INEEL/EXT-2000-00270
Revision 4

# Health and Safety Plan for WAG 3, OU 3-13, Group 6 Buried Gas Cylinders

May 2004

Idaho Completion Project

Bechtel BWXT Idaho, LLC

INEEL/EXT-2000-00270
Revision 4
Project No. 23510

# Health and Safety Plan for WAG 3, OU 3-13, Group 6 Buried Gas Cylinders

May 2004

Idaho Completion Project
Idaho Falls, Idaho 83415

Prepared for the
U.S. Department of Energy
Assistant Secretary for Environmental Management
Under DOE Idaho Operations Office
Contract DE-AC07-99ID13727

# ABSTRACT

This Health and Safety Plan establishes the procedures and requirements used to eliminate or minimize health and safety risks to persons working on the preliminary characterization, removal, and post-remedial design/remedial action sampling for Operable Unit 3-13, Group 6, Buried Gas Cylinders at Sites CPP-84 and CPP-94, as required by the Occupational Safety and Health Administration standard, 29 CFR 1910.120/1926.65, "Hazardous waste operations and emergency response." It contains information identifying hazards involved in performing the work, as well as specific actions and equipment used to protect persons while working at the work site.

This Health and Safety Plan is intended to give safety and health professionals the flexibility to establish and modify project safety and health procedures throughout the entire span of project operations based on existing and anticipated hazards. The health and safety officer supporting these activities will determine the most appropriate hazard control and required mitigation measures based on site-specific conditions and will make changes to this document as appropriate.

# CONTENTS

ABSTRACT ..... iii

ACRONYMS ..... xi

1. INTRODUCTION ..... 1-1

1.1 INEEL Site Description ..... 1-1

2. SITE DESCRIPTIONS AND PROJECT SCOPE ..... 2-1

2.1 CPP-84 Background and Description (West of INTEC) ..... 2-1

2.2 CPP-94 Background and Description (Northeast of INTEC) ..... 2-1

2.3 Scope of Work ..... 2-3

2.3.1 Pre-Removal Data Collection ..... 2-3
2.3.2 Removal of Compressed Gas Cylinders and Treatment ..... 2-3
2.3.3 Post-Removal Data Collection ..... 2-4
2.3.4 Field Activities ..... 2-4

3. HAZARD IDENTIFICATION AND MITIGATION ..... 3-1

3.1 Chemical and Radiological Hazards and Mitigation ..... 3-1

3.2 Routes of Exposure ..... 3-2

3.3 Environmental and Personnel Monitoring ..... 3-9

3.3.1 Industrial Hygiene Monitoring ..... 3-9
3.3.2 Radiological Monitoring ..... 3-9
3.3.3 RadCon Engineer/IH Exposure Assessments ..... 3-11

3.4 Physical Hazards Evaluation, Control, and Monitoring ..... 3-11

3.4.1 Temperature Extremes ..... 3-11
3.4.2 Noise ..... 3-14
3.4.3 Fire, Explosion, and Reactive Materials Hazards ..... 3-15
3.4.4 Biological Hazards ..... 3-16
3.4.5 Safety Hazards ..... 3-16
3.4.6 Inclement Weather Conditions ..... 3-18
3.4.7 Confined Spaces ..... 3-18
3.4.8 Excavation and Trench Areas ..... 3-18
3.4.9 Excavation, Surface Penetrations, and Outages ..... 3-18

3.5 Other Project Hazards ..... 3-19

3.5.1 Material Handling and Back Strain ..... 3-20
3.5.2 Working and Walking Surfaces ..... 3-20
3.5.3 Pressurized Systems ..... 3-20

3.5.4 Material Handling ..... 3-20
3.5.5 Overhead Objects ..... 3-21
3.5.6 Hoisting and Rigging of Equipment ..... 3-21

3.6 Site Inspections ..... 3-21

4. EXPOSURE MONITORING AND SAMPLING ..... 4-1

4.1 Exposure Limits ..... 4-1

4.2 Action Limits ..... 4-1

4.3 Environmental and Personnel Monitoring ..... 4-1

4.3.1 Industrial Hygiene Area and Personal Monitoring and Instrument Calibration ..... 4-6
4.3.2 Area Radiological Monitoring and Instrument Calibration ..... 4-6

5. ACCIDENT AND EXPOSURE PREVENTION ..... 5-1

5.1 Voluntary Protection Program and Integrated Safety Management ..... 5-1

5.2 General Safe-Work Practices ..... 5-2

5.3 Subcontractor Responsibilities ..... 5-3

5.4 Radiological and Chemical Exposure Prevention ..... 5-3

5.4.1 Radiological Exposure Prevention – As Low as Reasonably Achievable Principles ..... 5-3
5.4.2 Chemical and Physical Hazard Exposure Avoidance ..... 5-4

5.5 Buddy System ..... 5-4

6. PERSONAL PROTECTIVE EQUIPMENT ..... 6-1

6.1 Respiratory Protection ..... 6-1

6.2 Personal Protective Equipment Levels ..... 6-3

6.2.1 Level D Personal Protective Equipment ..... 6-3
6.2.2 Level B Personal Protective Equipment ..... 6-4

6.3 Protective Clothing Upgrading and Downgrading ..... 6-4

6.4 Inspection of PPE ..... 6-5

7. PERSONNEL TRAINING ..... 7-1

7.1 General Training ..... 7-1

7.2 Project-Specific Training ..... 7-1

7.3 Plan-of-the-Day Briefing, Feedback, and Lessons Learned ..... 7-5

8. SITE CONTROL AND SECURITY ..... 8-1

8.1 Support Zone ..... 8-4

8.2 Contamination Reduction Zone and Corridor ..... 8-4

8.3 Exclusion Zone ..... 8-4

8.4 Eating and Smoking ..... 8-5

9. OCCUPATIONAL MEDICAL SURVEILLANCE ..... 9-1

9.1 Subcontractor Workers ..... 9-1

9.2 Injuries on the Site ..... 9-2

9.3 Substance-Specific Medical Surveillance ..... 9-3

10. KEY SITE PERSONNEL RESPONSIBILITIES ..... 10-1

10.1 Task Site Responsibilities ..... 10-1

10.1.1 Field Team Leader/Subcontractor Technical Representative ..... 10-1
10.1.2 Health and Safety Officer ..... 10-3
10.1.3 Subcontractor Technical Representative ..... 10-3
10.1.4 Industrial Hygienist ..... 10-4
10.1.5 Safety Professional ..... 10-4
10.1.6 Radiological Engineer ..... 10-4
10.1.7 Radiological Control Technician ..... 10-5
10.1.8 Fire Protection Engineer ..... 10-5
10.1.9 Sampling Team ..... 10-5
10.1.10 Specialty Subcontractors ..... 10-6
10.1.11 Field Team Personnel ..... 10-6
10.1.12 Nonfield Team Personnel ..... 10-6
10.1.13 Visitors ..... 10-6

10.2 Facility (INTEC) Responsibilities ..... 10-7

10.2.1 Clean/Close INTEC Subproject 6 and INTEC Interface ..... 10-7
10.2.2 INTEC Work Authorization ..... 10-7

10.3 Project Management Team ..... 10-8

11. DECONTAMINATION PROCEDURES ..... 11-1

11.1 Contamination Control and Prevention ..... 11-1

11.2 Personnel and Equipment Decontamination ..... 11-1

11.2.1 Personnel Decontamination ..... 11-1
11.2.2 Decontamination in Medical Emergencies ..... 11-2
11.2.3 Equipment Decontamination ..... 11-2

11.3 Disposal of Contaminated PPE and Equipment ..... 11-3

11.3.1 Storage and Disposal of Contaminated Materials ..... 11-3
11.3.2 Project Sanitation and Waste Minimization ..... 11-3

12. EMERGENCY RESPONSE PLAN ..... 12-1

12.1 Field Worker Personnel Accountability ..... 12-1

12.2 Types of Emergency Events ..... 12-2

12.2.1 Events Requiring Emergency Notifications ..... 12-2
12.2.2 Events Requiring Local Project Evacuation and/or INEEL ERO Response.. 12-3
12.2.3 Events Requiring Total Facility and Project Evacuation ..... 12-3

12.3 Emergency Facilities and Equipment ..... 12-4

12.4 Emergency Communications ..... 12-6

12.5 Emergency Response Roles and Responsibilities ..... 12-6

12.5.1 INEEL and CFA EROs ..... 12-6
12.5.2 Project Personnel Involved in Emergencies ..... 12-7

12.6 Emergencies, Recognition of Warnings, and Response ..... 12-8

12.6.1 Emergency Recognition and Response ..... 12-8
12.6.2 Alarms ..... 12-9
12.6.3 Personnel Accountability/Area Warden ..... 12-10
12.6.4 Notifications ..... 12-11
12.6.5 Evacuation Routes ..... 12-11

12.7 Reentry and Recovery ..... 12-11

12.7.1 Reentry ..... 12-11
12.7.2 Recovery ..... 12-11

12.8 Critique of Response and Follow-up ..... 12-12

12.9 Telephone/Radio Contact Reference List ..... 12-12

13. RECORDKEEPING REQUIREMENTS ..... 13-1

13.1 Industrial Hygiene and Radiological Monitoring Records ..... 13-1

13.2 Field Team Leader/Subcontractor Technical Representative and Sampling Logbooks... 13-1

13.3 Document Control ..... 13-1

13.4 Site Attendance Record ..... 13-1

13.5 Administrative Record and Document Control Office ..... 13-2

14. REFERENCES ..... 14-1

# FIGURES

1-1. Map of the INEEL showing major facilities locations ..... 1-2

2-1. Location of Sites CPP-84 and CPP-94 ..... 2-2

7-1. Model identifying employees requiring HAZWOPER training at CERCLA sites ..... 7-4

8-1. Typical configuration of controlled work zones including radiological control areas for Site CPP-84 ..... 8-2

8-2. Typical example of construction area for Site CPP-94 ..... 8-3

10-1. Operable Unit 3-13 Group 6, Buried Gas Cylinders, organization chart ..... 10-2

12-1. Routes to the CFA Dispensary from CPP-84 and CPP-94—NOTE: Delete CPP-94 ..... 12-5

12-2. Primary evacuation routes for CPP-84 and CPP-94 ..... 12-13

# TABLES

3-1. OU 3-13, Group 6 activities and associated hazards ..... 3-2

3-2. Potential health contaminants at the OU 3-13, Group 6 project site ..... 3-3

3-3. Evaluation of nonradiological and radiological contaminants at Site CPP-84 ..... 3-4

3-4. Equipment to be used for monitoring radiological and nonradiological hazards at Sites CPP-84 and CPP-94 ..... 3-10

3-5. Action levels and associated responses for OU 3-13, Group 6 project hazards ..... 3-12

3-6. Heat stress signs and symptoms ..... 3-14

4-1. Tasks and hazards to be monitored and monitoring instruments ..... 4-2

4-2. Action levels and associated responses for the OU 3-13, Group 6, Buried Gas Cylinders project ..... 4-4

6-1. Guidance for respiratory and protective clothing selection ..... 6-2

7-1. Required project-specific training ..... 7-2

12-1. Emergency response equipment to be maintained at the site ..... 12-4

12-2. Responsibilities during an emergency ..... 12-8

12-3. Project notification responsibilities ..... 12-12

# ACRONYMS

| | |
|---|---|
| ACGIH | American Conference of Governmental Industrial Hygienists |
| ALARA | as low as reasonably achievable |
| ANSI | American National Standards Institute |
| Anti-C | anti-contamination |
| ARDC | Administrative Record and Document Control |
| BBWI | Bechtel BWXT Idaho, LLC |
| BGC | buried gas cylinder(s) |
| CAM | continuous air monitor |
| CC | construction coordinator |
| CE | construction engineer |
| CERCLA | Comprehensive Environmental, Response, Compensation and Liability Act |
| CFA | Central Facilities Area |
| CGA | Compressed Gas Association |
| CNS | central nervous system |
| COC | chain of custody |
| COPC | contaminant of potential concern |
| CRC | contamination reduction corridor |
| CRV | Cylinder Recovery Vehicle |
| CRZ | contamination reduction zone |
| CVS | cardiovascular system |
| DAC | derived air concentration |
| dBA | decibel A-weighted |
| DOE | Department of Energy |
| DOT | Department of Transportation |
| EAM | emergency action manager |

| | |
|---|---|
| EC | emergency coordinator |
| EPA | Environmental Protection Agency |
| ERO | emergency response organization |
| ES&H | environment, safety, and health |
| ESH&QA | environment, safety, health, and quality assurance |
| EZ | exclusion zone |
| FCC | field construction coordinator |
| FD | fire department |
| FFA/CO | Federal Facility Agreement and Consent Order |
| FFPE | facility fire protection engineer |
| FTL/STR | field team leader/subcontractor technical representative |
| GM | Geiger-Mueller |
| GI | gastrointestinal |
| HASP | Health and Safety Plan |
| HAZMAT | hazardous material |
| HAZWOPER | Hazardous Waste Operations and Emergency Response |
| HEPA | high-efficiency particulate air (filter) |
| HF | hydrogen fluoride |
| HPSC | hazard profile screening checklist |
| HSO | health and safety officer |
| ICS | Incident Command System |
| IDLH | immediately dangerous to life or health |
| IDW | investigation-derived waste |
| IH | industrial hygiene(ist) |
| INEEL | Idaho National Engineering and Environmental Laboratory |
| INTEC | Idaho Nuclear Technology and Engineering Center |

| | |
|---|---|
| IRTL | incident response team leader |
| JSS | job-site supervisor |
| LLW | low-level waste |
| MCP | management control procedure |
| MSDS | material safety data sheet |
| NE-ID | Department of Energy Idaho Operations Office |
| NFPA | National Fire Protection Association |
| NIOSH | National Institute of Occupational Safety and Health |
| NRTS | National Reactor Testing Station |
| OMP | Occupational Medical Program |
| OSC | on-scene commander |
| OSHA | Occupational Safety and Health Administration |
| OU | operable unit |
| PAL | personnel accountability leader |
| PEL | permissible exposure limit |
| PINS | portable isotopic neutron spectroscopy |
| PM | project manager |
| POC | point of contact |
| POD | plan of the day |
| PPE | personal protective equipment |
| PRD | program requirements directive |
| QAPjP | quality assurance project plan |
| RadCon | radiological control |
| RBA | radiological buffer area |
| RCIMS | Radiological Control and Information Management System |
| RCM | radiological control manual |

| | |
|---|---|
| RCT | radiological control technician |
| RCRA | Resource Conservation and Recovery Act |
| RE | radiological engineer |
| RMA | radioactive material area |
| ROD | Record of Decision |
| RWP | radiological work permit |
| SCBA | self-contained breathing apparatus |
| SE | safety engineer |
| SH&QA | safety, health, and quality assurance |
| SOP | standard operating procedure |
| SS | shift supervisor |
| STEL | short-term exposure limit |
| SWP | safe work permit |
| SZ | support zone |
| TAL | target analyte list |
| TLD | thermoluminescent dosimeter |
| TLV | threshold limit value |
| TPR | technical procedure |
| TWA | time-weighted average |
| USCG | United States Coast Guard |
| VPP | Voluntary Protection Program |
| WAC | Waste Acceptance Criteria |
| WAG | waste area group |
| WCC | Warning Communications Center |
| WGS | Waste Generator Services |

# HEALTH AND SAFETY PLAN FOR WAG 3, OU 3-13, GROUP 6 BURIED GAS CYLINDERS

## 1. INTRODUCTION

This Health and Safety Plan (HASP) establishes the procedures and requirements used to eliminate and/or minimize health and safety risk to persons working on the preliminary characterization, cylinder excavation, inspection, characterization, removal, treatment, and post-remedial design/remedial action (RD/RA) sampling for Operable Unit (OU) 3-13, Group 6, Buried Gas Cylinders at Sites CPP-84 and CPP-94, hereinafter referred to as buried gas cylinder (BGC) Sites CPP-84 and CPP-94. This HASP meets the requirements of the Occupational Safety and Health Administration (OSHA) standard, 29 CFR 1910.120/1926.65, "Hazardous waste operations and emergency response."

The preparation of this HASP is consistent with information found in the National Institute of Occupational Safety and Health (NIOSH)/OSHA/United States Coast Guard (USCG)/U.S. Environmental Protection Agency (EPA) *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities* (NIOSH 1985); Company Manual 14A, Safety and Health - Occupational Safety and Fire Protection; Company Manual 14B, Safety and Health - Occupational Medical and Industrial Health; Company Manual 15A, Radiation Protection INEEL Radiological Control (PRD-183); Company Manual 15B, Radiation Protection Procedures; and Company Manual 15C, Radiological Control Procedures.

