HEALTH AND SAFETY PLAN

NUCLEAR METALS, INC. SUPERFUND SITE
REMEDIAL DESIGN/REMEDIAL ACTION
CONCORD, MASSACHUSETTS

General Contractor:

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1.0 INTRODUCTION

On October 17, 2019, the United States Environmental Protection Agency (USEPA) lodged a Consent Decree (CD) with the United States District Court for the District of Massachusetts Eastern Division in connection with Civil Action No. Civil Action No. 1:19-cv-12097-RGS. The CD was entered by the Court on December 6, 2019. The CD and the Statement of Work (SOW) provided as Appendix B to the CD describe the Remedial Design/Remedial Action (RD/RA) activities to be performed for the Nuclear Metals, Inc. (NMI) Superfund Site (Site) in Concord, Massachusetts. The RD/RA activities are to be undertaken by the Settling Defendants (SDs) to the CD, with funding contributions from the Settling Federal Agencies (SFAs).

To efficiently implement the remedy, the work will be divided into five RA projects. RA Projects 1) – 4) below are outlined in Section 1.4 of the SOW. The need for RA Project 5) was identified during the Groundwater Non-time Critical Removal Action (NTCRA). The five RA projects are:

1) excavation and off-site disposal of contaminated sediments, underground drain lines and debris, and non-Holding Basin (HB) soils, or (Site-wide Soils and Sediments);

2) In-situ sequestration (ISS) of depleted uranium (DU) in HB soils and of depleted uranium and natural uranium in overburden and bedrock groundwater or ISS;

3) containment of HB stabilized soils with a low-permeability vertical wall and horizontal sub-grade cover or HB Containment;

4) hydraulic containment and ex-situ treatment of Volatile Organic Compounds (VOCs) and 1,4-dioxane in groundwater; and,

5) 1,4-dioxane and VOCs in bedrock groundwater.

Remedial Design Work Plan Overview

Section 3.1 of the SOW requires submittal of a Remedial Design Work Plan (RDWP) to summarize pertinent Site information, identify and describe the scopes and procedures for various pre-design investigations, describe the anticipated RD process, and discuss the RD-related deliverables and schedule.

As required by Section 3.3(a) of the SOW, Pre-Design Investigation Work Plans (PDI WPs) have been prepared for the three remedial components (Site-wide Soils and Sediments, ISS, and HB Containment). Hydraulic containment and ex-situ treatment of VOCs and 1,4-dioxane in groundwater as required by the Groundwater NTCRA is operating and does not require further PDI work to complete. However, the extent of 1,4-dioxane and VOCs in bedrock groundwater in the area up gradient from the extraction well needs further delineation. Separate PDI WPs were prepared for each remedial component, and are attached to the RDWP as follows:

- Site-wide Soils and Sediment PDI WP (Appendix A)

- ISS PDI WP (Appendix B)
- HB Containment PDI WP (Appendix C)
- 1,4-dioxane and VOCs in Bedrock Groundwater (Appendix D)

Section 3.4(a) of the SOW requires performance of Treatability Studies (TS) to support the ISS component of the remedy. Separate studies are needed to evaluate and select treatment materials/reagents, for high concentration DU within the HB, low concentration DU outside the HB, and isotopically natural U in bedrock, respectively. In addition to reagent selection, each media will require evaluation to determine the best means to apply the selected reagent. The overall Treatability Study Work Plan (TSWP) is attached as Appendix E.

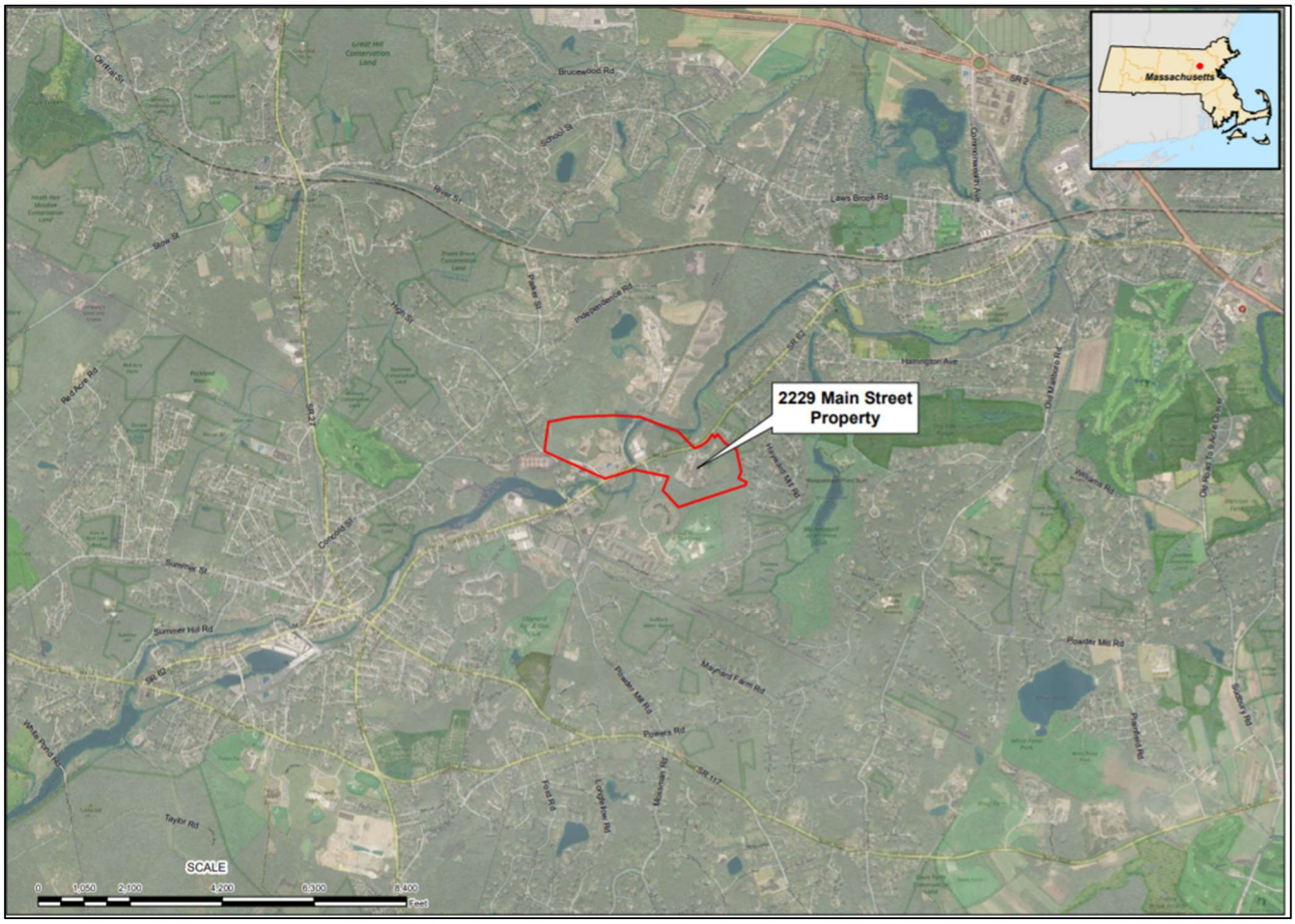
The RDWP will also include the following Supporting Deliverables:

- To continue the Post-Removal Site Control (PRSC) requirements established pursuant to the Building NTCRA, a Site Maintenance and Inspection Plan (SMIP) is provided as Appendix F
- Health and Safety Plan (HASP) – Appendix G
- Emergency Response Plan (ERP) – Appendix H
- Sampling and Analysis Plan: Field Sampling Plan (FSP) – Appendix I
- Sampling and Analysis Plan: Quality Assurance Project Plan (QAPP) – Appendix J
- Site Wide Monitoring Plan (SWMP) – Appendix K
- Community Relations Support Plan (CRSP) – Appendix L

1.1 Background

The NMI Site includes the 46-acre NMI Property located at 2229 Main Street in Concord, MA and downgradient properties where groundwater contamination has migrated (see Figure 1). The NMI property is surrounded by residential and woodland areas to the east and south, light commercial and industrial areas to the west, and Main Street (Route 62) and the Assabet River to the north. The remaining portions of the Site include the Downgradient Properties, where impacted groundwater is present, and include commercial offices, a former gravel pit and an ice rink located to the north and west of the NMI Property. A site locus map is provided as Figure 1-1.

Figure 1-1 Site Location



1.2 Purpose

This HASP has been prepared to address the requirements of Section 6.7 (a) the SOW. The objective of the site-specific HASP is to provide the basic requirements that are designed to protect personnel health, safety and the environment during implementation of the RD/RA. All contractors and their subcontractors assigned to this project are required to perform work in accordance with this HASP and applicable Federal and State Occupational Health and Safety Regulations.

The site-specific health and safety requirements and procedures in this HASP will be updated as necessary based on an ongoing assessment of site conditions.

Contractors and their subcontractors are required to review the following steps, as part of the planning process, prior to initiating work on-site to minimize the potential for disruption of work due to non-compliance or other safety related issues:

i. possible problems and hazards and their solutions

ii. environmental surveillance measures
iii. specifications for protective clothing
iv. the appropriate level of respiratory protection
v. the rationale for selecting that level
vi. criteria, procedures, and mechanisms for upgrading the level of protection and for suspending activity, if necessary

The work approach, administrative and engineering controls, required Personal Protective Equipment (PPE), and safety related issues shall be reviewed with the Site Project Manager (SPM) and subcontractors Field Supervisors/Site Health & Safety Officer (FS/HSO) prior to initiating activities on-site. The SPM and FS/HSO shall be notified of any change in work procedures or change in condition throughout the implementation of activities on-site as they relate to worker safety.

