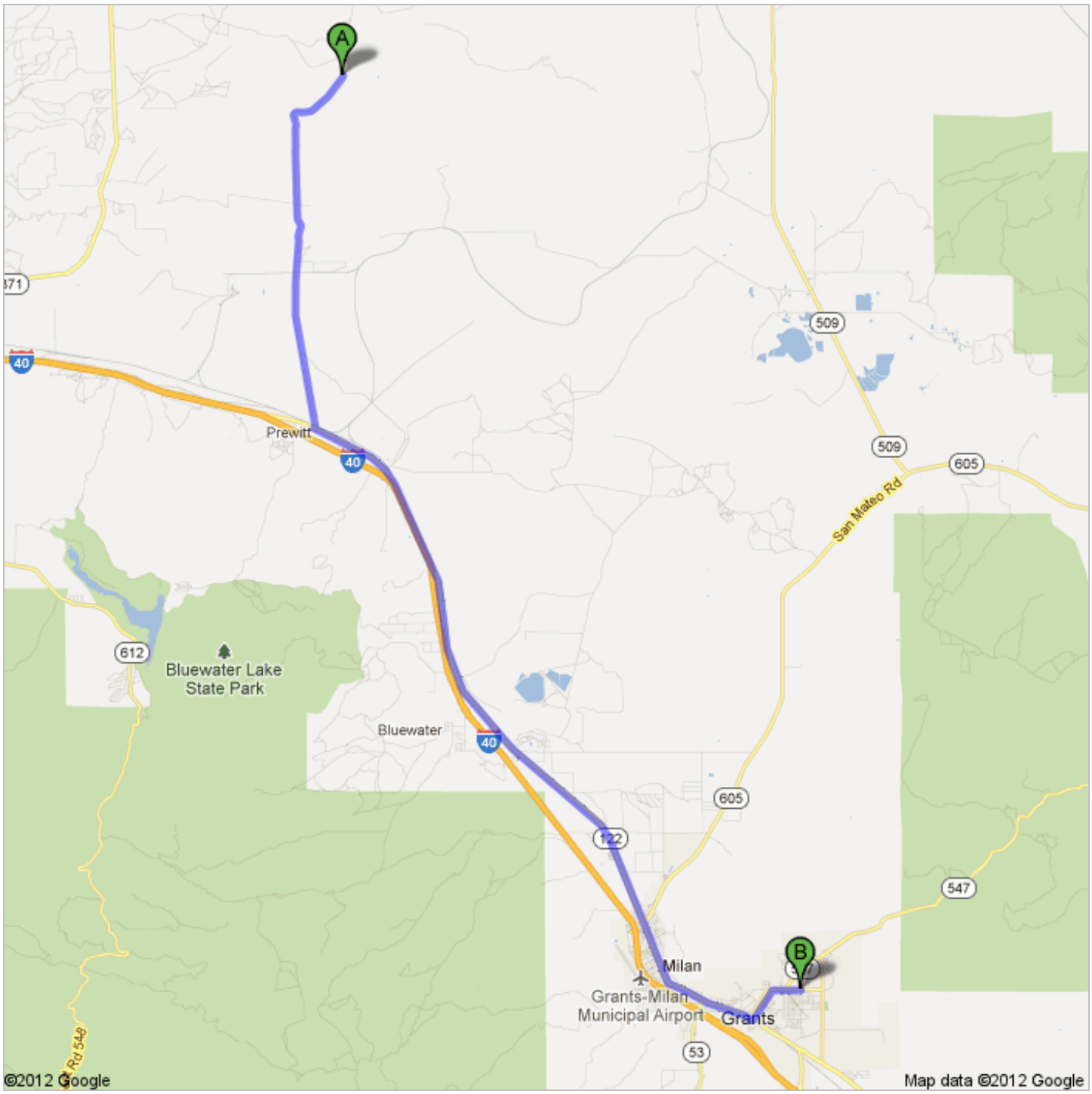
Figure 1

Site Vicinity Map
Tronox AUM Section 33

Casamero Lake Chapter, Navajo Nation, Prewitt, New Mexico

Directions to Cibola General Hospital
1016 E Roosevelt Ave, Grants, NM 87020 - (505) 287-4446
30.8 mi – about **49 mins**



Co Rd 19

1.	Head **southwest** on **Co Rd 19** About 24 mins	go 9.7 mi total 9.7 mi
2.	Turn left onto **NM-122 E/Frontage Rd** Continue to follow NM-122 E About 20 mins	go 18.1 mi total 27.8 mi
3.	Continue onto **W Santa Fe Ave** About 2 mins	go 1.4 mi total 29.2 mi
4.	Turn left onto **1st St** About 2 mins	go 0.9 mi total 30.0 mi
5.	Slight right onto **W Roosevelt Ave** Destination will be on the left About 2 mins	go 0.7 mi total 30.8 mi

Cibola General Hospital
1016 E Roosevelt Ave, Grants, NM 87020 - (505) 287-4446

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.

Map data ©2012 Google

Directions weren't right? Please find your route on maps.google.com and click "Report a problem" at the bottom left.