This HASP governs above-mentioned activities at Sites CPP-84 and CPP-94 performed by employees of Bechtel BWXT Idaho, LLC (BBWI), subcontractors to BBWI, employees of other companies, or the U.S. Department of Energy (DOE) laboratories. Persons not normally assigned to work on the project, such as representatives of DOE, the State of Idaho, OSHA, and the EPA, are considered visitors who fall under the definition of "visitors" as stated in OSHA 29 CFR 1910.120/1926.65.

This HASP will be reviewed and revised by the health and safety officer (HSO) in conjunction with the field team leader/subcontractor technical representative (FTL/STR); necessary environmental, safety, and health (ES&H) professionals; and the Idaho Nuclear Technology and Engineering Center (INTEC) environment, safety, health, and quality assurance (ESH&QA) manager or designee to ensure the effectiveness and suitability for the work scope outlined in this HASP. The hazard classification is defined as low hazard allowing a maximum of five individuals in the exclusion zone at one time (Manual 14B).

### 1.1 INEEL Site Description

The Idaho National Engineering and Environmental Laboratory (INEEL), formerly the National Reactor Testing Station (NRTS), encompasses 2,305 $km^2$ (890 $mi^2$), and is located approximately 55 km (34 mi) west of Idaho Falls, Idaho (see Figure 1-1).

The United States Atomic Energy Commission, now the DOE, established the NRTS, now the INEEL, in 1949 as a site for building and testing a variety of nuclear facilities. The INEEL has also been the storage facility for transuranic radionuclides and radioactive low-level waste (LLW) since 1952. At present, the INEEL supports the engineering and operations efforts of DOE and other federal agencies in areas of nuclear safety research, reactor development, reactor operations and training, nuclear defense materials production, waste management technology development, and energy technology and

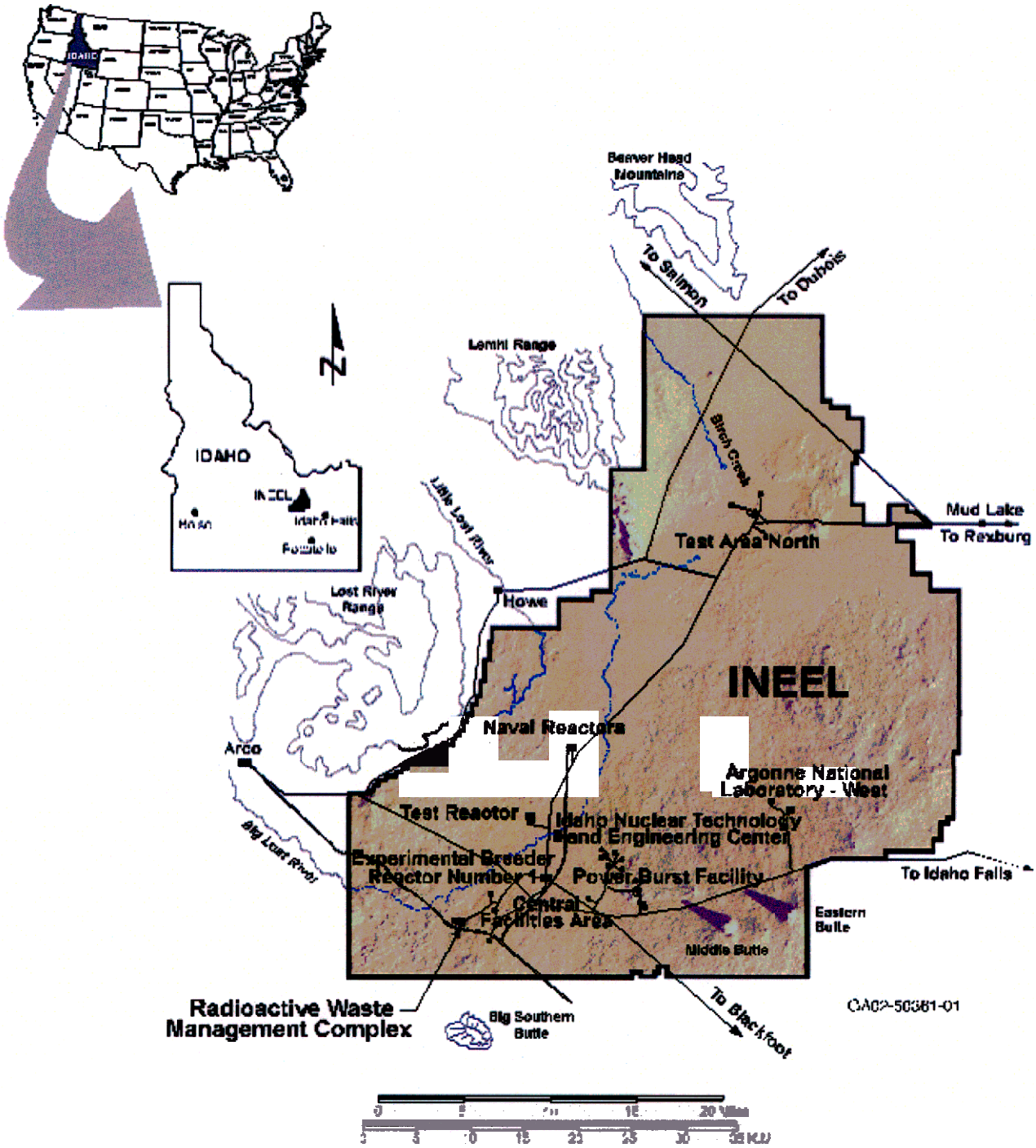


Figure 1-1. Map of the INEEL showing major facilities locations.

conservation programs. The DOE Idaho Operations Office (NE-ID)[a] has responsibility for the INEEL and designates authority to operate the INEEL to government contractors. BBWI, the current primary contractor for NE-ID at the INEEL, provides managing and operating services to the majority of INEEL facilities.

In November 1989, because of confirmed contaminant releases to the environment, the EPA placed the INEEL on the National Priorities List of the National Oil and Hazardous Substances Pollution Contingency Plan (54 FR 48184). In response to this listing, the DOE, the EPA, and the State of Idaho (collectively called the Agencies) negotiated a Federal Facility Agreement and Consent Order (FFA/CO) and Action Plan (DOE-ID 1991). The FFA/CO and Action Plan, signed in 1991 by NE-ID, EPA, and the State of Idaho Department of Environmental Quality, established the procedural framework and schedule for developing, prioritizing, implementing, and monitoring response actions at the INEEL in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) (42 USC § 9601 et seq.), the Resource Conservation Recovery Act (RCRA) (42 USC § 6901 et seq.), and the Idaho Hazardous Waste Management Act (HWMA) (HWMA 1983).

To better manage cleanup activities, the INEEL was divided into 10 waste area groups (WAGs); INTEC is designated as WAG 3. Each WAG contains a number of contaminant release sites grouped into OUs based on similarity of waste streams and projected remedial actions. Fourteen OUs have been defined for WAG 3. Operable units 3-01 through 3-13 are addressed in the OU 3-13 Record of Decision (ROD) (DOE-ID 1999). Remediation of Site CPP-84 and soil sampling and final remediation of Site CPP-94 will complete the FFA/CO (DOE-ID 1991) for WAG 3, OU 3-13, Group 6, Buried Gas Cylinders.

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a. NE-ID signifies that the DOE Idaho Operations Office reports to the DOE Office of Nuclear Energy, Science, and Technology (NE).

# 2. SITE DESCRIPTIONS AND PROJECT SCOPE

Both Sites CPP-84 and CPP-94 are located north of the Central Facilities Area (CFA) outside the fenced area of INTEC with further descriptions provided below.

## 2.1 CPP-84 Background and Description (West of INTEC)

CPP-84 was identified and added to the FFA/CO (DOE-ID 1991) as a new site in 1994 (Figure 2-1). CPP-84 is located between INTEC and Lincoln Boulevard and about 18 m (60 ft) south of the Big Lost River. The site consists of a trench where compressed gas cylinders were disposed after initial construction of INTEC (previously known as the Idaho Chemical Processing Plant or ICPP) in 1952.

A preliminary survey using metal detectors was conducted to estimate the horizontal and vertical extent of the trench. The trench is currently staked and measures approximately 6 × 9 m (20 × 30 ft) and approximately 2 m (5 ft) deep. The cylinders were originally stored in the maintenance building and contained gases used for construction purposes. It is estimated there are between 40 and 100 buried gas cylinders. Whether the cylinders were buried because they were empty, partially empty, leftover/unused, or damaged is unknown. A review of available historical information indicates the gases may be limited to acetylene, compressed air, argon, carbon dioxide, helium, nitrogen, and oxygen. These gases do not pose a significant human health risk but are considered an acute safety hazard. Ruptures of the cylinders could lead to personal injury, fire, or explosion. Hydrogen fluoride (HF) cylinders are not anticipated at this site but could potentially be found during remediation activities. This HASP identifies and mitigates potential and existing hazards associated with HF in the unlikely event it is encountered at CPP-84.

The environmental contaminants of potential concern (COPCs) at CPP-84 are acetone, asbestos, and the inorganic target analyte list (TAL) for metals. Acetone and asbestos may have been used as fillers and stabilizers in acetylene tanks. Acetylene is not an environmental hazard but is considered a simple asphyxiant and an explosion hazard. Because acetone is highly volatile, it is anticipated any leakage would have already vaporized. It is anticipated that the presumed asbestos-containing material will remain contained/intact within the acetylene containers in a bound and nonfriable state. TAL metals will also be assessed due to the presence of the metals cylinders and the potential of corrosion, oxidation, rusting, or breakdown of the cylinders.

## 2.2 CPP-94 Background and Description (Northeast of INTEC)

CPP-94 is located about 2.4 km (1.5 mi) northeast of INTEC along an unpaved security road. CPP-94 was identified and added to the FFA/CO as a new site in 1997 (Figure 2-1). Available information is based on visual observations, historical records and interviews, results from a survey using metal detectors in 1996, and cylinder removal actions conducted in 2000. Buried gas cylinders were removed from Site CPP-94 with final characterization and soils remediation to be accomplished as part of this work scope.

The COPCs at CPP-94 are fluoride (the breakdown product from HF) and TAL metals. Hydrofluoric acid (a solution of HF gas in water) is used as a major component in the spent fuel dissolution process and is a listed hazardous waste when disposed. HF, a colorless, toxic, nonflammable liquefied gas that is extremely corrosive, reacts violently with water. Although nonflammable, HF can react with certain metals to form potentially explosive hydrogen gas. However, fluoride, a residual

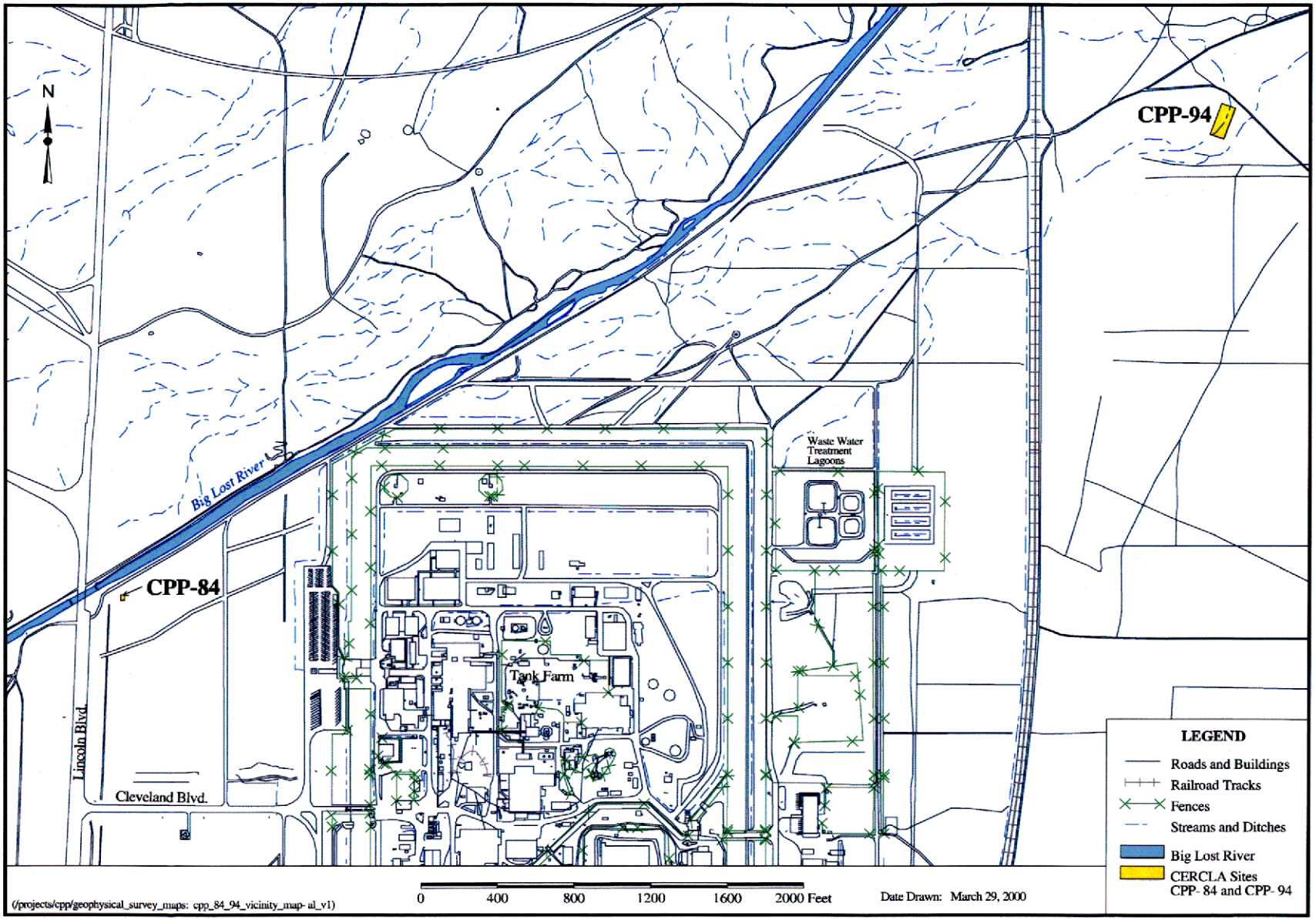



Figure 2-1. Location of Sites CPP-84 and CPP-94.

chemical of HF acid reactions, is a potential health and ecological hazard. TAL metals will be assessed due to the presence of the metals in cylinders and the potential of corrosion, oxidation, rusting, or breakdown of the cylinders.

## 2.3 Scope of Work

At Site CPP-84 the scope of work in divided into three phases: (a) pre-removal characterization activities (prior to buried cylinder removal), (b) removal and possible treatment to safe configuration, and (c) post-removal characterization activities (after buried cylinder removal). This HASP covers the activities and procedures for the characterization, removal, and post-RD/RA sampling of the buried gas cylinders at Site CPP-84 and post-RD/RA sampling and remediation activities at site CPP-94.

Prior to pre-removal data collection, weeding/grubbing will create a minimum of a 30-ft perimeter around Site CPP-84 to remove fuel from grass, brush, and weeds in accordance with National Fire Protection Association (NFPA) standards. These areas will again be marked off with survey paint.

### 2.3.1 Pre-Removal Data Collection

**Note:** During hand excavation activities, personnel and equipment will avoid contact or movement of the cylinders until cylinder and valving integrity is verified.

***2.3.1.1 Radiological Survey.*** A survey was performed to assess the level of radioactivity in the soil. No radioactive contamination was found to be present at either site. A radiological control technician will conduct periodic surveys during site excavation and removal activities to establish necessary radiological control measures including upgrading perimeter controls and personal protective equipment (PPE) requirements to prevent personnel exposure. If radioactivity is detected at levels significantly above background (normally 100 counts above background), work will be stopped so the contamination can be further assessed and may be controlled by use of a radiological work permit (RWP).

***2.3.1.2 Geophysical Survey.*** Geophysical data have been collected at CPP-84 and CPP-94. The purpose of the geophysical data is to better define the spatial extent of buried cylinders. By conducting a high-resolution magnetic-gradient geophysical survey, a more thorough characterization of the distribution of the cylinders is available for removal activities. For Site CPP-84, the subcontractor may perform additional magnetometry to further pinpoint subsurface metal. A fiberglass hand-push rod may be utilized to “feel” for metal below the ground. Additional technologies may be introduced to the project to help define the exact location and spatial extent of buried gas cylinders.