The following documents and resources were consulted during preparation of this HASP:

- Occupational Safety and Health Administration (OSHA) General Industry 29 CFR 1910 and Construction 29 Code of Federal Regulations (CFR) 1926 Standards
- Hazardous Waste Operations and Emergency Response (Department of Labor, OSHA 29 CFR Part 1910.120 and Part 1926.65)
- EPA's Standards Operating Safety Guide (PUB 9285.1-03, PB 92-963414, June 1992)

The measures in this HASP were developed and will be implemented to comply with applicable state and federal occupational health and safety regulations. The HASP is consistent with the objectives and contents of all other plans submitted as part of the RDWP. The HASP will be updated during work whenever changes are made to organizational structure or responsibilities, changes in types or levels of hazards, and changes to training and medical surveillance requirements, and when new work tasks are scoped.

The objective of this HASP is to provide the basic procedures designed to protect personnel health, safety and the environment during implementation of the RD/RA. Contractors and their subcontractors shall perform work in accordance with the Health & Safety requirements for their individual company, which shall meet the requirements of this HASP at a minimum, as well as applicable State and Federal Safety Regulations.

The NMI Superfund Site is a multi-employer work site. ***de maximis, inc.*** is the General Contractor (GC), or Controlling Employer, responsible for the implementation of the RD/RA work. ***de maximis, inc.,*** as the GC, has general supervisory authority over the worksite, including the power to directly identify and correct any health and safety violations, or require others (such as contractors and their subcontractors) to correct them. If safety concerns are noted, hazards shall be promptly remediated; failure to do so shall result in a stoppage of work until effective measures are employed to correct any potential hazards. Contractors are responsible for implementing health and safety requirements for their personnel and their subcontractors.

Section 3.3 of the RDWP provides a summary of the Agencies, management and contractor firms anticipated to be involved with the RD, at the time of this report. It is necessary that all on site representatives of these firms have read and understand the HASP to be considered a site worker. Section 10 of this HASP lays out the framework for training requirements for site workers and the varying levels of restrictions involved with site visitors.

1.3 Hospital Location, Route and MAP

Emergency medical services at the NMI Property are provided by the Concord Fire Department (CFD). Emergency medical services at the Groundwater Treatment Building are provided by Acton Fire Department (AFD). The closest hospital is:

Emerson Hospital (approximately 3 miles away)

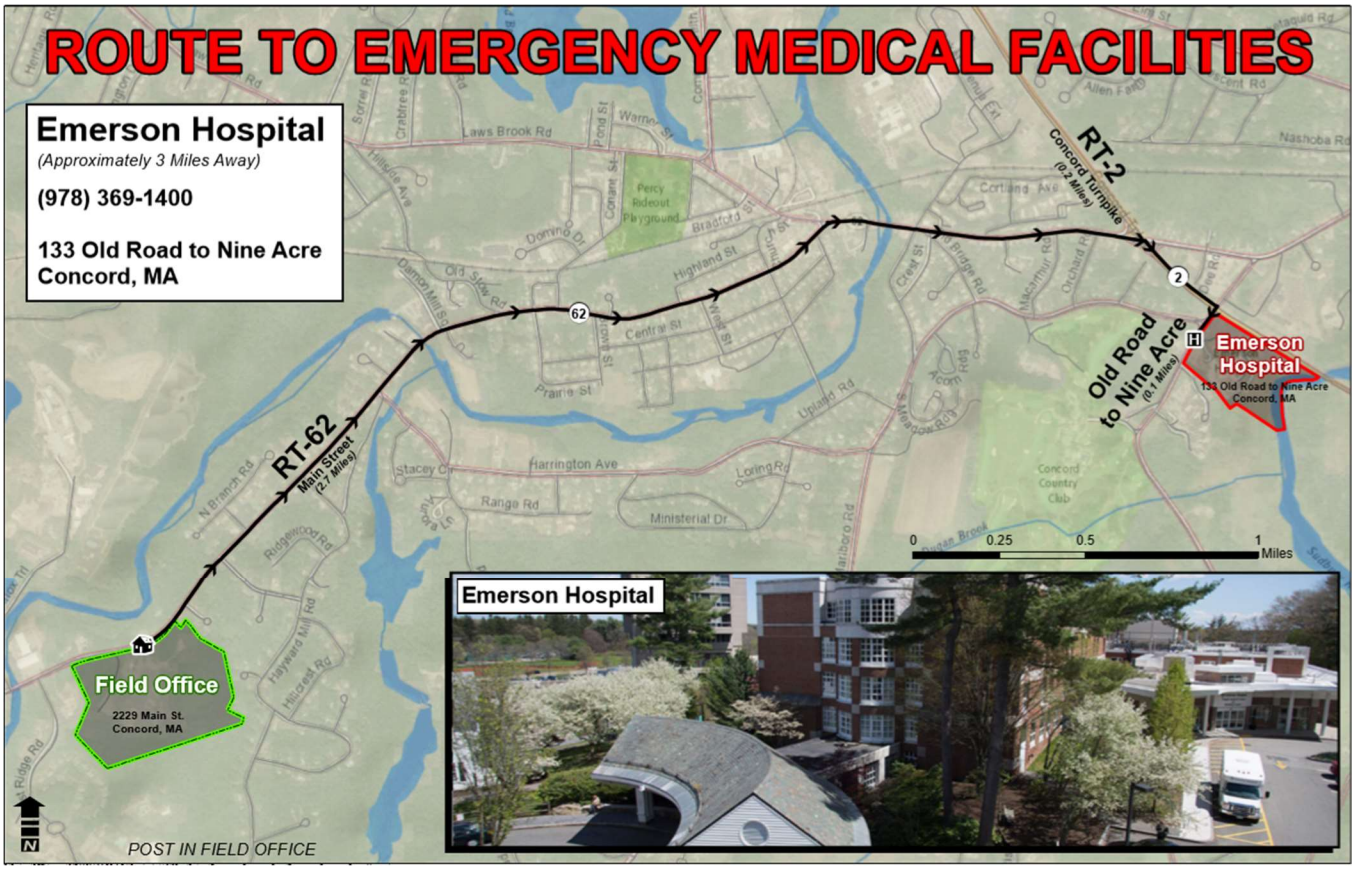
133 Old Road to Nine Acre

Concord, MA 01742

(978) 369-1400

Emerson Hospital provides 24-hour emergency medical care along with the services of a critical care center. A map of directions to Emerson Hospital is presented in Figure 1.3 below:

Figure 1-3 Hospital Location



At least one person qualified to perform first aid will always be present on the Site during work activity. Persons trained in first aid will have earned a certificate (or equivalent) in first-aid training from the American Red Cross. Additional training for re-certification will be performed as needed to ensure trained worker's certifications do not expire. First aid will be rendered to any person injured while on the Site as appropriate.

2.0 REMEDIAL DESIGN WORK PLAN OVERVIEW

The RDWP presents a description of the Site's ownership history, facility layout, past operations, previous environmental investigations and removal actions, and distribution of contamination. The RDWP details the technical operations approach for major work elements and includes the following attachments:

- Supporting Deliverables which include the following elements:
    - CRSP
    - HASP
    - ERP
    - FSP
    - QAPP
    - SWMP
    - CRSP

A detailed summary of the purpose and components of each of these plans is provided in Section 5.1 of the RDWP.