### 2.3.2 Removal of Compressed Gas Cylinders and Treatment

The removal of cylinders from Site CPP-84 may include locating through use of magnetometry technology and pushing nonconductive rods to verify readings for cylinder location mapping. No matter what technology is utilized, the cylinders’ location, depth, and positioning shall be identified prior to site excavation. Earth-scraping with an excavator may then proceed coupled with push rod and magnetics verification until within 1 ft of cylinders. Use of the trackhoe to unearth cylinders will be permitted only ½ the depth of the confirmed cylinder location (For example, if cylinders are found 3 ft from surface, they may dig within 1.5 ft of the cylinders. Then they will have to conduct additional verification; no mechanical excavation closer than 1 ft will be allowed.) Hand excavation with nonsparking tools or equivalent means will then be utilized when cylinders are located at a minimum of 1 ft from the soil surface.

Lexan shielding will be utilized on the cab of the trackhoe and may be necessary for field personnel for additional worker protection. At this point, the cylinder(s) will be further exposed by hand excavation of the surrounding soil. Hand-excavation tools will be constructed of nonsparking materials. The cylinders will be visually inspected to verify cylinder integrity, valve integrity, and contents prior to disturbance. Cylinders may then be moved by a cylinder grappler to the edge of the excavation. The cylinders may be remotely handled to segregated storage racks located downwind, as practicable, and individually secured in place. Flammable and combustible materials shall be separated at a minimum of 20 ft or a 5-ft-high fire barrier with a rating of 1 hour.

After the excavation and segregation phase, the cylinders may be loaded into a Cylinder Recovery Vessel (CRV) for contents verification, treatment, or safe recontainerization. Identified treatment will be determined upon gas identification per the specialized subcontractor's authorized procedures.

Treatment may include venting to the atmosphere and flaring. Empty cylinders flared or vented (excluding acetylene) may be disposed of at the Central Facilities Area (CFA) Landfill. Acetylene and HF cylinders will be shipped off-Site for treatment and disposal.

### 2.3.3 Post-Removal Data Collection

***2.3.3.1 Soil Sampling and Analysis.*** Soil samples will be collected at CPP-84 and CPP-94 to estimate the concentrations of COPCs in the soil. The purpose of this data collection effort is to provide a preliminary characterization of the soil excavated during removal activities and of the soil at the bottom of the excavation. Soil samples will be collected by hand using conventional soil sampling equipment, preserved and prepared for shipment, and shipped to an off-Site laboratory for chemical analysis (see SOP-11.12, "Soil Sampling").

***2.3.3.2 Geophysical Survey.*** A geophysical survey will again be performed at CPP-84 and CPP-94 following cylinder removal. The purpose of the geophysical data will be to confirm the complete removal of the buried gas cylinders. The same methods and personnel used for the pre-removal geophysical survey will likely be used for the post-removal survey.

### 2.3.4 Field Activities

The field activities for OU 3-13 involve the preparation and mobilization of the people and resources necessary to safely obtain data and collect samples necessary for characterizing Site CPP-84. At Site CPP-84, the scope will be performed in three phases: (1) premobilization; (2) performance of work, that is, perform removal operations and subsequent treatment, transport, or recharacterization activities, as well as remediation verification sampling (as necessary); and (3) demobilization/closeout.

- Remediation activities at CPP-84 consist of cylinder excavation and segregation, cylinder content sampling and analysis, and soil sampling and analysis. Based on the analytical results of cylinder contents, the method of treatment will be determined. It is anticipated that treatment methods will include venting of inert gasses and thermal or chemical oxidation of flammable (acetylene) gasses.

- Soil data will be collected at CPP-84 and CPP-94 at the conclusion of cylinder removal activities. Activities at CPP-94 will be limited to soil characterization, site remediation, and revegetation. The purpose of this data collection is to provide a characterization of the excavation bottom. Soil samples will be collected and analyzed for contaminants of potential concern (COPCs) at an off-Site laboratory. This activity is detailed in the *Preliminary Characterization Plan for the OU 3-13 Group 6 RD/RA Buried Gas Cylinder Sites: CPP-84 and CPP-94* (DOE-ID 2001).

General components of each phase, as applicable, are listed below:

**Phase I—Premobilization**

- Prepare and obtain necessary work control packages.
- Contact Waste Generator Services (WGS) to establish plan for handling investigation-derived waste (IDW).
- As required, prepare/obtain National Environmental Policy Act documentation, hazard categorization determination, job safety analyses (JSAs), Storm Water Pollution Prevention Plan, David-Bacon determination, and other needed permits.
- Ensure training requirements for sampling team/removal team members are complete and documented.
- Obtain necessary equipment and supplies.
- Ensure a Task Order Statement for the analytical laboratory is complete.

**Phase II—Performance of Work**

**Stage 1. Daily Preparations**

- Complete pre-job briefing and plan of the day (POD) in accordance with MCP-3003, "Performing Pre-job Briefings and Documenting Feedback," for contractor employees and/or PRD-1007, "Work Coordination and Hazard Control," for subcontract employees.
- Make notifications to the CFA area director, Warning Communications Center (WCC), Security, Shipping, etc., as necessary.
- Inventory the equipment and supplies necessary to safely complete the day's activities.
- Record daily preparations in the FTL/STR logbook.

**Stage 2. Data Collection, Sampling, and Decontamination**

- Locate, collect, label, and preserve samples according to the procedures outlined in the Characterization Plan.
- Perform decontamination procedures as outlined in the Characterization Plan.
- Mark/survey sample locations as outlined in the Characterization Plan.
- Record sampling activities in logbook.

**Stage 3. Documentation and Shipping**

- Complete chain-of-custody (COC) forms for all samples.
- Complete any required radiation screening/analysis before shipment.

- Package samples and label shipping container for shipment to certified analytical laboratory, complete shipping papers, transport shipping container to CFA shipping.

**Stage 4. Removal/Treatment**

- Visual inspection of compressed gas cylinders/valving.
- Hand excavation of cylinders using nonsparking tools.
- Perform nondestructive evaluation/testing of compressed gas cylinders and valving (as necessary).
- Evaluate transfer/treatment options.
- Perform transfer/treatment of cylinder contents based upon subcontractor procedures.

**Stage 5. Closeout of Day's Activities**

- Secure any unshipped samples according to procedures.
- If hazardous waste is generated, work with WGS to ensure proper storage.
- Ensure all paperwork, logbook entries, and documentation are complete and secured.
- Notify project manager (PM) of day's progress and prepare for next day's activities.

**Phase III—Demobilization and Closure, as applicable**

- Ensure all samples, waste, and equipment are accounted for. If waste was generated, work with WGS to complete the waste disposition/disposal process.
- Collect samples and perform radiological surveys.
- Handle, package, and document samples for shipment to certified laboratories.
- Sample waste handling, packaging, and disposal.
- Receive data packages from analytical laboratory.
- Submit data to appropriate agencies.

At conclusion of project, ensure all logbooks, sample forms and documentation, and other required documentation are submitted to the project FTL/STR/project manager or designee. The project FTL/STR/project manager or designee has the responsibility to return all Sample Analysis Management (SAM) documents to that organization for project record management.

# 3. HAZARD IDENTIFICATION AND MITIGATION

The objectives of this section are to provide guidance on the following:

- Evaluation of the sites' characterization, excavation, segregation, treatment, disposal, and remediation field activities and tasks to determine exposure potential and the extent of physical hazards to the project

- Establish monitoring requirements to evaluate exposure and contamination levels, determine action levels, and provide actions to be followed if action levels are reached

- Engineering control determination, work practices to limit personnel exposure, administrative controls, and appropriate respiratory protection and protective clothing to protect site personnel from hazards.

This HASP has been developed in accordance with MCP-2748 and follows the hazard identification, evaluation, and mitigation process found in PRD-25, "Activity Level Hazard Identification, Analysis, and Control."

The magnitude of or danger presented by hazards to personnel entering work zones is dependent on both the nature of tasks being performed and the proximity of personnel to the hazards. Engineering controls will be implemented (whenever feasible) along with administrative controls, work practices, and PPE to mitigate potential exposures and hazards. Hazard mitigation provided in this section in combination with other work controls (e.g., technical procedures, work orders, job safety analysis, and GDE-6212, "Hazard Mitigation Guide for Integrated Work Control Processes") will be used, where applicable, to eliminate or mitigate project hazards.

## 3.1 Chemical and Radiological Hazards and Mitigation

The anticipated safety hazards for this project include chemical agents and physical hazards. The magnitude of these hazards is dependent on both the manner in which work is performed and the mitigation incorporated into work controls. Engineering controls will be implemented (whenever feasible), along with adequate work practices, real-time monitoring of contaminants, and site-specific hazard training to further mitigate potential exposures and hazards.

JSAs and RWPs will be used in conjunction with this HASP to address safety, chemical, and radiological conditions at the sites. These work control documents will augment this HASP and provide further details about specialized protective methods and equipment during characterization, excavation, material segregation, treatment, disposal, sampling tasks, and final remediation activities.

Working with compressed gas cylinders is specifically defined in the Compressed Gas Association (CGA) bulletins and pamphlets. Specific CGA pamphlets relevant to work scope for CPP-84 may include but not be limited to the following:

- CGA P-22 – 1995 "The Responsible Management and Disposition of Compressed Gases and Their Containers," including CGA Addenda "Disposition of Unserviceable Acetylene Cylinders"

- CGA C-6 – 2001, "Standards for Visual Inspection of Steel Compressed Gas Cylinders"

- CGA P-38 – 2003, "Guidelines for De-valving Cylinders."

Abandoned cylinders defined in CGA P-22 fail to satisfy the ownership requirements including invoices or similar documents indicating serial numbers and other pertinent information. If classified as "abandoned", CGA suggests the cylinders be handled assuming worst-case scenario including shock-sensitive, explosive, poisonous, strong oxidizers, and/or incompatible mixtures. With the inclusion of flammable gases and oxidizers present at Site CPP-84, incompatible mixture hazards are assumed present during site work and appropriate controls shall be instituted.

Table 3-1 summarizes each primary task and the associated hazards and mitigation. Table 3-2 lists the potential contaminants that present the highest health hazards based on quantity of material present and potential releases. Table 3-3 presents an evaluation of the contaminants with respect to potential routes of exposure and symptoms of overexposure. Engineering and administrative controls, PPE strategies, personnel monitoring, and restricted access to potential contaminated areas will focus on those contaminants determined to present a "moderate" to "high" exposure potential.

## 3.2 Routes of Exposure

Exposure pathways for hazardous materials are related to the nature of the project task including type of equipment used and effectiveness of project controls (e.g., engineering controls and avoiding contact with contaminated material). Isolation methods (e.g., the soil vacuum extraction system), IH monitoring, training, and work controls are all intended to mitigate potential exposures and uptake of contaminants of concern. However, the potential for exposure remains, including these exposure pathways:

- Inhalation through fugitive dusts during intrusive activities and decontamination tasks. This contamination form can result in potential lung deposition.
- Skin absorption and contact with through unprotected skin or corrosion, resulting in chemical burns, uptake through skin absorption, and/or skin contamination.
- Ingestion into the gastrointestinal (GI) tract that result in GI irritation, internal tissue contamination, and/or deposition to target organs.
- Injection by breaking of the skin or migration through an existing wound, resulting in localized irritation, uptake of contaminants, and deposition of insoluble contaminants.

Table 3-1. OU 3-13, Group 6 activities and associated hazards.[a]

| Activity or Task | Associated Hazards or Hazardous Agent |
|---|---|
| Mobilization | Dust, lifting/back strain, environmental hazards (heat/cold stress), moving heavy equipment, pinch points, noise, slips/trips/falls, walking on uneven work surfaces |
| Field work | Radiation fields (gamma and neutron sources from magnetometry), excavations and surface penetration hazards, struck-by heavy equipment, industrial compressed gases, volatile organic compounds, potential hydrogen fluoride, oxidizers and flammable gases in near proximity, simple asphyxiates, lower explosive limit (LEL) levels, oxygen levels, environmental hazards (heat and cold stress), dust, noise, lifting/back strain, asbestos (if applicable breached container present) |
| Magnetometry/surveying | Dust, lifting/back strain, environmental hazards (heat/cold stress), pinch points, slips/trips/falls, heat and electricity from electrical generator |

Table 3-1. (continued).

| Activity or Task | Associated Hazards or Hazardous Agent |
|---|---|
| Collection of soil samples | Chemical/inorganic exposures, lifting/back strain, environmental hazards (heat/cold stress), excavation hazards, slips/trips/falls, radionuclide contamination (gamma screen for soil samples) |
| Removal/treatment/transfer of compressed gas cylinders and their contents | Chemical/inorganic exposures, lifting/back strain, environmental hazards (heat/cold stress), cryogenic (dry ice) burns, fire, heavy equipment operation, pinch points, slips/trips/falls, dust, explosion and fire hazards |
| Transporting samples | Chemical/inorganic exposures, lifting/back strain, environmental hazards (heat/cold stress), slips/trips/falls, heavy equipment operation, pinch points |
| PPE/equipment decontamination | Chemical/inorganic exposures, dust, lifting/back strain, environmental hazards (heat/cold stress) |
| Demobilization | Chemical/inorganic exposures, dust, lifting/back strain, environmental hazards (heat/cold stress), moving heavy equipment, pinch points, noise, slips/trips/falls, walking on uneven work surfaces. |

a. Monitoring and sampling will be conducted as deemed appropriate by project IH and RadCon personnel.

Table 3-2. Potential health contaminants at the OU 3-13, Group 6 project site.[a]

| CPP-84 Chemical or Compound | Estimated Quantity (kg) | CPP-94 Chemical or Compound | Estimated Quantity (kg) |
|---|---|---|---|
| Compressed industrial gasses | | | |
| Acetylene | 900 | Acidic soil/debris | <15 |
| Oxygen | 500 | Lead paint | <10 |
| Argon | 500 | | |
| Nitrogen | 500 | | |
| Propane | 500 | | |
| Hydrofluoric acid | <350 | | |
| Acetone | <10 | | |
| Lead paint | <10 | | |
| Asbestos | 100 | | |

a. Information in Table 3-2 is based on the estimated container number multiplied by the mass per container. Mass per container is derived from consultation with manufacturer. Mass is based on full containers; however, exact mass is unknown.

Table 3-3. Evaluation of nonradiological and radiological contaminants at Site CPP-84.

| CPP-84 Contaminant Chemicals[a] (CAS No., Vapor Density and Ionization Energy) | Exposure Limit[b] (PEL/TLV) | Routes of Exposure[c] | Symptoms of Overexposure[d] (Acute and Chronic) | Target Organs/System | Labeled as a Carcinogen (Source)[e] | Exposure Potential (all routes without regard to PPE) |
|---|---|---|---|---|---|---|
| **Metals and Inorganic Compounds** | | | | | | |
| Asbestos (12001-29-5) VD-NA | ACGIH TLV-0.1 fiber/cc<br><br>OSHA PEL-0.1 fiber/cc (29 CFR 1910.1101) | Ih, Ig, Con | Irritation of eyes and skin, chronic asbestosis, restricted pulmonary function. | Eyes/respiratory tract (mainly lungs) | Yes-A1-ACGIH<br>Yes-NTP-K<br>Yes-IARC-1<br>Yes-OSHA-Ca | Low Potential<br><br>Source from pipe insulation and ACBM. Airborne release fraction would be nominal to low because of matrix (core sample) |
| Acetylene (74-86-2) | OSHA PEL-1,000 ppm 10% LEL | Ih | Simple asphyxiant-dizziness, disorientation, unconsciousness, death. | Respiratory system, blood gases | No | Moderate Potential May be encountered during excavation if cylinders rupture or leak. |
| Argon (7440-37-1) | OSHA PEL-1,000 ppm | Ih | Simple asphyxiant-dizziness, disorientation, unconsciousness, death. | Respiratory system, blood gases | No | Moderate Potential<br><br>May be encountered during excavation if cylinder ruptures or leaks. |
| Acetone (67-64-1) | ACGIH TLV- 500 ppm STEL- 750 ppm<br><br>OSHA PEL – 1,000 ppm | Ih, Ig, Con | Irritant to eyes, skin, throat, headache, dizziness, dermatitis. | Respiratory system, skin | No | Low Potential<br><br>Source-limited presence. |

Table 3-3. (continued).

| CPP-84 Contaminant Chemicals[a] (CAS No., Vapor Density and Ionization Energy) | Exposure Limit[b] (PEL/TLV) | Routes of Exposure[c] | Symptoms of Overexposure[d] (Acute and Chronic) | Target Organs/System | Labeled as a Carcinogen (Source)[e] | Exposure Potential (all routes without regard to PPE) |
|---|---|---|---|---|---|---|
| Lead (7439-92-1) | ACGIH TLV – 0.05mg/m$^3$<br><br>OSHA PEL – 0.05 mg/m$^3$ | Ih, Ig, Con | Lassitude, weight loss, anemia, nausea, vomiting, paralysis, constipation. | GI tract, central nervous system, kidneys, blood, gingival tissue | Yes-IARC<br><br>BEI | Moderate Potential<br><br>Sources include post-removal sampling activities from compressed gas cylinder paint and valving. |
| Nitrogen (7727-37-9) | OSHA PEL 1,000 ppm | Ih | Simple asphyxiant-dizziness, disorientation, unconsciousness, death. | Respiratory system, blood gases | No | Moderate Potential<br><br>May be encountered during excavation if cylinder ruptures or leaks. |
| Oxygen | Concentrations to remain between 19.5% and 23.5%<br><br><19.5 % is oxygen-deficient atmosphere<br><br>>23.5 % is oxygen-enriched atmosphere | Ih | Suffocation from oxygen-deficient atmosphere.<br><br>Increased fire/explosion hazard from oxygen-enriched atmosphere. | Respiratory system, brain, blood gases | No | Moderate Potential<br><br>May be encountered during excavation if cylinder ruptures or leaks. |
| Propane (74-98-6) | OSHA PEL 1,000 ppm | Ih | Simple asphyxiant-dizziness, disorientation, unconsciousness, death. | Respiratory system, blood gases | No | Moderate Potential<br><br>May be encountered during excavation if cylinder ruptures or leaks. |

Table 3-3. (continued).

| CPP-84 Contaminant Chemicals[a] (CAS No., Vapor Density and Ionization Energy) | Exposure Limit[b] (PEL/TLV) | Routes of Exposure[c] | Symptoms of Overexposure[d] (Acute and Chronic) | Target Organs/System | Labeled as a Carcinogen (Source)[e] | Exposure Potential (all routes without regard to PPE) |
|---|---|---|---|---|---|---|
| Hydrogen fluoride or hydrofluoric acid (HF)<br><br>(7664-39-3) | ACGIH<br>Ceiling – 3 ppm<br><br>OSHA<br>PEL – 3 ppm<br>STEL – 6 ppm<br>IDLH – 30 ppm | Ih, S, Ig, Con | Severe eye burns, nose, throat; pulmonary edema, skin, eye burn; nasal congestion, bronchial irritation. | Eyes, respiratory system, skin, skeletal structure | No | Moderate Potential<br><br>Source presence during initial characterization. Presence by breached cylinder or leaky valving potential during compressed gas cylinder removal, treatment, and transfer of their contents. Soil contaminated from breached HF cylinders. |
| Hydrogen<br>(1333-74-0) | ACGIH<br>Simple asphyxiant<br>LEL 4%<br><br>OSHA<br><br>none | Ih | Asphyxiation. | None | No | Source presence during initial characterization. Presence by breached cylinder or leaky valving potential during compressed gas cylinder removal/treatment/transfer of compressed gas cylinders and their contents. |

Table 3-3. (continued).

| CPP-84 Contaminant Chemicals[a] (CAS No., Vapor Density and Ionization Energy) | Exposure Limit[b] (PEL/TLV) | Routes of Exposure[c] | Symptoms of Overexposure[d] (Acute and Chronic) | Target Organs/System | Labeled as a Carcinogen (Source)[e] | Exposure Potential (all routes without regard to PPE) |
|---|---|---|---|---|---|---|
| Potassium hydroxide (1310-58-3) | ACGIH<br>Ceiling – 2.00 mg/m$^3$<br>STEL – 2.00 mg/m$^3$<br><br>OSHA<br>Ceiling – 2.00 mg/m$^3$ | Ih, S, Ig, Con | Severe eye burns, nose, throat; eye and respiratory irritation; skin burn. | Eyes, respiratory system, skin | No | Moderate Potential<br><br>During compressed gas cylinder removal/treatment/transfer of compressed gas cylinders and their contents. To be used as a complexing agent for HF gases as generated during treatment option (if required). |
| Potassium fluoride (7789-23-3) | ACGIH<br>TWA-2.5 mg/m$^3$<br><br>NIOSH<br>TWA-2.5 mg/m$^3$<br><br>SHA<br>TWA-2.5 mg/m$^3$ | Ih, S, Ig, Con | Severe eye burns, nose, throat; pulmonary edema, skin, eye burn; nasal congestion, bronchial irritation. | Eyes, respiratory system, skin, skeletal structure | Yes-IARC | Moderate Potential<br><br>Source presence during initial characterization not expected as no cylinder disturbance allowed. Presence by breached cylinder or leaky valving potential during compressed gas cylinder removal/treatment/transfer of compressed gas cylinders and their contents. Soil contaminated from breached HF cylinders. |

Table 3-3. (continued).

| CPP-84 Contaminant Chemicals[a] (CAS No., Vapor Density and Ionization Energy) | Exposure Limit[b] (PEL/TLV) | Routes of Exposure[c] | Symptoms of Overexposure[d] (Acute and Chronic) | Target Organs/System | Labeled as a Carcinogen (Source)[e] | Exposure Potential (all routes without regard to PPE) |
|---|---|---|---|---|---|---|
| Radionuclides<br><br>(whole body exposure) | Administrative Control Level - 0.7 rem<br><br>Posting of radiation areas per Company Manual 15A (PRD-183), Table 3-3 | Whole body | Electronic dosimetry will be used to alert workers to increased gamma radiation fields.<br><br>Albedo dosimetry and NRD instruments will be used to monitor for neutron radiation. | Blood-forming cells, GI tract, and rapidly dividing cells | Yes-ICRP | Low-Moderate Potential.<br><br>Low doses from repeated handling of cores. Core sample contact readings may exceed 200 mr/hr. |

a. MSDSs for these chemicals are available at the CPP-84 project trailer.
b. American Conference of Governmental Industrial Hygienists (ACGIH) 2001 TLV Booklet and OSHA 29 CFR 1910 substance-specific standards.
c. (Ih) inhalation; (Ig) ingestion; (Con) contact hazard; (S) skin contact or absorption.
d. (Nervous system) dizziness/nausea/lightheadedness; (dermis) rashes/itching/redness; (respiratory) respiratory effects; (eyes) tearing/irritation.
e. If yes, identify agency and appropriate designation (ACGIH A1 or A2; NIOSH; OSHA; IARC; NTP).

GI = Gastrointestinal
ACBM = Asbestos-containing building
ICRP = International Commission
TWA = Time-weighted average
PEL = Permissible exposure limit
NRD = Neutron rate detection materials
STEL = Short-term exposure level
IDLH = Immediately dangerous to life or health
TLV = Threshold limit value
IARC = International Agency for Research on Cancer
NTP = National Toxicology Program on Radiological Protection

## 3.3 Environmental and Personnel Monitoring

Personnel working at the OU 3-13, Group 6 project site may be exposed to hazardous materials or hazardous physical agents, as already described. Safety hazards and other physical hazards will be monitored and controlled as determined by the Clean/Close INTEC Project HSO, IH, and RCT, as necessary. Specific hazardous agent exposures to be monitored are listed on Table 3-4.

### 3.3.1 Industrial Hygiene Monitoring

Various direct reading instruments and other semiquantitative detection tests will be utilized to determine the presence/absence of chemical and nonradiological agents. The frequency and type of sampling and monitoring will be determined by changing project conditions, direct reading instrument results, observations, and professional judgment. Instruments and sampling methods listed in Table 3-4 will be used by the project IH as deemed appropriate.

All full and partial-period airborne contaminant sampling will be conducted using applicable NIOSH or OSHA methods and in conformance to company procedures. Risk assessments for work-site personnel will be conducted according to MCP-153, "Industrial Hygiene Exposure Assessment," and PRD-1003, "General Requirements," Section 3.4, "Exposure Monitoring."

***3.3.1.1 Industrial Hygiene Instrument and Equipment Calibration.*** All monitoring instruments will be maintained and calibrated in accordance with the manufacturer's recommendations, existing IH protocol, and in conformance to the company safety and health manuals. Direct-reading instruments will be calibrated, or function-tested at a minimum, prior to daily use and more frequently as determined by the project IH. Calibration information, sampling and monitoring data, results from direct reading instruments, and field observations will be recorded.

### 3.3.2 Radiological Monitoring

No personnel radiological exposure is anticipated during the execution of the project fieldwork activities, as evidenced from prior surveys. Periodic radiological surveys may be conducted to verify the absence of radiological concerns. During project tasks, the potential exists for exposure to external (penetrating ionizing radiation [gamma, neutron, and high-energy beta]) from geophysical survey equipment's radioactive source. A project RWP will be generated to control a radioactive source if the radiation level is at or above 5 mR/hr at 1 ft from the source.

***3.3.2.1 Radiation Monitoring.*** Sources for external radiation hazards include buried gas cylinder waste, exposure from waste material brought to the surface, and the handling of radioactive sources (calibration, logging).

***3.3.2.2 Contamination Monitoring.*** The greatest potential for radioactive contamination will be from the soil samples taken around and under the buried gas cylinders. Contamination is of particular concern due to its mobility, the difficulty in detection, and, therefore, ease of cross-contamination. These data will be used by RadCon personnel to evaluate the effectiveness of engineering controls, ensure radiological area boundaries are established, alert project personnel to avoid contaminated areas, and ensure the effectiveness of personnel and equipment decontamination procedures.

***3.3.2.3 Radiological Instrument and Equipment Calibration.*** As applicable, RadCon personnel will utilize radiation and contamination detectors and counters to provide radiological information to project personnel. Daily operational and source checks will be performed on all portable survey instruments to ensure they are within the specified baseline calibration limits. Accountable

Table 3-4. Equipment to be used for monitoring radiological and nonradiological hazards at Sites CPP-84 and CPP-94.[a]

| Chemical or Radiological Hazard to be Monitored or Sampled | Equipment and Monitoring/Sampling Method | |
|---|---|---|
| Oxygen levels/lower explosive limits | Oxygen/combustible gas meter | |
| Hydrogen levels/lower explosive limits | Oxygen/combination gas meter (high response for any hydrogen) | |
| Asbestos | Bulk samples (if applicable breached cylinders are present) | |
| Hydrogen fluoride | Drager Pac-3 Personal HF Monitor | |
| Radionuclide contamination | Eberline RM-14 Count Rate Meter – Beta and gamma contamination<br>Eberline RO-20 Radiation Meter | |
| Hazardous noise levels (>85 dBA for an 8-hour workday, 83 dBA for a 10-hour day, >140 dBA impact) | ANSI Type S2A sound level meter and/or ANSI S1.25-1991 dosimeter (A-weighted scale for TWA dosimetry, C-weighted for impact dominant sound environments) | |
| Heat/cold stress | Heat Stress—wet bulb globe temperature, body wt, fluid intake | Cold Stress—ambient air temp, wind chill charts |

a. Monitoring and sampling will be conducted as deemed appropriate by project IH and RadCon personnel.
dBA = Decibel A-weighted TWA = Time weighted average ANSI = American National Standards Institute

radioactive sources will be maintained in accordance with MCP-137, "Radioactive Source Accountability and Control." All radiological survey and monitoring equipment will be maintained and calibrated in accordance with the manufacturer's recommendations and existing RadCon protocol and in conformance to MCP-93, "Health Physics Instrumentation," and in accordance with 10 CFR 835.703(d), "Other monitoring records."

***3.3.2.4 External Dosimetry.*** Based on RadCon requirements and exposure potentials at the project site, personnel who enter the project area will be required to wear personal dosimetry devices in accordance with Company Manual 15A (PRD-183). Dosimetry for personnel entering the exclusion zone (EZ) will consist of a basic thermoluminescent dosimeter (TLD). TLDs will be worn "face out" (beta window exposed). Dosimetry requirements will be stated in the task RWPs. The Radiological Control and Information Management Systems (RCIMS) (http://eshq.inel.gov/radcon) will be utilized at the OU 3-13, Group 6 project site to track external radiation exposures to project personnel. Individuals are responsible for ensuring all required personal information is provided to RadCon personnel for entry into RCIMS and logging in each day.

***3.3.2.5 Internal Monitoring.*** Internal radiation sources (removable and airborne contamination) at the OU 3-13, Group 6 project site include potentially airborne radioactivity from sampling and decontamination tasks. The purpose of internal dose monitoring is to demonstrate the effectiveness of contamination control practices and to document the nature and extent of any internal uptakes that may occur.

### 3.3.3 RadCon Engineer/IH Exposure Assessments

To prevent and mitigate potential personnel exposure to radiological, nonradiological, and physical hazards at the project site, action levels have been established for COPCs in Table 3-5 determined to be present at a moderate to high exposure potential. If action levels are reached, personnel will take the appropriate actions as listed. For PPE upgrades, the threshold for the particular level being currently worn must be exceeded or another type of contaminant introduced that will require modifications.

## 3.4 Physical Hazards Evaluation, Control, and Monitoring

The physical hazards action levels (Table 3-5) and the methods used to monitor and control them are described in this section. It is critical that all personnel are aware of and understand the nature of the tasks that will be conducted, the equipment to be used, and the controls in place to eliminate or mitigate potential safety hazards.

### 3.4.1 Temperature Extremes

The project activities will be conducted during months where there is a potential that heat stress factors could affect project personnel based on ambient air temperatures and layered PPE.

***3.4.1.1 Heat and Cold Stress.*** Ambient air temperatures can result in an increase or decrease in body temperature, heat fatigue, heat exhaustion, heat stroke, or frostbite that can lead to symptoms ranging from physical discomfort to unconsciousness to death. Personnel must inform the HSO when experiencing any signs and/or symptoms of heat or cold stress or if they observe a fellow employee ("buddy") experiencing heat or cold stress symptoms.

Table 3-5. Action levels and associated responses for OU 3-13, Group 6 project hazards.

| Contaminant/Agent Monitored | Action Level | Response Taken if Action Levels Exceeded |
|---|---|---|
| Asbestos | >1% | As determined by IH and requirements |
| Volatile organic compounds/HF | 10% LEL/1 ppm—HF | Approved respirator with appropriate filters, supplied air (with escape capabilities) or SCBA |
| Hydrogen | 4% LEL | Stop work until concentrations <1% LEL |
| Low/elevated oxygen levels | ≤19.5% / ≥23.5% | Stop work until concentrations at 19.5% to 23.0% |
| Hazardous noise levels | <85 dBA 8-hr TWA, <83dBA 10-hr TWA | No action |
| | 85–114 dBA | Hearing protection required to attenuate to below 85 dBA 8-hr TWA or 83 dBA for 10-hr TWA (based device NRR) |
| | (a) >115 dBA (b) >140 dBA | (a) Isolate source, evaluate NRR for single device, double protection as needed (b) Control entry, isolate source, only approved double protection worn |
| Radiation field | <5 mrem/hr | No action, no posting required |
| | 5–100 mrem/hr @ 30 cm (10 CFR 835.2) | Post as "Radiation Area"—Required items: RW I or II training, RWP, personal dosimetry |
| | >100 mrem—500 rad @ 100 cm | Post as "High Radiation Area"—Required items: RW II, RWP, alarming personal dosimetry, dose rate meter, and temporary shielding (as required) |
| Radionuclide contamination | 1—100 times RCM Table 2-2 values (PRD-183, Article 234) | Post as "Contamination Area"—Required items: RW II training, personal dosimetry, RWP, don PPE, bioassay submittal (as required) |
| | >100 times RCM Table 2-2 values (PRD-183, Article 234) | Post as "High Contamination Area"—Required items: RW II training, personal dosimetry, RWP (with prejob briefing), don PPE, bioassay submittal (as required) |
| Airborne radioactivity | Concentrations (μCi/cc) >30% of a DAC value (10 CFR 835.603(d)) | Post as "Airborne Radioactivity Area"—Required items: RW II training, personal dosimetry, RWP (with prejob briefing), don PPE, bioassay submittal (as required) |

NRR = Noise reduction rating
RCM = Radiological Control Manual
RW = Radiological worker
DAC = Derived air concentration
DBA = Decibel A-weighted
TWA = Time-weighted average
SCBA = Self-contained breathing apparatus
LEL = Lower explosive limit

Monitoring for heat and cold stress conditions shall be performed according to MCP-2704, "Heat and Cold Stress" (PRD-2107). Depending on the ambient weather conditions, work conditions, type of PPE worn, and the physical response of work operations personnel, the HSO or foreman is responsible for the heat stress stay time and must have the appropriate training (00TRN1083). Complete the Heat Stress Stay Time Worksheet in Appendix C of MCP-2704, "Heat and Cold Stress" (Form 440.34) using wet bulb globe temperature indices for the work environment, clothing adjustment factors, and work categories.