3.0 ORGANIZATION AND RESPONSIBILITIES

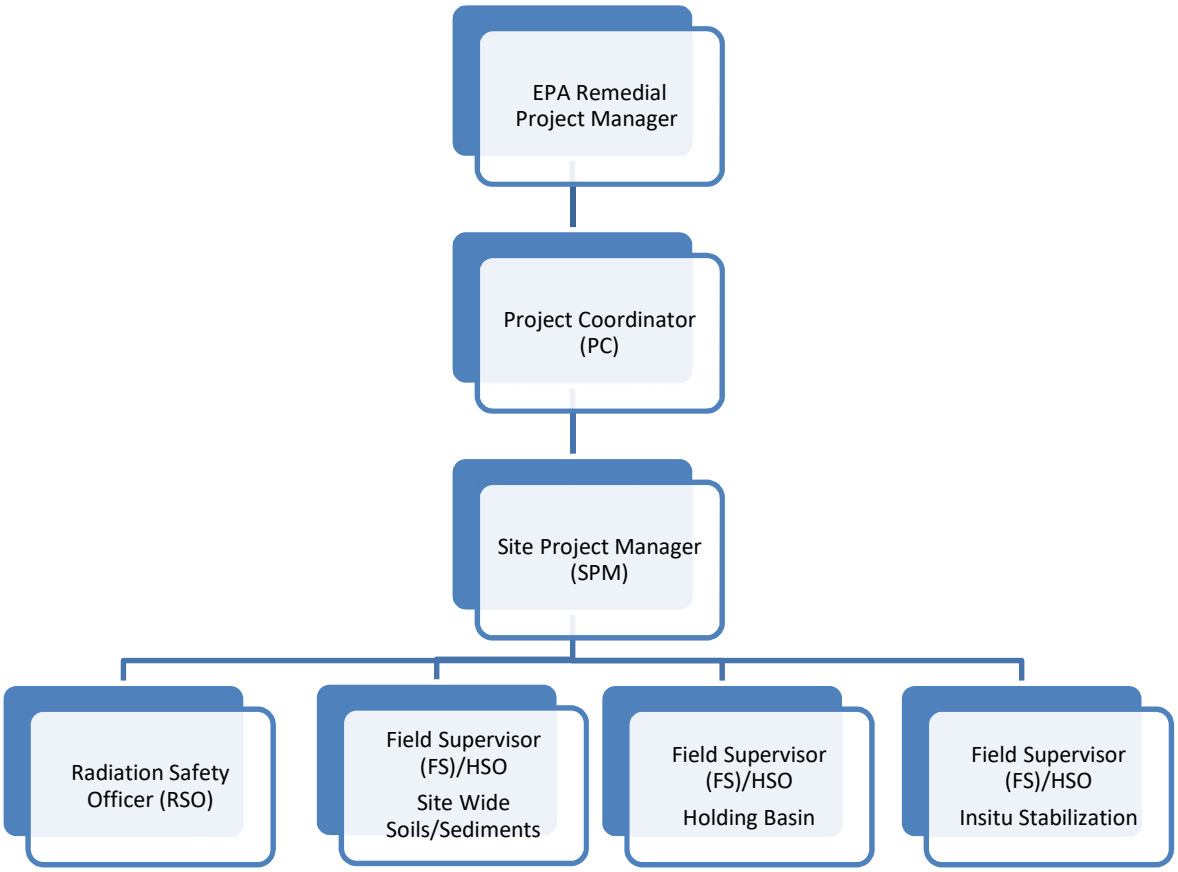
3.1 Site Communication Lines of Command

In accordance with the procedures set forth in this HASP, all members of each contractor will report to their company's Field Supervisor (FS). The Field Supervisors will also act as the Health and Safety Officer (HSO) for all work being performed under their firm's scope. FS/HSOs will be responsible to report to the Site Project Manager (SPM) for any manners involving health and safety. In addition to contractor specified FS/HSOs, a Radiation Safety Officer (RSO) will work in conjunction with the contractor FS/HSO in order to monitor health and safety measures that pertain to radiological contaminants and their handling. As with the FS/HSO, the RSO will report directly to the SPM for health and safety concerns.

The SPM will communicate with the Project Coordinator (PC). The SPM will coordinate emergency activities and contact local emergency response authorities if needed. In case of evacuation, see Section 8 and Section 12 for information on evacuation procedures and communication requirements.

The reporting responsibilities of specific project personnel are defined in the organizational chart below. Due to the importance of health and safety to the project, these roles and reporting structure is an operational guideline. If health and safety concerns are neglected, it is imperative that all site employees have the authority to stop work and report along the project management organizational structure until their concerns are addressed.

Figure 3-1 Organizational Chart



The SPM will coordinate with local authorities (e.g. police, fire, etc.) should an event rise to that level of concern.

3.2 Project Coordinator (PC)

The PC is responsible for administration of all actions by Settling Defendants required by the Settlement Agreement. The PC is responsible for supervising and directing the implementation of the RD/RA. The PC coordinates activities with EPA's remedial project manager (RPM) and is the interface between the community and the Settling Defendants on matters related to the RD/RA.

3.3 Site Project Manager (SPM)

The SPM reports to the PC and is responsible for overseeing all activities at the Site, including interacting with the regulatory agencies (e.g. Agencies, local municipalities, etc.), preparing reports and work plans, and processing and evaluating data. The SPM will establish project needs and monitor work in progress to ensure final deliverables adhere to requirements. The SPM's responsibilities include ensuring that all work incorporates

the HASP requirements into work plans and ensures support is provided for personnel engaged in safety related tasks. The SPM will coordinate any addenda or modifications of this HASP.

The SPM or designee will always be present at the Site during the performance of intrusive site activities and is responsible for directing the daily physical work. The SPM is the on-site individual responsible to implement emergency procedures and will determine appropriate response actions with the PC. Depending on the circumstances and time permitting, the SPM will review proposed response actions with the FS/HSO and/or RSO. Specific responsibilities for the SPM include:

- Evaluating and assessing emergency incidents or situations
- Assigning personnel and coordinating emergency response activities
- Communicating the specific hazards to field personnel
- Notifying the FS/HSO, RSO, and PC of an emergency
- Notifying appropriate emergency response agencies (and coordinating with the PC)
- Evaluating the safety of personnel in the event of an emergency and coordinating any necessary evacuation

3.6 Field Supervisors/Site Health and Safety Officer (FS/HSO)

Due to the nature of the work, subcontractor field supervisors will also be responsible for the role of Health and Safety Officers for their employees and firms working under them. FS/HSOs have the principal work area safety responsibility for their personnel. FS/HSOs ensure this responsibility is effectively carried out by integrating safety procedures into work plans and communicating safety requirements to workers each day. FS/HSOs monitor work to ensure work is being conducted as planned and in a safe manner.

The FS/HSO reports to the SPM and will work in coordination with the RSO and SPM to facilitate implementation of the requirements of this HASP. The contractors' site safety officer's name and contact information is listed in Table 3-1 of the RDRA Emergency Response Plan. The FS/HSO is responsible for assessing work area safety procedures and is a technical consultant to the project, SPM and workers. The FS/HSO shall perform field observations to ensure workers are implementing work in accordance with this HASP and State and Federal Safety regulations, assist with the development and presentation of safety briefings, review JSAs and work plans, and complete Loss and Near-Loss investigations as needed. The FS/HSO will confirm worker training requirements are satisfied prior to personnel to entering the site.

The FS/HSO will focus on health and safety issues related to the non-radiological portions of the HASP. The FS/HSO shall review radiological work plans as prepared by the RSO to ensure both radiological and traditional health and safety requirements are achieved.

The FS/HSO can recommend to the SPM and PC that Site access of individual Site personnel or companies be restricted or eliminated for non-compliance with this HASP or other health and/or safety reasons.

The FS/HSO has direct responsibility for adherence to the designated safety procedures in an emergency response situation. The FS/HSO shall account for on-site personnel during an evacuation or serious emergency and report to the SPM that all personnel are accounted for or if personnel are missing. In case of evacuation, see Section 8 and Section 12 for further information on evacuation procedures and communication requirements.

Emergency communication by the FS/HSO may require the following actions:

- Coordination with outside emergency services and emergency response personnel (communicating with the SPM and PC as soon as practical following an emergency event)
- Establish and demonstrate viability of two-way radio communications and site alarms or other procedures capable of warning site personnel and summoning assistance, e.g., air horn, site radio notification, etc.
- If an accident occurs, the FS/HSO shall immediately investigate what occurred and provide a copy of the Incident Report to the SPM. The Incident Report shall include, at a minimum, a solution that shall be implemented to prevent or minimize similar incidents from re-occurring on-site. The FS/HSO may use all site incidents as "lessons learned" that may be reviewed during the morning tailgate safety briefings.

3.7 Site Radiation Safety Officer (RSO)

The RSO reports to the SPM and serves as an independent assessor of radiological safety and acts as a technical consultant to the PC, SPM, FS/HSO, and personnel. The RSO assists each FS/HSO with the integration of radiological safety requirements into their work plans and daily briefings. The RSO is responsible to work with the FS/HSO for the delivery of site-specific radiological safety training and approving personnel for site work based on their medical surveillance and training documentation.

For non-radiological work issues, the RSO will coordinate with the FS/HSO to incorporate safety requirements into radiological work plans such that both radiological and traditional safety requirements are achieved. The RSO can recommend to the SPM and PC that access to the Site of individual personnel or companies are restricted or eliminated for health and/or safety violations, insufficient training or other safety related issues.

3.8 All Workers

All personnel working at the site are responsible for following safe work practices and requirements specified in this HASP, project work plans and company specific Job Safety Analysis (JSAs). Workers are expected to monitor the workplace for unsafe conditions and unsafe acts and respond immediately to assist with the correction of these hazards by notifying their FS/HSO, the SPM or the RSO. All site workers have Stop Work Authority (SWA) which may be implemented at any time without fear of retribution or punishment. Anyone invoking their SWA must immediately notify their supervisor after the work environment is placed in a safe condition. The supervisor shall immediately notify the site FS/HSO, RSO and/or SPM.

3.10 Visitors

A visitor is anyone not contracted to work on this project or an employee of a contractor who has not completed the training and medical surveillance requirements of this HASP. Visitors may include representatives of Federal, State or local agencies. Visitors must be briefed on the requirements of the HASP, their responsibilities while on-site, the need to have an escort at all times while in the work area, and the opportunity to ask questions. Visitors must sign a Visitor Safety Orientation Form as an acknowledgement that they have received the aforementioned information regarding site hazards and requirements. All visitors must be escorted by a fully trained and qualified Site worker. The exception to this escort requirement is access to the administrative areas which include the office trailers and parking lot outside of the active work areas.