Additionally, physiological monitoring may be conducted to determine if personnel are taking adequate precautions in accordance with MCP-2704 (PRD-2107) for the ambient conditions that exist during work performance. Work restrictions shall also be discussed in the daily pre-job briefing.

Heat exhaustion and heat stroke are extremely serious conditions that can cause death. An individual showing any of the symptoms of heat exhaustion listed in Table 3-6 will be subject to the following:

- Stop work
- Exit or be helped from the work area
- Remove or decontaminate protective clothing (as applicable)
- Move to sheltered area to rest
- Be provided cool drinking water
- Be monitored by a medic or CPR- and first-aid-certified employee.

A supply of cool drinking water will be provided in designated eating areas and consumed only in these areas. Areas with adequate heat will be made available during conditions that warrant work/rest regiments, for example, during periods of cold weather. Workers may periodically be interviewed by the IH/RCT or HSO to ensure that the controls are effective and that excessive heat and cold exposure is not occurring. Workers will be encouraged to monitor their body signs and to take breaks if symptoms of heat or cold stress occur.

Heat stress stay times will be documented on the daily prejob briefing by the subcontractor supervisor and/or the project IH when personnel are required to wear PPE that may increase heat body burden. These stay times will take into account the nature of the work (e.g., light, moderate, heavy), the type of PPE worn, and the ambient work temperatures.

***3.4.1.2 Low Temperatures***. Exposure to low temperatures will only be a factor if project tasks are delayed until the fall months or relatively cool ambient temperatures and wet or windy conditions are experienced. The project HSO, assisted by the IH, will be responsible for obtaining meteorological information to determine if additional cold stress administrative controls are required. MCP-2704 discusses the hazards and monitoring of cold stress. Project personnel will also be cautioned regarding cold stress factors associated with rapid cooling once impermeable PPE layers are removed causing the potential for freezing of accumulated moisture on PPE outer and inner surfaces (under extremely cold conditions). Section 6 of this document describes the requirements for the outer layer of protection based on radiological and nonradiological hazards.

Table 3-6. Heat stress signs and symptoms.

| Heat-Related Illness | Signs and Symptoms | Emergency Care |
|---|---|---|
| Heat rash | Red skin rash and reduced sweating | Keep the skin clean; change all clothing daily; cover affected areas with powder containing cornstarch or with plain cornstarch. |
| Heat cramps | Severe muscle cramps, exhaustion, sometimes with dizziness or periods of faintness | Move the patient to a nearby cool place; give the patient half-strength electrolytic fluids; if cramps persist, or if more serious signs develop, seek medical attention. |
| Heat exhaustion | Rapid, shallow breathing; weak pulse; cold, clammy skin; heavy perspiration; total body weakness; dizziness that sometimes leads to unconsciousness | Move the patient to a nearby cool place; keep the patient at rest; give the patient half-strength electrolytic fluids; treat for shock; seek medical attention.<br><br>DO NOT TRY TO ADMINISTER FLUIDS TO AN UNCONSCIOUS PATIENT. |
| Heat stroke | Deep, then shallow, breathing; rapid, strong pulse, then rapid, weak pulse; dry, hot skin; dilated pupils; loss of consciousness (possible coma); seizures or muscular twitching | Cool the patient rapidly. Treat for shock. If cold-packs or ice bags are available, wrap them and place one bag or pack under each armpit, behind each knee, one in the groin, one on each wrist and ankle, and one on each side of the neck. Seek medical attention as rapidly as possible. Monitor the patient's vital signs constantly.<br><br>DO NOT ADMINISTER FLUIDS OF ANY KIND. |

Additional cold weather hazards may exist from working on snow- or ice-covered surfaces. Slip, fall, and material handling hazards are increased under these conditions. Every effort must be made to ensure walking surfaces are kept clear of ice. The FTL/STR or HSO should be notified immediately if slip or fall hazards are noted at the project site.

### 3.4.2 Noise

If required, noise measurements will be performed by the IH per MCP-2719, "Controlling and Monitoring Exposure to Noise," (PRD-2108) to determine if personnel assigned to the jobs identified are above allowable noise exposure levels. A TLV of 85 dBA time-weighted average (TWA) will be applied to personnel exposed to noise levels over no more than an 8-hour day. This level is based on a 16-hour "recovery" period in a low noise environment. If personnel are required to work longer than 8 hours in a hazardous noise environment, then the TLV will be adjusted to a lower value. The project IH must be consulted regarding modifications to the 85 dBA for 8-hour TLV and 83 dBA for 10-hour TWA value.

Personnel whose noise exposure meets or exceeds the allowable level will be enrolled in the INEEL Occupational Medical Program (OMP) or subcontractor Hearing Conservation Program. Personnel working on jobs that have noise exposures greater than 85 dBA (83 dBA for 10-hour TWA) will be required to wear hearing protection until noise levels have been evaluated and will continue to wear the hearing protection specified by the IH until directed otherwise.

### 3.4.3 Fire, Explosion, and Reactive Materials Hazards

Flammable and combustible material hazards may include (a) combustible materials near ignition sources (hot motor or exhaust system) and (b) transfer and storage of flammable or combustible liquids in the supply zone (SZ) (fueling the drill rig and support equipment). Portable fire extinguishers with a minimum rating of 10A/60BC will be strategically located at the project site to combat Class ABC fires. They will be located in the EZ, on or near all site equipment that has exhaust heat sources, and on or near all equipment capable of generating ignition or sparking. A sufficient number of field team members will receive fire extinguisher training as listed in Table 6-1.

Potential explosion hazards at CPP-84 are posed by the gas cylinders. If the cylinders are pressurized and are disturbed, the potential exists for cylinder rupture that could result in a pressurized gas release. Fragmentation of cylinders, should they rupture, is a minor possibility.

The cylinders' location, depth, and positioning shall be identified prior to site excavation. A mini-trackhoe may be utilized for Site CPP-84 activities. The trackhoe shall dig no closer then 2 ft vertically or 5 ft horizontally from any portion of the compressed gas cylinders unless equivalent safe means are identified on the work control documentation. Acceptable equivalent methods may include the use of detailed magnetic surveys coupled with fiberglass, or equal, rods hand-driven in grids verifying cylinder depth and location(s). Hand excavation with nonsparking tools or equivalent safe means shall be utilized during activities less than or equal to 1 ft from any compressed gas cylinder. A trackhoe will not be utilized closer than 1 ft from identified/suspected cylinders.

Cylinder storage controls will also be implemented. When stored, flammable and oxidizing gases will be segregated by a minimum of 20 ft or a 5-ft-high fire barrier with a rating of 1 hour. Combustible materials will not be stored within 20 ft of flammable gas storage. All vegetation within 50 ft of cylinder storage will be mowed.

Because the condition of buried gas cylinders is unknown, it is assumed that pockets of ignitable fuel/air mixtures may be encountered. Ignition sources will be strictly controlled within the excavation area until air monitoring verifies ignitable fuel air mixtures (less than 10% LEL) are not present. Continued monitoring for flammable/combustible gases will be conducted while personnel access the exclusion zone where buried cylinders are located.

The subcontractor procedures for excavation, cylinder removal, cylinder storage, and cylinder treatment will be reviewed and approved by the assigned facility fire protection engineer (FFPE). All hot work and flaring operations must be reviewed and approved by the FFPE to ensure required hazard control measures are incorporated.

All flaring, cutting, welding, grinding, and similar hot work activities will be reviewed and approved by the FFPE. All hot work activities to be conducted during Stage I or Stage II fire restrictions will also require the authorization of the INEEL fire marshal.

***3.4.3.1 Project Equipment Fire Hazards.*** Combustible or ignitable materials in contact with or near exhaust manifolds, catalytic converters, or other ignition sources could result in a fire. The INTEC fire protection engineer should be contacted if questions arise regarding potential ignition sources. The accumulation of combustible materials will be strictly controlled at the project site. Disposal of combustible materials will be assessed at the end of each shift. Class A combustibles, such as trash, cardboard, rags, wood, and plastic, will be properly disposed of in metal receptacles in the SZ and in appropriate waste containers within the contamination reduction corridor (CRC), contamination reduction zone (CRZ), and EZ.

Diesel fuel and/or gasoline that may be used at the task site for fueling must be safely stored, handled, and used. Only Factory Mutual/Underwriters Laboratory-approved flammable liquid containers labeled with the content will be used to store fuel. All fuel containers will be stored (a) at least 15 m (50 ft) from any facilities and ignition sources or (b) inside an approved flammable storage cabinet. Additional requirements are provided in PRD-308, "Handling and Use of Flammable and Combustible Liquids." Portable motorized equipment (e.g., generators and light plants) will be shut off and allowed to cool down in accordance with the manufacturer's operating instructions prior to refueling to minimize the potential for a fuel fire.

The project location represents wildland/urban interfaces. As such, defensible spaces will be maintained to (1) protect project equipment from wildland fire exposure and (2) prevent fires that may be initiated by project activities from spreading to adjacent vegetation. A minimum of 30 ft of mowed defensible space will be maintained around project equipment, storage, and parking locations.

Flaring and any other hot-work-related activities will be reviewed and approved by the INEEL fire marshal during Stage I and Stage II fire restrictions.

### 3.4.4 Biological Hazards

Fieldwork at CPP-84 and CPP-94 could provide habitat for various rodents and insects. Based on biological studies done at the INEEL, deer mice have been known to carry the hantavirus. The virus is present in the nesting and fecal matter of deer mice. A potential exists for project personnel to disturb nesting or fecal matter during the course of mobilization and intrusive activities. If such materials are disturbed, they can become airborne and create a potential inhalation pathway for the virus. Also, contact and improper removal of these materials may provide additional inhalation exposure risks.

If suspect rodent nesting or excrement material is encountered, the Clean/Close INTEC IH and Clean/Close INTEC-Subproject 6 HSO will be notified immediately and no attempt shall be made to remove or clean the area. Following an evaluation of the area, an SWP may be written for disinfecting and removal of material from the project task area. The IH will provide the necessary guidance for protective equipment, mixing and application of the disinfecting solution (bleach solution), and proper disposal method of the waste. Typical PPE for disinfecting and removal of a large nesting area may include full-face respirator with a HEPA filter cartridge, Tyvek coveralls, outer booties, and two pair of gloves (latex inner-nitrile outer).

Insects (ticks and mosquitoes) and arachnids (spiders) may also be encountered at the project site. Common areas to avoid include material stacking/staging areas, under existing structures (trailers, buildings, etc.), under boxes, and other areas that provide shelter for snakes. Protective clothing will prevent insects from direct contact with personnel; however, repellant (DEET or equivalent) may be required during Level D activities. Areas where standing water has accumulated provide breeding grounds for mosquitoes and should be avoided.

### 3.4.5 Safety Hazards

Industrial safety hazards pose a significant, if not the most likely, threat to personnel during investigation and sampling tasks. Section 5 describes general safe work practices that must be followed at all times. The following sections describe specific industrial safety hazards and procedures to eliminate or minimize potential hazards to project personnel.

***3.4.5.1 Heavy Equipment and Moving Machinery.*** The hazards associated with heavy equipment operation include injury to personnel, equipment damage, and property damage. All

heavy equipment will be operated in the manner intended and according to manufacturer's instructions. Only authorized personnel will be allowed in the vicinity of operating heavy equipment and should maintain visual communication with the operator. Work-site personnel will comply with MCP-2745, "Heavy Industrial Vehicles"; PRD-5123, "Motor Vehicle Safety"; and 29 CFR 1910.178, "Powered industrial trucks."

Site personnel working around or near heavy equipment and other moving machinery will comply with PRD-600, "Maintenance Management Requirements," and DOE-STD-1090-2001, "Hoisting and Rigging," as applicable and appropriate. Additional safe practices include the following:

- Movement of drill string section with the catline or overhead hoist system will be limited based on wind restrictions for safe operations in accordance with PRD-600, "Maintenance Management Requirements." The HSO or designee is responsible for obtaining wind speed readings from the INEEL Warning Communications Center (WCC) or weather station. A 25-mph wind restriction will be enforced for all hoisting and rigging operations as defined by PRD-600, "Maintenance Management Requirements."

- All heavy equipment will have backup alarms.

- Walking directly in back of or to the side of heavy equipment without the operator's knowledge will be prohibited; all precautions will have been taken prior to moving heavy equipment.

- While operating heavy equipment in the work area, the equipment operator will maintain communication with a designated person responsible for providing direct voice contact or approved standard hand signals; in addition, all site personnel in the immediate work area will be made aware of the equipment operations.

- All equipment will be kept out of traffic lanes and access ways and will be stored so as not to endanger personnel at any time handling heavy objects.

***3.4.5.2 Powered Equipment and Tools.*** At the site, radiological release surveys will determine what equipment can leave the contaminated area. All power equipment and tools will be properly maintained and used according to the manufacturer's specifications by qualified individuals. PRD-5101, "Portable Equipment and Handheld Power Tools," (PRD-2015) will be followed for all work performed with powered equipment.

***3.4.5.3 Electrical Hazards/Energized Systems.*** Electrical equipment and tools as well as underground lines may pose shock or electrocution hazards to personnel. Safety-related work practices shall be employed to prevent electric shock or other injuries resulting from direct or indirect electrical contact. If work on energized systems is necessary, these practices will conform with the requirements in PRD-5099, "Electrical Safety" (PRD-2011); MCP-3650, "Chapter IX Level I Lockouts and Tagouts" (PRD-2011); MCP–3651, "Chapter IX Level II Lockouts and Tagouts" (PRD-2012); facility supplemental MCPs; and Parts I through III of NFPA 70E. In addition, all electrical work will be reviewed and completed under the appropriate work controls (i.e., HASP, SWPs, work orders).

Before beginning any subsurface penetrations, underground utility clearances will be obtained by contacting telecommunications (526-1688 or 526-2512). Subsurface investigation clearance will be obtained in accordance with MCP-6205, "Subsurface Investigations" (PRD-2014). The requirements for advanced 48-hour notice will be met.

***3.4.5.4 Personal Protective Equipment.*** Wearing PPE may reduce a worker's ability to move freely, see clearly, and hear directions and noise that might indicate a hazard. Also, PPE can increase the risk of heat stress. Work activities at the project will be modified as necessary to ensure that personnel are able to work safely in the required PPE. Project personnel shall comply with PRD-5121, "Personal Protective Equipment" (PRD-2001 and PRD-2109), and MCP-432, "Radiological Personal Protective Equipment" (PRD-3001).

### 3.4.6 Inclement Weather Conditions

When inclement or adverse weather conditions develop that may pose a threat to persons or property at the project (such as sustained strong winds 25 mph or greater), electrical storms, heavy precipitation, or extreme heat or cold) these conditions will be evaluated and a decision made by the job-site supervisor (JSS), with input from the HSO, IH, SE, RCT, and other personnel, as appropriate, to stop work, employ compensatory measures, or proceed. The FTL/STR and JSS shall comply with INEEL management control procedures (MCPs) and site work control documents that specify limits for inclement weather.

### 3.4.7 Confined Spaces

Work in confined spaces may subject workers to risks involving engulfment, entrapment, oxygen deficiency, and toxic or explosive atmospheres. *No confined space entries are expected for this project.* Entrances are posted with the required danger or caution sign per MCP-2749, "Confined Space" (PRD-2110). If a suspected confined space is not posted, treat it as a permit-required confined space until a determination is made by the assigned safety/IH personnel. In accordance with MCP-2749 (PRD-2110), a confined space entry permit is required before anyone enters the space. A copy of the "Confined Space Identification and Hazard Evaluation Form" (Form 442.09) for each confined space to be entered will be provided by the HSO and project IH. The evaluation will include completion of a "Confined Space Entry Permit" (Form 442.06 or 442.06A or applicable). Fire department (FD) notification is required prior to authorizing entry. A trained attendant will be outside the confined space to assist entrants, monitor the well-being of entrants, and notify the rescue team, if necessary. Personnel required to enter the space will be briefed on the hazards involved, the meaning of warning signals of any monitoring equipment that is worn or taken into the space, any special tools or equipment to be used, and actions to take in case of an emergency. The emergency rescue plan is outlined below.

### 3.4.8 Excavation and Trench Areas

A mini-trackhoe may be utilized for Site CPP-84 activities. The trackhoe must not dig closer then 2 ft vertically or 5 ft horizontally from any portion of the compressed gas cylinders. Hand excavation with nonsparking tools shall be utilized during activities less than or equal to 2 ft from any compressed gas cylinder.

The excavation will be protected by a perimeter barrier to preclude falls into the excavation or trench. No one shall enter the trench/excavation until evaluated as a confined space and proper shoring/sloping or protective means provided, in accordance with PRD-22 and PRD-2014, "Excavation and Surface Penetration." Sites CPP-84 and CPP-94 must be hand-excavated using nonsparking tools. Nonsparking tools will also be utilized for hand-excavation operations at Site CPP-84.

### 3.4.9 Excavation, Surface Penetrations, and Outages

Excavation activities conducted in conjunction with drilling activities are considered ground penetrations. All surface penetrations and related outages will be coordinated through the point of

contact (subcontractor technical representative) and will require submittal of an outage request for outages (e.g., road, electrical, and water). The submission of an outage request will not be considered an approval to start the work. Other specific outage requirements are addressed in the special conditions section of the management and operating contract. No surface penetrations will be allowed or conducted until the area has been evaluated and an approved subsurface evaluation documented.

All excavation activities will be conducted and monitored in accordance with applicable company policies and procedures and 29 CFR 1926, Subpart P, "Excavations." The following are some key elements from these requirements:

- The location of utility installations (e.g., sewer, telephone, fuel, electric, water lines, or any other underground installations) that may reasonably be expected to be encountered during excavation work will be determined before opening an excavation.

- Structural ramps that are used solely by employees as a means of access or egress from excavations will be designed by a competent person. Structural ramps used for access or egress of equipment will be designed by a competent person qualified in structural design and will be constructed in accordance with the design. Structural ramps will be inspected in accordance with applicable company forms.

- Employees exposed to public vehicular traffic will be provided with and will wear warning vests or other suitable garments marked with or made of reflecting or high-visibility material.

- Daily inspections of excavations, areas adjacent to the excavations, and protective systems will be made by a competent person for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. An inspection will be conducted by the competent person before the start of work and as needed throughout the shift. Inspections also will be made after every rainstorm or other hazard-increasing occurrence.

- Sloping or benching will be constructed and maintained in accordance with the requirements set forth in 29 CFR 1926, Subpart P, Appendix B, for the soil type as classified by the competent person. This classification of the soil deposits will be made based on the results of at least one visual inspection and at least one manual analysis.

## 3.5 Other Project Hazards

Site personnel should continually look for potential hazards and immediately inform the HSO of the hazards so action can be taken to correct the condition.

The HSO, RCT, or JSS will conduct daily inspections of the project to ensure that barriers and signs are being maintained, unsafe conditions are corrected, and debris is not accumulating on the site. These inspections will be noted in the FTL/STR logbook. The Clean/Close INTEC Project HSO may, at any time, recommend changes in work habits to the STR/FTL. However, all changes that may affect the characterization effort must have concurrence from the appropriate project technical discipline representative onsite and a data analysis report prepared as required.

Personnel working at the project are responsible to use safe-work techniques, report unsafe working conditions, and exercise good personal hygiene and housekeeping habits throughout the course of the project.

### 3.5.1 Material Handling and Back Strain

Manual material handling will be minimized through task design and use of mechanical and/or hydraulic lifts whenever possible. Lift no more than 22 kg (50 lb) or 1/3 of body weight, whichever is less, using proper lifting techniques in accordance with MCP-2692, "Ergonomics Program" (PRD-2016).

Additionally, back strain and ergonomic considerations must be given to material handling and equipment usage. Mechanical and hydraulic lifting devices should be used to move materials whenever possible. The industrial hygienist will conduct ergonomic evaluations of various project tasks to determine the potential ergonomic hazards and provide recommendations to mitigate these hazards. Applicable requirements from company policies and procedures will be followed.

### 3.5.2 Working and Walking Surfaces

Slippery work surfaces can increase the likelihood of back injuries, overexertion injuries, slips, and falls. The various work surfaces associated with drilling and sampling activities present inherent tripping hazards because of uneven ground, equipment in use, and metal working surfaces. Additionally, the potential for slip, trip, and fall hazards will increase during winter months because of ice- and snow-covered surfaces combined with objects beneath the snow. During the prejob briefing, all personnel will be made aware of tripping hazards that cannot be eliminated. Tripping and slip hazards will be evaluated during the course of the project in accordance with applicable company policies and procedures.

### 3.5.3 Pressurized Systems

Equipment operated on this project may utilize high-pressure air and hydraulic systems. The hazards presented to personnel, equipment, facilities, or the environment because of inadequately designed or improperly operated pressure systems include blast effects, shrapnel, fluid jets, release of toxic or asphyxiant materials, contamination, equipment damage, personnel injury, and death. These systems can include pneumatic, hydraulic, or compressed gas systems. The requirements of applicable company policies and procedures and the manufacturer's operating and maintenance instructions must be followed. This includes inspection, maintenance, and testing of systems and components in conformance with American National Standards Institute (ANSI), Compressed Gas Association, etc.

All pressure systems will be operated in the designed operating pressure range, which is typically 10 to 20% less than the maximum allowable working pressure. Additionally, all hoses, fittings, lines, gauges, and system components will be rated for the system for at least the maximum allowable working pressure (generally the relief set point). The Clean/Close INTEC Project HSO and appropriate subject matter experts shall inspect all pressure systems prior to their use on this project site.

### 3.5.4 Material Handling

The most common type of accident that occurs during material handling is when a load is being handled and a finger or toe is caught between two objects. Material can shift or fall from one level to the next, catching fingers and hands. Use proper work methods to control the movement of objects and avoid placing body parts between moving and stationary objects. Proper gloves and other appropriate PPE can be an effective means of mitigating injury in the event of accidental caught-between or struck-by incidents.

### 3.5.5 Overhead Objects

Personnel may be exposed to falling overhead objects, debris, or equipment or impact hazards during the course of the project from drilling and well installation activities. Sources for these hazards will be identified and mitigated in accordance with applicable company policies and procedures. In the case of overhead impact hazards, they will be marked where there is a potential for falling debris, in combination with head protection PPE.

### 3.5.6 Hoisting and Rigging of Equipment

All hoisting and rigging of the materials during well installation, maintenance, and drilling activities will be performed in accordance with applicable company policies and procedures and DOE-STD-1090-2001, "Hoisting and Rigging," as applicable for this project. Hoisting and rigging equipment will show evidence of a current inspection (e.g., tag) and be inspected before use by qualified personnel. Additionally, the operator or designated person for mobile cranes or boom trucks will perform a visual inspection each day or before use (if the crane has not been in regular service) of items such as, but not limited to, the following:

- All control mechanisms for maladjustment that would interfere with proper operation
- Crane hooks and latches for deformation, cracks, and wear
- Hydraulic systems for proper oil level
- Lines, tanks, valves, pumps, and other parts of air or hydraulic systems for leakage
- Hoist ropes for kinking, crushing, birdcaging, and corrosion
- All anti-two-block, two-block warning, and two-block damage prevention systems for proper operation.

**Note:** The operator or other designated person will examine deficiencies and determine whether they constitute a safety hazard. If deficiencies are found, they will be reported to the safety professional.

## 3.6 Site Inspections

Project personnel may participate in site inspections during the work control preparation stage (such as the hazard identification and verification walkdowns), conduct self-assessments or, conduct other inspections. Additionally, the HSO, project manager, or FTL/STR will perform periodic safety inspections in accordance with applicable company policies and procedures.

Targeted or required self-assessments may be performed during investigation and sampling operations in accordance with applicable company policies and procedures. All inspections and assessments will be documented and available for review by the FTL/STR. These inspections will be noted in the FTL/STR logbook. The Clean/Close INTEC Project HSO may, at any time, recommend changes in work habits to the STR/FTL.

# 4. EXPOSURE MONITORING AND SAMPLING

A potential for exposure to radiological, chemical, and physical hazards exists during project tasks, which may affect all personnel who work on the OU 3-13, Group 6, Buried Gas Cylinders project. Site Control and Security (Section 8) describes the use of engineering and administrative controls, worker training, and wearing PPE to provide the mitigation strategy for these hazards. Monitoring and sampling will be used during project tasks to (1) assess the effectiveness of these controls, (2) determine the type of PPE needed for individual tasks, and (3) determine the need for upgrading and downgrading of PPE as described in Section 6. Monitoring with direct-reading instruments will be conducted as deemed appropriate to provide RadCon and IH personnel with real-time data to assess the effectiveness of control measures.

Table 4-1 lists the tasks and hazards to be monitored, the frequency, and the monitoring instruments. Table 4-2 lists the action levels and associated responses for specific hazards.

## 4.1 Exposure Limits

Exposure limits are identified in Table 3-3 for specific project tasks. Project tasks will be continually assessed in accordance with applicable company policies and procedures and evaluated by RadCon and IH personnel to ensure engineering control effectiveness. Action limits should be adjusted as required based on changing site conditions, exposure mitigation practices, and PPE levels.

## 4.2 Action Limits

Action limits are one-half or 50% of the exposure limits identified in Table 3-3 to serve as the initial limits for the OU 3-13, Group 6, Buried Gas Cylinders, project sites. Monitoring results at or above an action limit, identified through exposure monitoring, will initiate additional evaluations including consideration for improved engineering controls, administrative controls, reevaluation of personal protective equipment, and probable need for additional exposure monitoring based on the industrial hygienist's recommendations. Action limits may be adjusted based on changing site conditions, exposure mitigation practices, and PPE levels.

## 4.3 Environmental and Personnel Monitoring

RadCon and IH personnel will conduct initial and periodic monitoring of OU 3-13 Group 6, Buried Gas Cylinders, operations with direct-reading instruments, collect swipes, and conduct full-and partial-period air sampling, as deemed appropriate, in accordance with the applicable technical procedures (TPRs), MCPs, OSHA substance-specific standards, and as stated on work permits and other guidelines. As new OU 3-13 Group 6, Buried Gas Cylinders, processes or hazards are introduced, they will be evaluated and controlled in accordance with applicable company policies and procedures. Instrumentation listed on Table 4-1 will be selected based on the site-specific conditions and contaminants associated with project tasks. The RCT and IH will be responsible for determining the best monitoring technique for radiological and nonradiological contaminants respectively. Safety hazards and other physical hazards will be monitored and mitigated as outlined in Section 3.

Table 4-1. Tasks and hazards to be monitored and monitoring instruments.[a,b]

| Tasks | Hazard(s) to be Monitored | Instrument Category to be Used[c] |
|---|---|---|
| | Chemical constituents—organic vapors, simple asphyxiants, oxidizers, flammables | 3, 4 |
| | Respirable dust—silica (area and personal) | 3, 5 |
| | Ergonomics, repetitive motion, lifting | 7 |
| | Heat and cold stress | 8 |
| Surface surveys, magnetometry | Ionizing radiation—(alpha, beta, gamma) | 1 |
| | Radionuclide contamination—(alpha, beta, gamma) | 1 |
| | Respirable dust—silica (area) | 4, 5 |
| Excavation activities | Ionizing radiation—(alpha, beta, gamma) | 1 |
| | Radionuclide contamination—(alpha, beta, gamma) | 1 |
| | Chemical constituents—organic vapors, lead | 3, 4 |
| | Respirable dust—silica (area and personal) | 3, 5 |
| | Hazardous noise | 6 |
| | Ergonomics, repetitive motion, lifting | 7 |
| | Heat and cold stress | 8 |
| | Radionuclide contamination—(alpha, beta, gamma) | 1 |
| | Respirable dust—silica (area) | 4, 5 |
| Cylinder segregation | Respirable dust—silica (area and personal) | 4, 5 |
| | Hazardous noise | 6 |
| | Ergonomics, repetitive motion, lifting | 7 |

Table 4-1. (continued).

| Tasks | Hazard(s) to be Monitored | Instrument Category to be Used[c] |
|---|---|---|
| Equipment decontamination | Radionuclide contamination—(alpha, beta, gamma) | 1 |
| | Chemical constituents—organic vapors, lead, cadmium | 3, 4 |
| | Hazardous noise | 6 |
| | Ergonomics, repetitive motion, lifting | 7 |
| | Heat and cold stress | 8 |

a. Monitoring and sampling will be conducted as deemed appropriate by project Industrial Hygiene and Radiological Control personnel based on specific tasks and site conditions.
b. Equivalent instrumentation other than those listed may be used.
c. 1 = Eberline RM-14 Count Rate Meter (Beta-gamma). Eberline RO-20 Radiation Meter.
3 = (Organic vapor) Direct reading instruments (photoionization detector, flame ionization detector, or infrared detector) detector tubes or grab samples, multi-gas meter with $\%O^2$, LEL, and HF (where presence suspected). (Dust) Direct-reading instrument (miniram).
4 = (Organic vapors and lead) Personal sampling pumps with appropriate media for partial and full period sampling using NIOSH or OSHA-validated methods.
5 = (Silica dust, respirable) NIOSH 7500 or equivalent, personal sampling pump, 10-mm cyclone, full-period sampling.
6 = ANSI Type S2A sound level meter or ANSI S1.25-1991 dosimeter (A-weighted scale for time-weighed average dosimetry, C-weighted for impact dominant sound environments).
7 = Observation and ergonomic assessment of activities in accordance with applicable company policies and procedures, and American Conference of Governmental Industrial Hygienists threshold limit value.
8 = Heat stress—wet-bulb globe temperature, or MCP-2704 - Appendix F with PPE, WBGT Temperature for no PPE. Cold stress—ambient air temperature, wind chill charts.

Table 4-2. Action levels and associated responses for the OU 3-13, Group 6, Buried Gas Cylinders project.

| Contaminant/Agent Monitored | Action Level | | Response Taken If Action Levels Are Exceeded | |
|---|---|---|---|---|
| Nuisance particulates (not otherwise classified) | >10 $mg/m^3$ (inhalable fraction)<br>>3 $mg/m^3$ (respirable fraction) | | Move personnel to upwind position of source and close equipment cab windows and doors.<br>Use wetting or misting methods to minimize dust and particulate matter.<br>IF wetting or misting methods prove ineffective, THEN don respiratory protection[a] (as directed by industrial hygienist). | |
| Hazardous atmosphere | As defined by applicable company policies and procedures or based on one-half or 50% of the individual contaminant exposure limit, >10% LEL, oxygen content <19.5% or >23.5%, etc. | | 1. Measure atmosphere prior to initiating operation or personnel entry and verify specific limit or condition has been met (e.g., <LEL).<br>2. Utilize engineering controls to maintain safe atmosphere/below specified limit.<br>3. IF engineering control fails to control contaminant below safe atmospheric/exposure limit, THEN stop operation and evacuate personnel until safe atmosphere/specified limit can be achieved. | |
| Silica (respirable fraction) | Greater than or equal to the OSHA permissible exposure limit of<br>$\frac{10\ mg/m^3}{\%silica + 2}$<br>(29 CFR 1910.1000 [Z3]) | | Move personnel to upwind position of source.<br>Use wetting or misting methods to minimize dust and particulate matter during mixing.<br>IF wetting or misting methods prove ineffective, THEN don respiratory protection[a] (as directed by industrial hygienist). | |
| Hazardous noise levels | <85 decibel A-weighted (dBA) 8-hour time-weighted average (TWA), <83dBA 10-hour TWA | | No action. | |
| | 85 to 114 dBA | | Hearing protection required to attenuate hazard to below 85 dBA 8-hour TWA or 83 dBA for 10-hour TWA (device noise reduction rating [NRR]). | |
| | (a) >115 dBA | (b) >140 dBA | (a) Isolate source, evaluate NRR for single device, double protection as needed. | (b) Control entry, isolate source, only approved double protection worn. |
| Radiation field | <5 mrem/hour | | No action, no posting required. | |
| | 5 to 100 mrem/hour @ 30 cm (PRD-183, Table 2-3 and Article 234) | | Post as "Radiation Area"—Required items: Radiological Worker I or II training, radiological work permit (RWP), personal dosimetry. | |
| | >100 mrem to 500 Rad @ 100 cm (PRD-183, Table 2-3 and Article 234) | | Post as "High Radiation Area"—Required items: RW II, RWP, alarming personal dosimetry, dose rate meter, and temporary shielding (as required). | |

Table 4-2. (continued).

| Contaminant/Agent Monitored | Action Level | Response Taken If Action Levels Are Exceeded |
|---|---|---|
| Radionuclide contamination | 1 to 100 times company determined limits[b] ((PRD-183, Table 2-4 and Article 235) | Post as "Contamination Area"—Required items: RW II training, personal dosimetry, RWP, don personal protective equipment (PPE), bioassay submittal (as required). |
| | >100 x company determined limits[b] (PRD-183, Table 2-4 and Article 235) | Post as "High Contamination Area"—Required items: RW II training, personal dosimetry, RWP (with prejob briefing), don PPE, bioassay submittal (as required). |
| Airborne radioactivity | Concentrations (μCi/cc) >30% of and derived air concentration value (10 CFR 835.603(d)) | Post as "Airborne Radioactivity Area"—Required items: RW II training, personal dosimetry, RWP (with prejob briefing), don PPE, bioassay submittal (as required). |

a. Level C respiratory protection will consist of a full-face respirator equipped with a high-efficiency particulate air filter cartridge as prescribed by the project IH and RadCon personnel (based on contaminant of concern).
b. The project radiological engineer and/or the RCT will define company limits.