4.0 ACTIVITY HAZARD ANALYSIS

The major components that shall be implemented as part of the RD/RA are:

- Operate the Groundwater Treatment System, including periodic monitoring and maintenance and replacement of standard treatment chemicals (e.g. Sodium Persulfate, sodium hydroxide, etc);
- Conduct periodic groundwater elevation and groundwater water quality monitoring events;
- Completion of additional pre-design sampling and investigative activities as well as field scale pilot testing;
- Extraction and ex-situ treatment of VOCs and 1,4 dioxane in overburden and bedrock aquifers;
- Excavation of ~85,000 cubic yards of soil
- Break up ~180k square feet of concrete slab
- Screen for/handle of depleted uranium
- Excavation of sediments from the sphagnum bog and cooling water pond
- Installation of bedrock wells for monitoring and extraction
- Installation of a ~95-foot-deep containment well (likely slurry or similar) and
- In-situ Stabilization (via injection) of uranium in soils (~95 feet)

4.1 Site Hazards

This section provides a general hazard assessment for hazards which may be encountered during the RDRA. The following potential hazards have been identified:

- Inhalation of dust (ex. silica) and/or VOCs;
- Asbestos containing materials (ACM), (e.g., cement drainpipes);
- Dermal (skin and eye) contact with contaminants;
- Ingestion of contaminants;
- Physical hazards associated with the use of heavy equipment;
- Noise exposure;
- Radiation exposure;
- Trip/fall hazards;
- Physical restrictions and burdens imposed by use of PPE;
- Heat stress (depending on season);

- Ice hazards (depending on season);
- Cold exposure (depending on season);
- Flammable hazards;
- Energized sources;
- Excavations; and
- Biological hazards (ticks, mosquitos, wasps, etc.)
- Chemical & Physical Hazards associated with the operation of the Groundwater Treatment System (ex. Sodium Hydroxide, Noise, etc.)

4.2 Chemical Hazards

This section describes the highest potential chemical hazards that may be encountered at the Site. Table 4-1 is a summary of possible chemical contaminants of concern (COCs) and exposure limits. If any new hazards are identified, they will be communicated to site personnel in tailgate safety meetings and in modifications to this HASP.

4.2.1 VOCs

VOCs include a variety of chemicals that are used in glue, paint, solvents, and other products and easily evaporate. Common VOCs include trichloroethylene (TCE) and tetrachloroethene (PCE). Both compounds are found in on-site groundwater at concentrations that exceed the MCL of 5 ug/L. Low concentrations of chlorinated VOCs have been detected in soils at the Drum Burial Area, Old Landfill and the Industrial Drain Lines.

4.2.2 SVOCs

Semi-volatile Organic Compounds (SVOCs) are chemicals that may vaporize when exposed to temperatures above room temperature. The SVOC 1,4-dioxane is present in groundwater at the Site above the risk-based cleanup level of 0.46 ug/L. 1,4 – Dioxane is believed to have been included as a stabilizer in solvents historically used at the Site.

4.2.3 PCBs

Areas of the Site that accepted wastewater and dredged materials from the Cooling Water Recharge Pond and the Sweepings Piles have been contaminated with Poly-Chlorinated Biphenyls (PCBs) above the cleanup level of 1 ppm. Surface soils around the transformer pads located adjacent to Building B, and east of Building D may also contain PCBs. PCBs have been detected in sediments within the Sphagnum Bog which is located at the base of the berm between the Cooling Water Recharge Pond and the bog where PCB-impacted soils are located. Two PCB-contaminated sediment and soil samples ≥ 50 ppm are in the Cooling Water Recharge Pond and Sweepings Pile. Compliance with the PCB regulations

40 CFR Part 761 shall be maintained during all phases of work involving ≥ 50 ppm PCB-contaminated soils and/or sediments.

4.2.4 Beryllium

Beryllium was present in drums that were removed from a buried trench that was located between the Cooling Water Recharge Pond and the Holding Basin as part of the December 2004, Remedial Investigation Feasibility Study (RI/FS). Beryllium may also be present within soils at the Old Landfill area, which may have been used for the disposal of solid waste from the research and development laboratories on-site. During the RI, ground penetrating radar was used to identify metallic anomalies within the Old Landfill. Due to safety concerns at the time, these areas were avoided during the collection of soil samples. Because of this, it is possible that previous soil samples did not characterize the highest levels of beryllium contamination in this area

4.2.5 Copper

Neutralized nitric acid solution containing dissolved copper and DU was discharged to the unlined Holding Basin between 1958 and 1985. Various facility drain lines from the buildings also appear to have discharged to the Holding Basin. The primary receiving media were vadose zone soils and saturated soil below, adjacent, and surrounding the Holding Basin, and groundwater below the Holding Basin. Copper is also present within Cooling Water Recharge Pond and Sphagnum Bog sediments. The extent of contamination in sediments is largely defined by areas where copper, PCBs, and/or DU exceed cleanup levels

Table 4-1 – Chemical Contaminants of Concern

Contaminant Name (Synonyms)	Appearance & Physical Form (Pure substance)	OSHA PEL/ NIOSH REL/ ACGIH TLV	STEL	IDLH	Routes of Entry	Potential Health Effects (Acute & Chronic)	PID Ionization Potential
Arsenic (Inorganic)	Silver-gray or tin-white, brittle odorless solid	0.010 mg/m^3 0.002 mg/m^3 (REL) 0.01 mg/m^3 (TLV)	N/E	5 mg/m^3	Inhalation Skin absorption Skin and/or eye contact Ingestion	Ulceration of nasal septum, dermatitis, gastrointestinal disturbances peripheral neuropathy, respiratory irritation, hyperpigmentation of skin (potential occupational carcinogen)	NA
Asbestos	White, or greenish (chrysotile), or blue (crocidolite), or gray-green (amosite), fibrous, odorless solid	< 0.1 fibers per cm^3	NA	NA	Inhalation, Ingestion, Skin or eye contact	Asbestosis, dyspnea, restricted decreased pulmonary function, irritation eyes	NA
Beryllium	METAL hard, grey-white, brittle solid	0.2 µg/m^3 (PEL) 0.5 µg/m^3 (REL) 0.05 µg/m^3 (TLV)	2.0 µg/m^3 (STEL) Ceiling 5 µg/m^3 (30 min) Max peak 25µg/m^3	4000 µg/m^3	Inhalation Contact (skin and or eye)	Berylliosis (chronic exp), anorexia, weight loss; lassitude (weakness, exhaustion), chest pains, cough, clubbing of fingers, cyanosis, pulmonary insufficiency, irritation eyes, dermatitis [potential occupational carcinogen]	NA

Contaminant Name (Synonyms)	Appearance & Physical Form (Pure substance)	OSHA PEL/ NIOSH REL/ ACGIH TLV	STEL	IDLH	Routes of Entry	Potential Health Effects (Acute & Chronic)	PID Ionization Potential
Copper (dust)	Reddish, lustrous, malleable, odorless solid	1 mg/m^3 1 mg/m^3 (REL) 1 mg/m^3 (TLV)	N/E	100 mg/m^3	inhalation, ingestion, skin and/or eye contact	Eyes, skin, respiratory system, liver, kidneys (increased risk with Wilson's disease)	NA
Lead	Heavy, ductile, soft gray solid, often present in paint from pre-1977.	0.50µg/m^3	N/E	100 mg/m^3	Inhalation Contact Ingestion	Weakness, insomnia, facial pallor, constip, abdom pain, anemia, tremor, kidney disease, irrit eyes, hypotension	NA
Polycyclic Aromatic Hydrocarbons (PAHs)/Coal tar Pitch Volatiles (benzene soluble fraction), anthracene, BaP, phenanthrene, acridine, chrysene, pyrene)	Black or dark brown amorphous residue	0.2 mg/m^3 0.1 mg/m^3 (cyclohexane extractable fraction) (REL) 0.2 mg/m3 (benzene soluble aerosol) (TLV)	N/E	80 mg/m^3	Inhalation Skin and/or eye contact	Dermatitis, bronchitis (potential occupational carcinogen)	NA
Polychlorinated Biphenyls (PCB, chlorodiphenyl 42% chlorine)	to pale yellow, viscous liquid with mild hydrocarbon odor	1 mg/m3 (PEL) 0.001 mg/m^3 (REL) 1 mg/m^3 (TLV)	N/E	5 mg/m3	Inhalation Absorption Ingestion skin and/or eye Contact	Irritation eyes; chloracne; liver damage; reproductive effects (potential occupational carcinogen)	NA

Contaminant Name (Synonyms)	Appearance & Physical Form (Pure substance)	OSHA PEL/ NIOSH REL/ ACGIH TLV	STEL	IDLH	Routes of Entry	Potential Health Effects (Acute & Chronic)	PID Ionization Potential
Polychlorinated Biphenyls (PCB, chlorodiphenyl 54% chlorine)	Colorless to pale yellow, viscous liquid or solid with mild hydrocarbon odor	0.5 mg/m^3 (PEL) 0.001 mg/m^3 (REL) 0.5 mg/m^3 (TLV)	N/E	5 mg/m3	Inhalation Absorption Ingestion skin and/or eye Contact	Irritation eyes; chloracne; liver damage; reproductive effects (potential occupational carcinogen)	NA
SVOCs - Dioxane	Colorless liquid or solid (below 53°F)	100 PPM (360 mg/m^3) 20 PPM (TLV)	N/E	500 PPM	Inhalation Absorption Ingestion skin and/or eye Contact	irritation eyes, skin, nose, throat; drowsiness, headache; nausea, vomiting; liver damage; kidney failure; [potential occupational carcinogen]	NA
Silica (respirable)	Colorless, odorless solid	0.05 mg/m^3 0.05 mg/m^3	N/E	Ca [25 mg/m^3 (cristobalite, tridymite); 50 mg/m^3 (quartz, tripoli)]	inhalation, skin and/or eye contact	Cough, dyspnea (breathing difficulty), wheezing; decreased pulmonary function, progressive resp symptoms (silicosis); irritation eyes; [potential occupational carcinogen]	NA