### 4.3.1 Industrial Hygiene Area and Personal Monitoring and Instrument Calibration

The project industrial hygienist will conduct full- and partial-period sampling of airborne contaminants and monitoring of physical agents at a frequency deemed appropriate based on direct-reading instrument readings and changing site conditions. When conducted, all air sampling will be conducted using applicable National Institute of Occupational Safety and Health (NIOSH), OSHA, or another validated method. Both personal and area sampling and monitoring may be conducted.

Various direct-reading instruments may be used to determine the presence of nonradiological and other chemical and physical agents. The frequency and type of sampling and monitoring will be determined by changing site conditions, direct-reading instrument results, observation, professional judgment, and in accordance with the applicable company policies and procedures.

All monitoring instruments will be maintained and calibrated in accordance with the manufacturer's recommendations, existing industrial hygiene protocol, and in conformance with the companywide safety and health manuals. Direct-reading instruments will be calibrated or function-tested, at a minimum, before daily use and more frequently as determined by the project industrial hygienist. Calibration information, sampling and monitoring data, results from direct-reading instruments, and field observations will be recorded as stated in Section 13.

### 4.3.2 Area Radiological Monitoring and Instrument Calibration

Area radiological monitoring will be conducted during project tasks to ensure that personnel are given adequate protection from potential radiological exposure. Instruments and sampling methods listed in Table 4-1 may be used by the RCT as deemed appropriate and as required by project- or task-specific RWPs. When conducted, monitoring will be performed in accordance with applicable company manuals. The data obtained from monitoring will be used by RadCon personnel to evaluate the effectiveness of engineering controls, evaluate decontamination methods and procedures, and alert personnel to potential radiation sources.

Radiological Control personnel will use radiation and contamination detectors and counters listed in Table 4-1 or equivalent instruments to provide radiological information to personnel. Accountable radioactive sources will be maintained in accordance with applicable company policies and procedures. All radiological survey and monitoring equipment will be maintained and calibrated in accordance with the manufacturer's recommendations, existing RadCon protocol, and in conformance with applicable company policies and procedures.

# 5. ACCIDENT AND EXPOSURE PREVENTION

Project activities will present numerous safety, physical, chemical, and radiological hazards to personnel conducting these tasks. It is critical that all personnel understand and follow the site-specific requirements of this HASP. Engineering controls, hazard isolation, specialized work practices, and the use of PPE will be implemented to eliminate or mitigate potential hazards and exposures, where feasible. However, all personnel are responsible for the identification and control of work area hazards in accordance with Integrated Safety Management System (ISMS) principles and practices. **At no time will hazards be left unmitigated without implementing some manner of controls (e.g., engineering controls, administrative controls, or the use of PPE)**. Project personnel shall use stop work authority in accordance with applicable company policies and procedures where it is perceived that imminent danger to personnel, equipment, or the environment exists.

This HASP is to be used in conjunction with applicable company policies and procedures. Where appropriate, applicable company policies and procedures, mitigation guidance, JSAs, and RWPs will be incorporated into applicable sections of the HASP.

## 5.1 Voluntary Protection Program and Integrated Safety Management

The INEEL safety processes embrace the Voluntary Protection Program (VPP) and ISMS criteria, principles, and concepts to identify and mitigate hazards, thereby preventing accidents. All management and workers are responsible for implementing safety policies and programs and for maintaining a safe and healthful work environment. Project personnel are expected to take a proactive role in preventing accidents, ensuring safe working conditions for themselves and fellow personnel, and complying with all work control documents, procedures, and permits.

The **ISMS** is focused on the **system** side of conducting operations and **VPP** concentrates on the **people** aspect of conducting work. Both programs define work scope, identify and analyze hazards, and mitigate the hazards, and additional information on these programs is available on the INEEL Intranet. BBWI (current primary management and operating contractor) and its subcontractors participate in VPP and ISMS for the safety of their employees. This document includes all elements of both systems. The five key elements of VPP and ISMS and their corresponding HASP sections are as follows:

| Voluntary Protection Program | Integrated Safety Management System | Health and Safety Plan Section |
|---|---|---|
| | Define work scope | Section 2 |
| Work site analysis | Analyze hazards | Section 3, 4, 6, 8 |
| Hazard prevention and control | Develop and implement controls | Section 3, 4, 5, 6, 7, 8, 11, 12 |
| Safety and health training | Perform within work controls | Section 7 |
| Employee involvement | Perform work within controls | Section 3, 4, 5 |
| Management leadership | Provide feedback and improvement | Section 5, 10 |

## 5.2 General Safe-Work Practices

Sections 1, 2, and 3 of this document defined the project work scope and associated project-specific hazards with mitigation. The following practices are mandatory for all project personnel to further reduce the likelihood of accidents and injuries. All visitors permitted to enter work areas must follow these requirements. Failure to follow these practices may result in permanent removal from the project and other disciplinary actions. The project FTL/STR and HSO will be responsible for ensuring the following safe-work practices are adhered to at the project site(s):

- Limit work area access to authorized personnel only, in accordance with applicable company policies and procedures and Section 8 of this document.

- All personnel have the authority to initiate STOP WORK actions in accordance with applicable company policies and procedures.

- Personnel will not eat, drink, chew gum or tobacco, smoke, apply sunscreen, or perform any other activities in CERCLA areas where there is an increased probability of hand-to-mouth transfer and ingestion of work areas contaminants.

- Be aware of and comply with all safety signs, tags, barriers, and color codes as identified in accordance with applicable company policies and procedures.

- Be alert for dangerous situations, strong or irritating odors, airborne dusts or vapors, and spills that may be present. Report all potentially dangerous situations to the FTL/STR or HSO.

- Avoid direct contact with hazardous materials and waste. Personnel will not walk through spills or other contamination areas and will avoid kneeling, leaning, or sitting on equipment or potentially contaminated surfaces.

- Be familiar with the physical characteristics of INTEC, including, but not limited to

  - Prevailing wind direction

  - Location of fellow personnel, equipment, and vehicles

  - Communications at the project site and with INTEC or CFA

  - Area and the type of hazardous materials stored and waste disposal materials

  - Major roads and means of access to and from the project site

  - Location of emergency equipment

  - Warning devices and alarms at INTEC and/or CFA

  - Capabilities and location of nearest emergency assistance.

- Report all broken skin or open wounds to the operations manager, FTL/STR, or HSO. An OMP physician must examine all wounds to determine the nature and extent of the injury. If required to enter into a radiological contamination area, a RadCon supervisor will determine whether the wound can be bandaged adequately in accordance with applicable company manuals.

- Prevent releases of hazardous materials. If a spill occurs, personnel must try to isolate the source (if possible and if this does not create a greater exposure potential) and then report it to the FTL/STR, or HSO. The Warning Communications Center (WCC) and INTEC shift supervisor will be notified and additional actions will be taken, as described in Section 12. Appropriate spill response kits or other containment and absorbent materials will be maintained at the project site.

- Illumination levels during project tasks will be in accordance with 29 CFR 1910.120 (Table H-120.1, "Minimum Illumination Intensities in Foot-Candles").

- Ground-fault protection will be provided whenever electrical equipment is used outdoors.

- Keep all ignition sources at least 15 m (50 ft) from explosive or flammable environments and use nonsparking, explosion-proof equipment when working on systems containing flammable or explosive liquids, gases, and vapors.

- Follow all safety and radiological precautions and limitation of TPRs and requirements identified in work packages.

## 5.3 Subcontractor Responsibilities

Subcontractors are responsible for meeting all applicable requirements listed in the completed, applicable company forms, policies, and procedures, as well as the Subcontractor Requirements Manual (TOC-59), and contract general and special conditions. Additionally, subcontractors are expected to take a proactive role in hazard identification and mitigation while conducting project tasks and report unmitigated hazards to the project point of contact and Clean/Close INTEC Subproject 6 health and safety officer after taking mitigative actions within the documented work controls.

## 5.4 Radiological and Chemical Exposure Prevention

Exposure to potential chemical, radiological, and physical hazards will be mitigated by using of engineering controls, administrative controls, and PPE as a last means of defense to prevent and minimize exposure where engineering controls are not feasible. All project personnel are responsible for understanding the hazard identification and mitigation measures necessary to prevent exposures.

### 5.4.1 Radiological Exposure Prevention – As Low as Reasonably Achievable Principles

Radiation exposure of project personnel will be controlled such that radiation exposures are well below regulatory limits and that there is no radiation exposure without commensurate benefit. **Unplanned and preventable exposures are considered unacceptable.** All project tasks will be evaluated with the goal of eliminating or minimizing exposures. All project personnel have the responsibility for following as-low-as-reasonably-achievable (ALARA) principles and practices, and personnel working at the site must strive to minimize both external and internal radiation doses.

### 5.4.2 Chemical and Physical Hazard Exposure Avoidance

**Note**: Identification and control of exposures to carcinogens will be conducted in accordance with applicable company policies and procedures.

TLVs or other occupation exposure limits have been established for numerous chemicals and physical agents (e.g., noise, heat, or cold stress) that may be encountered. These exposure limits provide guidelines in evaluating airborne, skin, and physical agent exposures. The TLVs represent levels and conditions under which it is believed that nearly all workers may be exposed day after day without adverse health effects. The TLV-TWA is a time-weighted average concentration for a conventional 8-hour workday and a 40-hour workweek, to which it is believed that nearly all workers may be repeatedly exposed, day after day, without adverse health effects. Action limits (instantaneous concentrations for short time periods) have been established (Section 3) to further reduce the likelihood of exceeding TLVs.

Controls will be employed to eliminate or mitigate chemical and physical hazards wherever feasible. The hierarchy of controls in order are (1) engineering controls, (2) administrative controls, and (3) PPE. In addition to these controls, use of technical procedures and work orders, hold points, training, and monitoring of hazards will be used as appropriate to reduce exposure potential. Some methods of exposure avoidance include

- Wearing all required PPE, inspecting all pieces before donning, and taping all seams
- Changing PPE if it becomes damaged or shows signs of degrading
- Minimizing time in direct contact with both hazardous material and waste
- Doffing PPE following standard practices (i.e., rolling outer surfaces in and down) and follow doffing sequence
- Washing hands and face before eating, drinking, smoking, or engaging in activities that may provide contaminant pathways.

## 5.5 Buddy System

The two-person or buddy system will be used during project tasks. The buddy system is most often used during project activities requiring the use of protective clothing and respiratory protection where heat stress and other hazards may impede a person's ability to self-rescue. The buddy system requires each employee to assess and monitor his or her buddy's mental and physical well being during the course of the operation. A buddy must be able to perform the following activities:

- Provide assistance if required
- Verify the integrity of PPE
- Observe his or her buddy for signs and symptoms of heat stress, cold stress, or contaminant exposure
- Notify other personnel in the area if emergency assistance is needed.

The buddy system will be administered by the FTL/STR in conjunction with the HSO.

# 6. PERSONAL PROTECTIVE EQUIPMENT

The purpose of PPE is to shield or isolate personnel from chemical, radiological, physical, and/or biological hazards that cannot be eliminated though engineering or other controls and that may be encountered. It is important to realize that no PPE ensemble can protect against all hazards under all conditions and that work practices and adequate training will also provide a greater level of protection to workers.

**Note:** *For upgrading or downgrading PPE, the FTL/STR and HSO must involve the IH, RCT, and/or the radiological engineer before any changes are made.*

Selection of the proper PPE to protect project personnel is based on the following:

- Characterization tasks to be conducted
- Known or suspected radiological and nonradiological materials and agents expected to be found at the project
- Potential contaminant routes of entry
- Physical form and chemical characteristics of contaminants
- Acute and chronic effects from exposure to contaminants
- Local and systemic toxicity of contaminants
- Anticipated exposure levels (surface and airborne)
- The Hazard Analysis evaluation of this HASP
- Protective clothing requirements are specified on the RWP in accordance with MCP-432 (PRD-3001).

The PPE is generally divided into two broad categories: (1) respiratory protective equipment and (2) personal protective clothing. Both of these categories are incorporated into the standard four levels of protection (Levels A, B, C, and D), based of the potential severity of the project hazards. Table 6-1 provides guidance in the selection process for respiratory and protective clothing.

## 6.1 Respiratory Protection

The level and type of respiratory protection is project-specific and relates directly to the airborne hazards for each given task or activity. Level D (no respiratory protection) is anticipated for preliminary characterization. Removal/treatment/transfer/sampling of compressed gas cylinder contents at CPP-84 will require Level B respiratory protection until valve/cylinder integrity is known or treatment and/or transfer to another container is required outside a controlled vessel specifically designed to do so in a closed, controlled environment. Modified Level D will be utilized at CPP-84 and at CPP-94 for fire protection activities. If unanticipated conditions are encountered at either site, the project IH will assess the need for additional respiratory requirements.

Table 6-1. Guidance for respiratory and protective clothing selection.

| Hazard | Level of Protection |
|---|---|
| **Respiratory PPE Selection**[a] | |
| Not immediately dangerous to life or health (IDLH) or oxygen-deficient atmospheric conditions. Gaseous, vapor, particulate, and/or aerosol chemicals/radionuclides. | Level C—full-facepiece, as determined by IH/RadCon<br><br>Level B—full-facepiece supplied-air respirator with an air-purifying escape cartridge or airhood (bubblehood)<br><br>HEPA/chemical combination cartridge for concentrations up to the protection factor of an air-purifying full-facepiece respirator and within the assigned DAC [b] value |
| IDLH or oxygen-deficient atmospheric conditions. Gaseous, vapor, particulate, and/or aerosol chemicals/radionuclides. | Level B—full-facepiece, supplied-air respirator with an escape-only SCBA [c] or<br>Level A—SCBA<br><br>HEPA/chemical combination cartridge for concentrations up to the protection factor of an air-purifying full-facepiece respirator and within the assigned DAC [b] value |
| **Protective Clothing Selection** | |
| Low atmospheric contaminant levels that are present under stable conditions. No anticipated immersion, splashes, or potential for unexpected contact with chemical or radiological contaminants. | Level D |
| Moderate atmospheric contaminants under relatively stable conditions, liquid splashes, or other direct contact that do not have corrosive characteristics or can be absorbed by exposed skin. Low radionuclide contamination and airborne radioactivity levels.[d] | Level C |
| Moderate to high atmospheric contaminants under unstable conditions, potential for contact with wet, contaminated surfaces/material that can saturate or permeate Level C protective clothing. Moderate radionuclide contamination and airborne radioactivity levels.[d] | Level B |
| High and unknown atmospheric contaminants, potential for contact with substances that pose a high hazard potential to the skin, high potential for splash, immersion or exposure to unexpected vapors, gases, aerosols, or dusts that may present an IDLH situation/readily absorbed through the skin. High radionuclide contamination and airborne radioactivity levels.[d] | Level A |

a. A multichemical/HEPA combination cartridge to be selected by IH and RadCon personnel based on specific task hazards.
b. Derived air concentration (DAC) based on specific radionuclides.
c. SCBA = self-contained breathing apparatus.
d. Contamination levels and airborne radioactivity as defined by. (PRD-183, Table 2-2 and Table 2-4)

If respiratory protection is required, all personnel required to wear respirators shall complete training and be fit-tested before being assigned a respirator per the training and documentation requirements in Section 7 of this HASP. Requirements for respirator use, emergency use, storage, cleaning, and maintenance, as stated in MCP-2726, "Respiratory Protection," (PRD-2109) shall be followed.

## 6.2 Personal Protective Equipment Levels

The following section provides a detailed explanation of Level B and Level D PPE. The anticipated PPE level to be used for Sites CPP-84 is Level B during intrusive cylinder investigation, handling, and treatment phases. Level D PPE is anticipated during mobilization, site preparation work, and post-remediation sampling at Sites CPP-84 and CPP-94. Modifications shall be made under the direction of the HSO in consultation with the project IH or RadCon personnel, as appropriate.

All personnel entering the administrative control area (supply zone and beyond) wear, at a minimum, hard hat, sturdy leather boots above the ankle (safety shoes if falling object hazards present), and safety glasses. Additional PPE requirements shall be posted, discussed, and enforced prior to allowing entry beyond the supply zone.

### 6.2.1 Level D Personal Protective Equipment

Level D PPE will only be selected as a work uniform and not on a project with respiratory or skin absorption hazards requiring whole body protection. It provides no protection against airborne chemical hazards but rather is used for protection against nuisance contamination and physical hazards. Level D PPE ensemble may be modified by the IH and/or RCT to provide protection from skin and physical hazards, but not respiratory protection. Basic Level D PPE consists of the following:

- Nomex coveralls, hood, gloves, and boots
- Hard hat (as required by SE and type of work being performed)
- Eye protection, safety glasses with side shields as a minimum (see PRD-5121, "Personal Protective Equipment" [PRD-2001])
- Safety footwear (steel or protective toe and shank, as determined by the HSO).

Optional Level D modifications consists of the following:

- Chemical or radiological protective clothing (Tyvek, Saranex, etc.) as prescribed in site-specific RWP or SWP
- Chemically resistant hand and foot protection
- Modesty garments under outer protective clothing
- Any specialized protective equipment (hearing protection, cryogenic gloves, face shields, welding goggles, aprons, etc.)
- Leather gloves
- Hard hat, safety glasses, and sturdy leather boots (steel toe boots, as necessary).

### 6.2.2 Level B Personal Protective Equipment

Level B PPE will only be selected as a work uniform for work activities performed within the exclusion zone of CPP-84 and CPP-94 during removal or treatment. Level B provides protection from both respiratory or skin absorption hazards requiring whole body protection. The Level B PPE ensemble may be modified by the IH and/or RCT to provide protection from skin and physical hazards, but not respiratory protection. Basic Level B PPE consists of the following:

- Chemical or radiological protective clothing (neoprene acid suit)
- Chemically resistant hand and foot protection (neoprene gloves and neoprene boot covers)
- Modesty garments under outer protective clothing
- Nomex coveralls, hood, gloves, and boots
- Ballistic suits
- Supplied air with escape capabilities or SCBA
- Hard hat
- Safety glasses with side shield
- Safety toe boots
- Gloves to protect from use of cryogenics (burn prevention).

## 6.3 Protective Clothing Upgrading and Downgrading

The project HSO, in consultation with the project IH or RadCon personnel, will be responsible for determining when to upgrade or downgrade PPE requirements. Upgrading or downgrading of PPE requirements, based on current conditions, is a normal occurrence. Action levels, listed in Section 3, Table 3-5, provide the basis for determining such decisions. Additional reasons for upgrading or downgrading include the following:

- Upgrading
  - Unstable or unpredictable site radiological and/or nonradiological hazards
  - Contaminants that present difficulty in monitoring or detecting
  - Known or suspected presence of skin absorption hazards
  - Temporary loss or failure of engineering controls
  - Identified source or potential source of respiratory hazard(s)
  - Change in the task procedure that may result in an increased contact with contaminants or meeting any of the criteria listed above

- Downgrading
  - New information or monitoring data that show the contaminant levels to be lower than established action limits
  - Implementation of new engineering or administrative controls that eliminate or significantly mitigate hazards
  - Elimination of potential skin absorption or contact hazards
  - Change in project conditions that results in removal of physical hazards or reduces/isolates them to a controlled area
  - Completion or change in tasks that results in the elimination of key hazards that require higher levels of PPE.

## 6.4 Inspection of PPE

All PPE ensemble components must be inspected prior to use and when in use within work zones. Self-inspection and the use of the buddy system, once PPE is donned, will serve as the principal forms of inspection. If PPE should become damaged or degradation/permeation is suspected, an individual will inform others of the problem and proceed directly to the work zone exit point to doff and replace the unserviceable equipment. Additionally, all PPE that becomes grossly contaminated or presents a potential source for the spread of such contamination will be required to be decontaminated or replaced.

# 7. PERSONNEL TRAINING

All INEEL personnel will receive training, as specified in 29 CFR 1910.120 and/or 29 CFR 1926.65 and INEEL companywide manuals, as applicable. Table 7-1 summarizes the project-specific training requirements for personnel-based access requirements, responsibilities at the project site, potential hazards, and training level requirements.

Modifications (e.g., additions to or elimination of) to training requirements listed in Table 7-1 may be necessary based on changing field conditions. Any changes to the requirements listed in Table 7-1 must be approved by the HSO, with concurrence from the FTL/STR, project manager, RCT, and industrial hygienist, as applicable. These changes should be based on site-specific conditions and will generally be considered a minor change to the HASP, as defined by instructions from applicable company forms because they are administrative in nature.

## 7.1 General Training

All project personnel are responsible for meeting training requirements including applicable refresher training. Evidence of training will be maintained at the project site, field administrative location, or electronically (e.g., Training Records and Information Network [TRAIN] [http://train1.inel.gov/index.html]). Nonfield team personnel and visitors must be able to provide evidence of meeting required training for the area of the site they wish to access before being allowed into a project area. **As a minimum**, all personnel who access project locations must receive a site-specific briefing, are required to wear PPE, and must provide objective evidence of having completed INEEL computer-based PPE training (00TRN288, "Personal Protective Equipment") or equivalent, in accordance with 29 CFR 1910.132, "General requirements." Activities conducted outside a facility boundary (both CPP-84 and CPP-94) require personnel to complete unexploded ordinances training.

## 7.2 Project-Specific Training

Before beginning work at the project site, field team members will receive project-specific HASP training that will be conducted by the HSO (or designee). This training will consist of a complete review of (1) a controlled copy of the project HASP, attachments, and document action requests; (2) applicable JSAs and SWPs (if required); (3) work orders; and (4) other applicable work control and work authorization documents, with time for discussion and questions. Project-specific training can be conducted in conjunction with, or separately from, the required formal prejob briefing applicable company policies and procedures.

At the time of project-specific HASP training, personnel training records will be checked and verified to be current and complete for all the training requirements shown in Table 7-1. After the HSO (or designee) has completed the site-specific training, personnel will sign applicable company forms indicating that they have received this training; understand the project tasks, associated hazards and mitigations; and agree to follow all HASP and other applicable work control and safety requirements. Applicable training forms are available on the INEEL Intranet under "Forms."

Table 7-1. Required project-specific training.

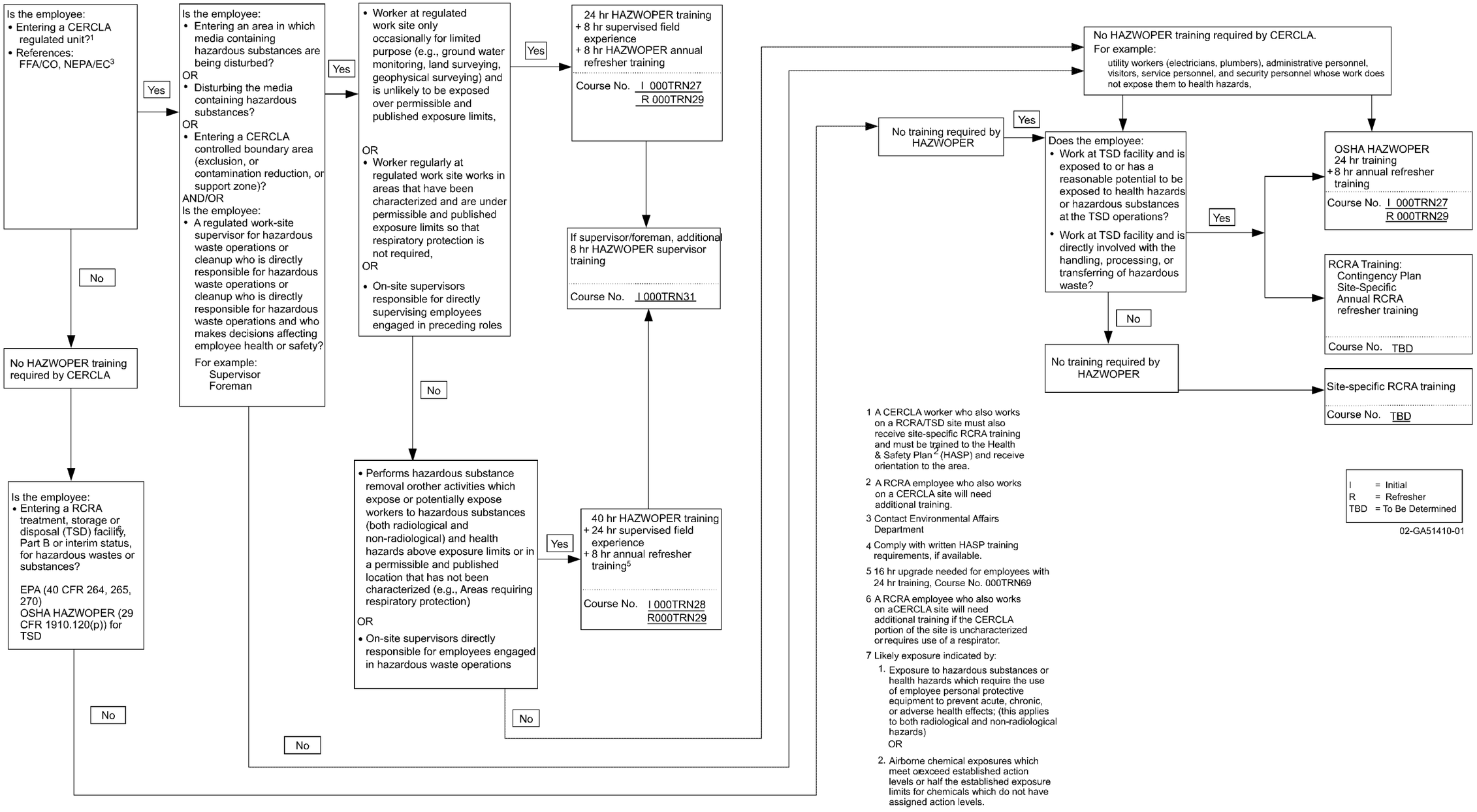
| Required Training | FTL/STR, HSO, Subcontract Supervision and Sampler Supervision | Subcontract Personnel, Other Field Team Members | Access into the Designated or Controlled Work Area, Construction Area or Contamination Reduction Zone | Access to Project Areas Outside Designated or Controlled Work Area, Construction Area or Support Zone |
|---|---|---|---|---|
| 40-hour hazardous waste operations (HAZWOPER)[a] - operations | Yes | Yes | | |
| 24-hour HAZWOPER[b] - operations | | | Yes | |
| HAZWOPER supervisor | Yes | | | |
| Project-specific health and safety plan training[c] | Yes | Yes | Yes | |
| Project-site orientation briefing[d] | | | | Yes |
| Fire extinguisher training (or equivalent) | e | e | | |
| Cardiopulmonary resuscitation, medic first aid | e | e | | |
| Respirator training (contingency only) | f | f | f | |
| Use of Personal Protective Equipment (00TRN288) | Yes | Yes | Yes | |
| Hearing conservation | g | g | g | |
| Prejob Briefings and Postjob Reviews (00TRN732) | Yes[h] | Yes[h] | Yes[h] | |
| Unexploded Ordinance Recognition (00TRN803) | Yes | Yes | Yes | Yes |
| Integrated Safety Management (00TRN666) | Yes | Yes | Yes | |
| Lead Awareness (00TRN225) | Yes | Yes | Yes | |
| Required Reading PRD-5040, "Handling and Use of Compressed Gasses" | Yes | Yes | Yes[h] | |
| Heat Stress Training (00TRN606) | Yes | Yes | | |
| Heat stress competent person | Yes[e] | | | |
| Working in Hazardous Temperatures - Cold Stress (SMTT0010) | Yes | Yes | | |
| JSA training | Yes | Yes | Yes | |
| Prejob briefing performance evaluation (00TRN754) | i | | | |

Table 7-1. (Continued).

| Required Training | FTL/STR, HSO, Subcontract Supervision and Sampler Supervision | Subcontract Personnel, Other Field Team Members | Access into the Designated or Controlled Work Area, Construction Area or Contamination Reduction Zone | Access to Project Areas Outside Designated or Controlled Work Area, Construction Area or Support Zone |
|---|---|---|---|---|
| DOE Radiological Worker II/ Radiological Worker I | i | i | i | |
| Compressed Gas Safety (00TRN1041) | Yes | Yes[j] | Yes | |

**Note 1**: Shaded fields indicate specific training is not required or applicable.
**Note 2:** Supervised field experience is only required if personnel have not previously completed this training at another CERCLA (42 USC § 9601) site (documented), or they are upgrading from 24- to 40-hour HAZWOPER training. A copy of the training record must be kept at the project site as evidence of training or be available electronically.
**Note 3:** Completed training project forms should be submitted to the training coordinator for inclusion in the TRAIN system within 5 working days of completion.
a. Includes 8-hour HAZWOPER refresher training, as applicable, and supervised field experience as follows: 40-hour HAZWOPER = 24-hour supervised field experience and 24-hour HAZWOPER = 8-hour supervised field experience).
b. 40-hour or 24-hour HAZWOPER training requirement will be determined by the HSO based on the nature of the project tasks and potential for exposure to contaminants or safety hazards.
c. Includes project-specific hazards communications (29 CFR 1910.120), site-access and security, decontamination and emergency response actions, as required by 29 CFR 1910.120(e).
d. Orientation includes briefing of site hazards, designated work areas, emergency response actions, and PPE requirements. Personnel receiving project-site orientation briefing only are limited to the areas outside designated work areas and must be escorted by a project supervisor or designee who is fully trained on the requirements of the HASP.
e. At least one trained person onsite when field team is working and the health and safety officer will determine appropriate number of personnel requiring training.
f. Only required if entering area requiring respiratory protection (e.g., action levels exceeded or the industrial hygienist sampling shows respirators required).
g. Only if entering areas where initial exposure determination indicates exposure above the action limit is possible.
h. Includes all attendees of prejob briefings.
i. As required, based on project duties and/or site zone access requirements.
j. Or equivalent as demonstrated by subcontractor.

A trained HAZWOPER 8-hour supervisor (FTL/STR or other person who has been trained by the HAZWOPER supervisor) will monitor the performance of each newly 24-hour or 40-hour trained worker to meet the 1 or 3 days of supervised field experience, respectively, in accordance with 29 CFR 1910.120(e). Following the supervised field experience period, the supervisor will complete applicable company forms to document the supervised field experience. Figure 7-1 outlines personnel training requirements at CERCLA sites.




1 A CERCLA worker who also works on a RCRA/TSD site must also receive site-specific RCRA training and must be trained to the Health & Safety Plan[4] (HASP) and receive orientation to the area.

2 A RCRA employee who also works on a CERCLA site will need additional training.

3 Contact Environmental Affairs Department

4 Comply with written HASP training requirements, if available.

5 16 hr upgrade needed for employees with 24 hr training, Course No. 000TRN69

6 A RCRA employee who also works on aCERCLA site will need additional training if the CERCLA portion of the site is uncharacterized or requires use of a respirator.

7 Likely exposure indicated by:

1. Exposure to hazardous substances or health hazards which require the use of employee personal protective equipment to prevent acute, chronic, or adverse health effects; (this applies to both radiological and non-radiological hazards)

   OR

2. Airborne chemical exposures which meet or exceed established action levels or half the established exposure limits for chemicals which do not have assigned action levels.

Figure 7-1. Model identifying employees requiring HAZWOPER training at CERCLA sites.

## 7.3 Plan-of-the-Day Briefing, Feedback, and Lessons Learned

A daily prejob briefing or equivalent meeting will be conducted and documented by the subcontractor supervision, FTL, STR, or designee. During this meeting, daily tasks are to be outlined; hazards identified; hazard controls, mitigation, and work zones established; PPE requirements discussed; and feedback from personnel solicited. At the completion of this meeting, any new work control documents will be reviewed and signed (e.g., SWP, JSA, or RWP). Work restrictions shall also be discussed in the daily pre-job briefing.

Particular emphasis will be placed on lessons learned from the previous workday's activities and how tasks can be completed in the safest, most efficient manner. All personnel are encouraged to contribute ideas to enhance worker safety and mitigate potential exposures at the project sites.

Safety and health topic-specific training or safety meetings may also be conducted during the course of the project to reinforce key safety topics. They may be conducted by project safety and the industrial hygienist or any field team member and should be performed in conjunction with the prejob briefing. Credit for a safety meeting can be received for such topic-specific training if a tailgate training form or equivalent is completed and submitted to the appropriate training coordinator (within 5 days) for entry into TRAIN.