Contaminant Name (Synonyms)	Appearance & Physical Form (Pure substance)	OSHA PEL/ NIOSH REL/ ACGIH TLV	STEL	IDLH	Routes of Entry	Potential Health Effects (Acute & Chronic)	PID Ionization Potential
Uranium Insoluble	Radioactive Metal: silver-white malleable, ductile, lustrous, solid.	0.25 mg/m3(PEL) 0.2mg/m^3 (REL) 0.2 mg/m^3 (TLV)	0.6 mg/m3	10 mg/m3	Inhalation Ingestion Skin and/or Eye Contact	Dermatitis; kidney damage; blood changes, in animals: lung lymph node damage. Potential for cancer is related to alpha – emitting properties and radioactive decay (potential occupational carcinogen)	NA
Uranium Soluble	Radioactive Metal: silver-white malleable, ductile, lustrous, solid.	0.05 mg/m3(PEL) 0.05 mg/m^3 (REL) 0.2 mg/m^3 (TLV)	0.6 mg/m3	10 mg/m3	Inhalation Ingestion Skin and/or Eye Contact	lacrimation, conjunctivitis, short breath, cough, chest rales, nausea, vomiting, skin burns, red blood cells, casts in urine, proteinuria, high blood urea nitrogen, potential for cancer is a result of alpha-emitting properties and radioactive decay products,	NA
VOCs - Tetrachloroethylene	Colorless liquid with a mild chloroform-like odor	100 PPM 25 PPM (TLV) Ceiling 200 PPM Max Peak 300 PPM 5 min in any 3 hr	100 PPM	150 PPM	Inhalation Skin absorption Ingestion Skin and/or eye contact	Irritation eyes, skin, nose, throat, respiratory system; nausea, flush face, neck, dizziness, incoordination, headache, drowsiness,	9.32 eV

Contaminant Name (Synonyms)	Appearance & Physical Form (Pure substance)	OSHA PEL/ NIOSH REL/ ACGIH TLV	STEL	IDLH	Routes of Entry	Potential Health Effects (Acute & Chronic)	PID Ionization Potential
VOCs - Trichloroethylene	Colorless liquid (unless dyed blue) with a chloroform-like odor	100 PPM Ceiling 200 PPM Max Peak 300 PPM 5 min in any 2 hr 10 PPM (TLV)	25 PPM	1000 PPM	Inhalation Skin absorption Ingestion Skin and/or eye contact	Irritation skin, eyes, headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremors, drowsiness, nausea, vomiting, dermatitis, cardiac arrhythmias, paresthesia, liver injury (potential occupational carcinogen)	9.45 eV
Sodium Hydroxide (Water Treatment Plant)	White Solid	2 mg/m3 TWA; 2 mg/m3 Ceiling; 2 mg/m3 Ceiling	2 mg/m3	10 mg/m3	Inhalation Ingestion Skin and/or eye contact	Strongly irritating and corrosive. Can cause severe burns and permanent damage to tissue. burns in the mouth, throat, stomach, and GI tract as symptoms of ingestion. Irritating to respiratory tract	NA

Notes:

<	Less than
>	Greater than
°C	Degrees Celsius
°F	Degrees Fahrenheit
µ/m³	Micrograms per cubic meter
g	Gram
g/ml	Grams per milliliter
C	Ceiling is the employee's exposure, which shall not be exceeded during any part of the work day
IDLH	Immediate danger to life and health
lbs	Pounds
LEL	Lower explosive limit
m³	Cubic meters

a.	**Hazard properties**
Carc	carcinogen
Cocarc	cocarcinogen
Cor	corrosive
Expl	explosive
Flam	flammable
Inf	infectious
Mut	mutagenic
Narc	narcoti
Rad	radioactive
React	reactive
Scarc	suspected carcinogen
Tera	teratogen

b.	**Acute exposure symptoms:**
Abd	abdominal pain
CNS	central nervous system depression
Coma	comatose
Conf	confusion
Conv	convulsions
Decr	decreased
Diar	diarrhea
Diz	dizziness
Drow	drowsiness
Eye	eye irritation
Fevr	fever
Head	headache

Notes:

mg/l	Milligrams per liter
mg/m^3	Milligrams per cubic meter
mg/kg	Milligrams per kilogram
mm	Millimeter
N/A	Not applicable
N/E	None established
N/F	Nonflammable
N/I	No information is available
ppb	Parts per billion
ppm	Parts per million
UEL	Upper explosive limit

a.	**Hazard properties**
Tox	toxic
Vol	volatile

b.	**Acute exposure symptoms:**
Naus	nausea
Nerv	nervousness
Resp	respiratory system irritation
Skin	skin irritation
Sweat	sweating
Trem	tremors
Uncon	unconsciousness
Vom	vomiting

4.3 Radiological Hazards

Depleted uranium (DU) is present within the overburden groundwater and natural uranium is present within bedrock groundwater. The primary source of DU at the Site is historical disposal at the Holding Basin. Other potential sources of DU at the Site include particulate emissions from building roof stacks, spills, and discharge of contaminated water or fluids to the Cooling Water Recharge Pond.

The soils within the Holding Basin footprint above and below the water table are identified as principle threat material. The maximum concentration of DU in the Holding Basin soils is approximately 12,000 mg/kg and the average concentration is approximately 93 mg/kg. These materials are located at least 20 feet below ground surface. In addition, at one location in the industrial courtyard near an old transformer, DU in the surface soils was reported at a concentration of 5,070 mg/kg.

Low concentrations of DU were detected in surface soils at the Site, generally surrounding the buildings, as well as in soil/sediment in parking lot drainage swales and outfalls. The Depleted Uranium Metal Exterior Site Characterization Survey was completed on the exterior portions of the site in September of 2013 as part of the NTCRA. The purpose of this characterization was to locate discrete pieces of DU in surface soils (up to 6 inches in depth) and evaluate asphalt and concrete paved areas not previously identified for remediation as part of the Feasibility Study (FS). Discrete pieces of DU along with impacted soils was removed and disposed of as part of the NTCRA.

DU has also been detected at elevated concentrations in sediments within the Cooling Water Recharge Pond and the soils surrounding this area. This suggests that DU was released to the Cooling Water Recharge Pond either by floor drain lines that discharged to the pond; by historical breaches or overflow of the Holding Basin; or by discharge of cooling water that was contaminated with DU.

Unlike the DU plume in overburden groundwater, there is no clear source of uranium with a natural isotopic signature for the bedrock groundwater. The source of elevated uranium

in bedrock groundwater is most likely naturally occurring uranium minerals in bedrock. Uranium may have been released to groundwater from the bedrock matrix due to natural variability in groundwater geochemistry, or as a result of site-related activities that may have altered bedrock groundwater geochemistry.

In order to provide detailed guidance on work that may include exposure to these contaminated matrices, a site-specific Radiation Protection Program has been developed. The Radiation Protection Program is in Appendix A.

4.4 Physical Hazards

This section describes the physical hazards that may be encountered at the Site. As new hazards are identified, they will be communicated to site personnel in the tailgate safety meetings and in modifications to this HASP.

Potential physical hazards include:

- Confined space
- Ergonomic
- Burns and fire hazards
- Cut/puncture
- Electrical hazards
- Excessive noise
- Slips, trips, and falls
- Hit by objects or equipment/pinches
- Excavation and trenching
- Cold stress
- Heat stress

These potential Hazards are addressed in the Appendices of the HASP.

4.5 Confined Space

The necessity of confined space work will be determined by the Field Supervisors. Contractors and subcontractors must perform entry into confined spaces in accordance with OSHA 29 CFR 1910.146 and Subpart AA of 29 CFR 1926. A list of permit confined spaces currently located on-site is included as Table 1 of Appendix H, the Confined Space Program which will be updated and maintained by the SPM. The SPM shall communicate the location and potential hazards of each space as part of the initial site safety training as well as tailgate safety meetings. Field supervisors are required to inform the SPM when a permit required confined space entry is necessary.

Potential hazards associated with permit required confined space entry include:

- Possible buildup of toxic, combustible, or oxygen-deficient/enriched atmospheres;

- Uneven/slippery surfaces;
- Physical isolation of the employee(s) when in need of rescue;
- Inwardly converging walls or the potential for engulfment; and
- Falls

The confined space entry program is in Appendix H.

4.6 Ergonomics

Ergonomics is an applied science of arranging things that people use to promote a safe and efficient interaction between those items and workers. Ergonomics can help to reduce or prevent musculoskeletal disorders (MSDs), which affect an individual's muscles, nerves, blood vessels, ligaments and tendons. Risk factors that may develop MSDs include lifting heavy items, bending, reaching overhead, pushing and pulling heavy loads, working in awkward body postures and performing the same or similar tasks repetitively. Exposure to these known risk factors for MSDs increases a worker's risk of injury.

Risk factors that may develop into MSDs include - exerting excessive force (lifting heavy objects, pushing or pulling heavy loads, etc.), performing the same or similar tasks repetitively, working in awkward postures or being in the same posture for long periods of time (kneeling, squatting, etc.). Localized pressure into the body part (using the hand as a hammer), cold temperatures, and vibration (hammer drills, portable grinders, chainsaws) may develop MSDs.

In order to prevent MSDs for any site-worker, workers are encouraged to be vocal of workspaces that cause discomfort. The FS/HSO will work to remedy the situation and minimize exposure to uneasy conditions to the best of their ability. Due to the nature of the work, some work days may be less comfortable than others, however the FS/HSO will do their best to provide proper remedies (e.g. heavy lifting equipment, team lifts for items over 50 lbs., space for movement and proper breaks to relieve workers from awkward positions).

4.7 Burns and Fire Hazards

Work activities such as cutting, grinding and welding are potential fire and burn hazards on-site. Contractor and subcontractor personnel are required to perform such activities under a Burn or Hot Work Permit. The FS/HSO and SPM require notification prior to the beginning and following the completion of any hot work on-site. Copies of all Hot Work Permits must be submitted to the FS/HSO upon completion.

Burn and fire hazards can also result from improper electrical wiring in equipment, improper storage of flammable material (such as gasoline), improper disposal of oil-soaked rags or improper disposal of smoking material. Contractor and subcontractor Field Supervisors are responsible for ensuring all equipment is inspected prior to, and

throughout its use for damage. All damaged equipment must be tagged out and immediately taken out of service. Flammable materials must be stored in the flammable storage area. Smoking is only permitted in designated locations.

The Hot Work Procedures are in Appendix B

4.8 Cut/Puncture

Potential cut and/or puncture hazards may include, but are not limited to, the use of box-cutters, old fencing, site debris chainsaws, as well as coming in contact with discarded trash or construction debris (ex. board with nails) on-site. Field supervisors shall ensure good housekeeping is always maintained on site grounds. Additional PPE such as protective aprons, chaps, cut resistant gloves or sleeves may be required where cut/puncture hazards are present. In addition, consideration should be given towards utilizing safer tools to minimize the potential for serious injury such as the use of "safety" auto retractable box cutters in lieu of standard utility knives.

The Bloodborne pathogen protection program is in Appendix D.

4.9 Electrical Hazards

Overhead electrical utilities are present throughout the site which may be obscured from view by trees. Underground power lines are also present to support site lighting. Live electrical panels which power office trailers and equipment are also present. In addition to the direct contact hazard, there is the potential for a secondary contact from a poorly grounded generator, or the placement of extension cords, and/or tools in water.

Live electrical panels and breakers must be clearly labeled to ensure all personnel are aware of the hazard and are knowledgeable on what they power/function. Field supervisors shall check extension cords periodically for damage and dispose of/or repair in accordance with manufacturer's recommendations. Field supervisors shall ensure a ground fault circuit interrupter (GFCI) is always functional and being used when using electrical tools or equipment.

The Energy Control Program is in Appendix G.

4.10 Excessive Noise

Most activities that utilize heavy machinery and powered equipment have the potential to produce excessive noise. Movement of construction vehicles as well as use of jack hammers and high-speed saws will result in high noise levels that warrant engineering controls and personal protective equipment. Field supervisors are required to ensure personnel are not exposed to excessive noise through monitoring and are protected from dangerous sounds levels by using the proper PPE.

The Hearing Conservation Program is in Appendix C.

4.11 Slips, Trips, and Falls

Arrangements of soil, tools, equipment, and other objects will change frequently during RD/RA activities which may create conditions for workers to be injured by slips, trips, and falls. Field supervisors shall always follow basic housekeeping requirements and ensure tools and equipment is stored properly at the end of each day.

Personnel accessing and monitoring site wells are also subject to potential slips, trips and falls due to vegetations, slippery slopes and uneven footing. To mitigate risks, proper footwear and caution is expected to be used during monitoring activities.

4.12 Heat Stress

Work performed in hot weather with exposure from direct sun increase the potential for heat related injury or illness to workers. Use of additional PPE, such as a modified Level D (ex. hard hat, safety glasses, safety boots and nitrile gloves) presents an increase potential for heat related injury or illness. Heat stress monitoring, and controls (administrative and/or engineering) shall be implemented during hot weather conditions.

The Heat Stress Safety Program is in Appendix I.

4.13 Struck by/Equipment Pinches

All tasks where there is moving construction equipment involve the potential for “caught between” or “struck by” injuries to occur. Common equipment pinch injury situations include the use of hand tools for twisting or pounding, as these tools can slip or miss and thereby cause injury to a worker.

All heavy equipment and/or vehicles where there is an obstructed view to the rear shall be equipped with functioning back-up alarms. Trained spotters will also be used to back vehicles into position for loading or unloading of materials. The Field Supervisor is required to ensure personnel complete daily, pre-use equipment inspections. This inspection shall document the required the confirmation that the back-up alarms for each vehicle is functional.

Field staff shall inspect hand tools prior to use each day. Staff shall be required to notify their supervisor in the event a damaged tool is identified. Field supervisors are responsible for removing damaged tools out of service by discarding or “tagging out” tools that need repair, or replacement.

4.14 Excavation and Trenching

Primary hazards of excavation activities include potential cave-ins due to heavy equipment operation or changing soil/weather conditions, slips, trips and fall hazards related to

equipment handling, and/or uneven or unstable surfaces, air containments within the excavation, and excessive noise from on-site equipment.

The Excavation and Trenching Safety Program is in Appendix E.

4.15 Cold Stress

Cold stress hazards occur during work at less than 4° C. In addition, wet and windy conditions enhance the impact of cold stress on workers. Consequently, any work conducted during cold days will require cold stress intervention techniques.

The Cold Stress Protection Program is in Appendix J.

4.16 Biological Hazards

Depending upon the season and specific site conditions, various biological hazards may be present at the Site. These may include such things as poison oak, poison ivy, poison sumac, flying insects, spiders, snakes, various ticks, and vermin such as mice. The presence of these hazards and the need for control measures will be determined during work planning for the RD/RA. Particular attention will be given to pits, hollows, or other shaded areas in which personnel work.

4.16.1 Animals/Rodents

Wild and domestic animals carry various diseases which can cause sickness and even death. Some common animals/rodents are field mice, rats, cats, dogs, coyotes, fox, etc. Bites from these animals can transmit rabies and a variety of other diseases, viruses, etc.

4.16.2 Ticks

Ticks are carriers of many different diseases with *Lyme disease* being the most likely hazard for work at the Site. Contact with ticks is most likely to come from work in areas where there is dense brush, high grass or leaf litter. Field supervisors shall encourage personnel to wear light colored clothing and utilize insect repellent containing at least 20% DEET prior to commencing work in wooded or overgrown areas of the site. Personnel shall perform an end of the day check to ensure ticks have not attached themselves to their body or clothing. In the event an attached tick is found, it shall be properly removed, placed in a plastic bag and frozen. The person bit should seek medical attention if redness or inflammation is present.

4.16.3 Poisonous Plants

Poison ivy and poison oak are identified by three leaves radiating from a stem. Each leaf of poison sumac has clusters of seven to 13 smooth-edged leaflets. Workers must be alert and avoid these plants. Poison ivy is in the form of a vine, while poison oak and sumac are bush-like. All produce a delayed allergic hypersensitivity. Any work activity such as brush

clearing is likely to bring workers in contact with these plants will require protective clothing to prevent contact.

4.16.4 Poisonous Snakes

There are two types of poisonous snakes indigenous to Massachusetts: copperheads and timber rattlers. These snakes are extremely rare and contact between site workers and poisonous snakes is not considered likely. Precautions used for pre-work surveying of areas should be sufficient to reduce the risk of snake bites. However, personnel should always stay alert for their presence on the site.

4.16.5 Flying Insects

Flying insects such as mosquitoes, wasps, hornets, and bees may be encountered. Walk-downs of work areas will be performed to identify potential nests of stinging insects prior to the start of activities. The use of insect repellent; the reduction in the amount exposed skin (ex. long sleeve shirts), and avoidance of perfumes and/or colognes may aid in reducing the potential for exposure to flying insects. Personnel with serious allergic responses to stings are advised to notify supervisors or co-workers of location of their prescribed EpiPen(s).

4.16.6 Spiders

The black widow and the brown recluse are two poisonous spiders found throughout the United States. The brown recluse is the spider that is most likely to inhabit the Site.

Workers are encouraged to wear gloves and use caution when work is performed in older, abandoned structures such as well houses, or storage areas. Use insect repellants, such as DEET or Picaridin, on clothing and footwear to further reduce potential for contact.

4.17 Explosive (Over-pressurization) Hazards

Explosions due to over-pressurization can occur as a result of increase in ambient temperature surrounding a container. Over-pressurization can occur if the container is not designed to handle this change in pressure and/or due to improper storage.

All flammable and combustible materials must be stored in the designated location on-site. Compressed gas cylinders, when improperly handled, have enough pressures to create an explosive projectile if the cylinder head is broken at the valve. Any handling of compressed gas cylinders will require adherence to cylinder safety rules and protection of cylinders from heat sources.

5.0 HAZARD PROTECTION PRACTICES AND CONTROLS

5.1 HIERARCHY OF CONTROLS

Controlling exposures to occupational hazards is the fundamental method of protecting site personnel. Traditionally, a hierarchy of controls has been used as a means of determining how to implement feasible and effective controls. One representation of this hierarchy is illustrated in Figure 5-1 below and summarized as follows:

- Elimination
- Substitution
- Engineering controls
- Administrative controls
- Personal protective equipment

The idea behind this hierarchy is that the control methods at the top of the list are potentially more effective and protective than those at the bottom. During the RD/RA, elimination is not always practical or possible given the nature of the work. Substitution, particularly where chemicals or tools are brought onto the Site for use will be considered whenever purchases are made.

Engineering, administrative controls and personal protective equipment will be the primary controls used at the Site. This section outlines the types of engineering controls to be employed. The subsequent sections expand upon the work practices and PPE that will be used to protect workers.

Figure 5-1 - Hierarchy of Controls

5.1.1 Engineering Controls

The preferred method of exposure prevention and mitigation is engineering controls. The principal engineering control method will involve isolation of the source from the exposed workers.

5.2 WORK PRACTICES

Personnel will adhere to established safe work practices at all times throughout the RD/RA. The following sections clarify specific work practices that will be used on this project to protect workers. Hazard types associated with field activities are identified, as well as protection practices that will be used.

5.2.1 GENERAL WORK PRACTICES

Whenever possible, contact with contaminated (or potentially contaminated) surfaces will be avoided. Puddles and discolored surfaces will be walked around, not through. Workers will not kneel or set equipment directly on potentially contaminated ground.

Entry into any controlled or exclusion zone established at the Site will be in accordance with the control document such as a task specific work plan or JSA.

Equipment and non-disposable PPE, such as respirators, gloves, boots, etc., will not be removed from controlled areas until they have been surveyed and released by a member of the radiological safety staff, when necessary. Additional decontamination procedures may be established in a task specific work plan prior to moving material or equipment from a controlled zone.

Legible and understandable precautionary labels or marking will be prominently attached to containers of debris, and contaminated protective clothing.

No food or beverages will be present or consumed in a controlled or exclusion zone. No tobacco products will be present or used, and cosmetics will not be applied in control or exclusion zones. Such products are allowed only in designated uncontrolled areas.

All personnel must observe one another for abnormalities such as:

- Changes in complexion and skin discoloration
- Changes in coordination
- Changes in demeanor
- Excessive salivation and pupillary response
- Changes in speech pattern
- Irritability or mood swing

All personnel will inform one another of non-visual abnormalities such as:

- Headaches
- Dizziness
- Nausea
- Blurred vision
- Cramps
- Irritation of eyes, skin, or respiratory tract

Any detected abnormalities will be immediately reported to the individual's FS/HSO and/or RSO.

An emergency eyewash unit will be located immediately adjacent to areas where employees handle hazardous or corrosive materials. Operations involving the potential for eye injury, splash, etc., will have locally available eye wash units capable of delivering at least 0.4 gallons per minute for at least 15 minutes.

If any on-site activities continue later than dusk, adequate lighting will be provided. The lighting will meet the lighting required specified by 29 CFR 1926.56.

Exterior hazardous work, such as handling hazardous materials and heavy loads, and equipment operation etc., will be avoided during high winds or severe storms.

Operations involving the potential for fire hazards will be conducted in a manner as to minimize the risk of fire by using non-sparking tools. Fire extinguishers shall also be immediately available along with a fire watch. Sources of ignition shall also be identified and removed from the area and when necessary, using explosion-proof instruments and/or bonding and grounding techniques. 29 CFR 1926.151(a)(3).

PPE which includes safety glasses, steel toe boots and hard hats that meet 29 CFR 1926.102, 29 CFR 1926.96 and ANSI Z89.1 will be worn during all field work activities

Any personnel willfully engaged in unsafe practices or activities during working hours or while on the Site (including parking lot) will be subject to potential removal from the project team and expulsion from the site.

5.2.2 Buddy System

The "buddy system" is a practice which prevents a worker from being isolated from other workers by providing visual contact among workers in groups of at least two members. Worker isolation prevents observations for abnormalities and delays assistance to an injured or ill worker. The "buddy system" will be used at all times by all field personnel in Controlled and Exclusion Zones. In the "buddy system," personnel must stay within the line of sight of at least one other person.

5.2.3 Dust Control

The most effective way to control dust is to minimize its initial generation. Preventive measures shall be implemented by project personnel to maintain fugitive dust emissions at levels below action levels. The following list details methods and measures that can be applied:

- Minimize dust generation during PDI work by utilizing wet methods during invasive work (drilling, test pits, etc.)
- Using dust suppressants during excavation, loading and hauling operations such as water spraying of haul roads, stockpile(s) and loading equipment
- Scheduling hauling operations to minimize trips
- Water sprays for concrete slab demolition and local water spray application at point of cutting tool use

In accordance with 29 CFR 1926.1153, a written exposure control plan must be established in addition to the exposure control methods used and implemented. The written exposure control plan will identify tasks that involve exposure to respirable silica and methods used to protect workers, including methods to restrict access to work areas where exposures may be high.

5.2.4 Tailgate Safety Meetings

The FS/HSO will conduct a tailgate safety meeting at the beginning of each shift. The topics discussed at the tailgate safety meeting will include health and safety considerations for the day's activities, necessary PPE, and potential problems with new operations. All attendees shall sign the tailgate attendance form. Attendance records and meeting notes will be maintained with the project files.

5.2.5 Access/Egress

Life safety considerations for the Site include means of egress consisting of exit access, exits and exit discharge, exit signage, and emergency lighting. Field supervisors shall ensure that exits within office areas shall be maintained clear and free at all times.

In addition, FS/HSO will ensure that work areas are maintained in a manner that will not impede a worker's ability to exit the space. In the event of an emergency, workers shall not be placed at risk due to lack of egress in any work zone.

5.2.6 Heavy Equipment Operation

Safety hazards include working with heavy equipment such as forklifts, backhoes, drill rigs, etc. Special attention must be given by personnel working in the vicinity of this equipment to remain a safe distance from moving parts and tools. The following are general safety precautions for heavy equipment operations:

5.2.6.1 Controlled Access Zones:

1. When working around heavy equipment, the following safe distances must be maintained:
   a) Non extendable equipment (ex. dump truck, bulldozer, etc.): 15 ft in front of the machine and 15 ft behind the machine (with the side limits established during the job briefing according to individual circumstances).
   b) Extendable equipment (excavator, telehandler, etc.): 10 ft beyond the maximum reach of any extended portion of the machine in any direction.
2. Personnel must not enter a machine's Controlled Access Zone without first communicating with the operator either through hand signals or a radio. Workers must maintain eye contact with equipment operators prior to entering a machine's work-zone.
3. Operators must not allow the machine to approach workers closer than 15 ft without first communicating with them using a horn, hand signals or a radio.
4. Blind spots: Where blind spots occur in potential travel areas a "spotter" will be used to communicate with the operator and warn personnel in the area of the presence of moving equipment.
5. All machinery used on-site where the operator's vision is obscured to the rear of the vehicle (ex. dump truck, etc.) will be equipped with functioning mirrors, back-up alarms and utilize a spotter when backing up.

5.2.7 Drum Handling

Due to the bulk size and weight of drummed materials, the followings precautions will be utilized during drum handling to prevent injury and minimize risk of spills.

5.2.7.1 General Safety Precautions

- All drums and containers of hazardous materials and hazardous wastes will be labeled in accordance with the regulations promulgated by the U.S. Department of Transportation (DOT) and MassDEP (310 CMR 30.341).
- Drums and containers of known or potentially hazardous waste must be closed at all times except when adding or removing waste.
- Field supervisors shall inspect drums and containers weekly and their integrity shall be assured prior to being moved.
- Work performed requiring movement of drums and containers shall be planned and organized to minimize the movement of the materials.
- When a container holding hazardous waste is not in good condition, e.g., severe rusting, apparent structural defects, or if it begins to leak, the waste must be transferred immediately to another container or otherwise processed to remedy the situation. Wastes transferred from damaged or leaking containers will not be mixed.

- Spill response materials and equipment shall be available in any area where spills, leaks, or ruptures may occur.
- Major spills shall be handled in accordance with the Emergency Response Plan.

5.2.7.2 Receiving and Storage

1. Drums should not be placed on a pallet in such a way that the edge of the drum extends beyond the edge of the pallet. The drums are to be banded together at a level in the top 1/3 of their height for safety if the pallet will be placed on another pallet of drums.
2. Wastes shall be placed in storage according to their compatibility. At no time will incompatible wastes be placed on the same pallet.
3. Drums will be placed in drum storage in rows or racks separated by aisles at least two ft (24") wide in such a way that all drums on each pallet are visible for inspection, including the label.
4. The pallets shall not be placed so that they overlap the next pallet.

5.2.9 Compressed Gas Cylinders

The following are general safety precautions for working with compressed gases (29 CFR 1926.350):

1. All compressed gas cylinders shall be stored in well ventilated areas. The cylinders shall be secured upright at all times, and when not in use, the protective cap shall be placed over the cylinder's valve.
2. Flammable substances such as oil and volatile liquids will not be stored in the same area.
3. Cylinders of oxygen will not be stored within 20 ft of cylinders containing flammable gases. If storage must be closer than 20 ft, then the cylinders shall be separated by a fire-resistive wall (such as concrete partition) at least 5 ft high and have a fire rating of at least 1/2 hour.

5.2.10 Flammable Liquids

Flammable liquids like oil, gas, kerosene and many solvents present unique fire hazards (29 CFR 1926.152). They give off invisible vapors that can travel long distances and catch fire quickly or explode when ignited by something as small as a static discharge.

Flammable and combustible liquids will be used only when a nonflammable replacement is not reasonably available. The use of these liquids will be kept to a minimum and will be returned to an approved storage cabinet or storage area when not in use. The FS/HSO must be notified of

all flammable liquids brought on-site by any personnel in accordance with the site HAZCOM Program. Flammable liquids are to be stored in approved cabinets or enclosures.

FS/HSOs shall ensure the following general safety precautions for working with flammable liquids are adhered to by their field staff:

- Keep ignition sources, such as cigarettes or hot machinery surfaces, away from flammable liquids;
- Use only in areas with good ventilation;
- Store in approved metal containers. Liquids shall be added to container using approved, metal funnel;
- Ground and bond containers when transferring materials to safely discharge static electricity;
- Take only what is needed for a job;
- Clean up spills and leaks quickly;
- Remove clothing that has absorbed liquids immediately;
- Never store near heat sources; and
- Do not cut or weld on drums or containers that once contained gasoline or other flammable liquids.

5.2.11 Corrosive Liquids

The following basic safe practices will be used when working with corrosive materials:

- Be aware of all the hazards (fire/explosion, health, chemical reactivity) of the materials you work with – review the SDS prior to use;
- Store corrosives in suitable labeled containers away from incompatible materials, in a cool, dry area;
- Store, handle, and use corrosives in well-ventilated areas;
- Inspect containers for damage or leaks before handling. Never use containers that appear to be swollen;
- Dispense corrosives carefully and under ventilation and keep containers closed when not in use;
- Wear face shields, safety goggles, longs sleeves, and double gloves, using latex or nitrile gloves, unless SDS states otherwise;
- Spill Control Kits with the appropriate clean up equipment will be present on site for all the different materials being used at the site (consult SDSs). Corrosive spill controls

typically neutralize the hazardous nature of the spilled material. Acids and bases require different types of spill control materials;

- Know where to closest eyewash station and safety showers are located, and how to use them;
- Flush contaminated eyes or skin with water for at least 20-30 minutes, sometimes longer, in case of accidental contact. Call immediately for medical assistance; and
- Do not reuse empty containers. The residue may be hazardous.

5.2.12 Electrical Safety

The existing electrical service provides power to office trailer areas, fence-line air monitoring systems, as well as site lighting, security and main gate operation.

5.2.12.1 General Electrical Safety Guidelines

- Electrical repairs will be made only under the direction of documented qualified, trained individual;
- Lock Out/Tag Out (Energy Control) procedures shall always be implemented to prevent the release of hazardous energy as workers perform maintenance activities;
- An employee's use of metal in jewelry and clothing will be limited in locations where an energized circuit can be contacted by the metal or the voltage is sufficient to cause arcing from the circuit to the metal;
- Electrical switches will be visually inspected before each use and will be replaced as necessary;
- Electrical fixtures used in hazardous atmospheres or confined spaces (tools, wiring, lights, radios, etc.) must be intrinsically safe (lights must be approved with a Class I Div. I rating) as indicated in the National Electric Code Part 500 -5;
- Electrical wiring apparatus safety procedures will be conducted in accordance with OSHA Standard 29 CFR 1926, Subpart K;
- Electrical equipment will be of a type listed by Underwriters Laboratories or Factory Mutual Engineering Corporation for the specific application;
- Electrical installations will comply with the National Electrical Safety Code or the National Electrical Code regulations;
- Electrical work shall be performed by personnel familiar with code requirements and have documented they are qualified for the class of work to be performed;
- Live parts of wiring or equipment will be guarded to protect all persons or objects from harm;

- Flexible electric cords will be covered or elevated to protect from damage by foot or vehicle traffic; and eliminate trip hazards;
- Temporary power lines, switch boxes, receptacle boxes, metal cabinets, and enclosures around equipment will be marked to indicate the maximum operating voltage;
- Patched, oil-soaked, worn, or frayed electric cords or cables shall not be used;
- Extension cords or cables will not be fastened with staples, hung from nails, or suspended by wire;
- Electrical circuits will be grounded in accordance with the National Electrical Code and the National Electrical Safety Code unless otherwise noted in the reference manuals;
- Portable and semi-portable electrical tools and equipment will be grounded by a multi-conductor cord having an identified grounding conductor and a multi-contact polarized plug-in receptacle unless it is clearly marked as “double insulated;”
- Personnel shall stay at least 10 ft away from all overhead power lines and assume they are energized;
- Semi-portable equipment, floodlight, and work lights will be grounded. The protective ground of such equipment will be maintained during moving unless supply circuits are de-energized;
- Tools protected by an approved system of double insulation, or its equivalent, need not be grounded. Double insulated tools will be distinctly marked and listed by Underwriters Laboratories or Factory Mutual Engineering Corporation;
- Flexible cord will be of a type listed by the Underwriters Laboratories. Flexible cord sets will contain the number of conductors required for the service plus equipment ground wire. The cords will be hard usage or extra hard usage as specified in the National Electrical Code. Approved cords may be identified by the word “outdoor” or letters “WA” on the jacket;
- Temporary wiring will be guarded, buried, or isolated by elevation to prevent accidental contact by personnel or equipment;
- Ground fault circuit interrupters (GFCI) are required in circuits used for portable power tools unless the tool is clearly marked as “double insulated.” Certification will be indicated by the presence of color-coded labels. GFCIs or assured equipment grounded outlets must be used in conjunction with power hand tools and cord sets which are plugged into any 15 or 20 ampere (120 VAC) outlets;

- All power tools, cord sets, and GFCIs should be inspected at least quarterly. The inspection must ensure equipment grounding conductors are continuous, each receptacle and plug is correctly wired, insulation is free of defects and GFCIs operate properly; and
- Personnel that are using such equipment are responsible for performing a visual inspection prior to each day's use for external defects, such as deformed or missing pins or insulation damage, and for evidence of possible internal damage. Defective equipment must be removed from service immediately.

5.2.13 Breaker Boxes and Junction Boxes

- All new and existing breaker switches will be labeled to identify the circuit for which it is being used;
- All new and existing breaker boxes will be labeled when there is a single switch which could interrupt power to a series of circuits;
- The area around a circuit breaker boxes will be kept clear 30 inches in all directions; and
- Bare or exposed wiring shall never be allowed.

5.2.14 Electrical Extension Cords

Cords will be inspected before each use for deterioration, fraying, or other external damage. In addition:

- Cords will not be used if damaged or frayed (damaged cords will be tagged out "Do Not Use" and placed in a separate area for repairs or discarded);
- Splicing of cords will not be permitted;
- There must be a ground plug on the cord; and
- A GFI, ground fault interrupter, must be used with all electrical extension cords, electrical power tools, and other electrical devices.

5.2.15 Electrical Lockouts

FS/HSOs shall ensure protective measures such as Lock-Out/Tag-Out is employed prior to the performance of maintenance involving energized equipment. FS/HSOs are also responsible for notifying field personnel of location and type of equipment that is locked out and will ensure site personnel do not attempt to operate locked out equipment.

Contractors shall follow their Lockout/Tag-out Standard Operating Procedure before and during any maintenance involving energized equipment (electrical or mechanical). Field supervisors shall notify the SPM of any work involving Lock-Out/Tag-Out prior to initiating such work. A

copy of the completed Lock-out/Tag-Out form shall be provided to the HSO once work is complete.

5.2.16 Electrical Panels and Boxes

When turning the power to an electrical panel on or off, *always do this by operating the switch on the outside right hand side of the box* ***WITH YOUR LEFT HAND***. This positions your face and body right of the box instead of directly in front which would provide some protection to you in the event of a panel explosion and/or panel arcing.

5.2.17 Confined Space

FS/HSOs must ensure entry into confined spaces on site is performed in accordance with OSHA 29 CFR 1910.146 and Subpart AA of 29 CFR 1926. Table 1 of Appendix H identifies the known entry points that will constitute adherence with the Confined Space Entry Program. The HSO and FS shall identify work to be performed in these areas and communicate the location and potential hazards of each space as part of the initial site safety training as well as tailgate safety meetings. Field supervisors are required to inform the SPM when permit require confined space entry is needed.

Where entry into permit required confined spaces is needed, the FS/HSOs shall ensure that the following requirements must be met prior to Permit Required Confined Space Entry:

- Confined space entrants, attendants, and entry supervisors must complete a Permit Required Confined Space Entry training. Copies of training records or certificates must be provided to the HSO prior to the start of work. Work associated with a permit required confined space entry will not be permitted unless training documentation is provided;
- A Confined Space Entry Permit (CSEP) must be completed and posted near the space entrance point for review;
- Each confined space entrant and attendant must attend a pre-entry briefing conducted by the entry supervisor and Field Supervisor;
- Each permit required confined space entrant and attendant must verify that the entry supervisor has authorized entry and that all permit or certificate requirements have been satisfied;
- Only individuals listed on the Authorization/Accountability Log are permitted to enter the space; and
- Each confined space entrant and attendant must verify that atmospheric monitoring has been conducted at the frequency specified on the permit or certificate and that monitoring results are documented and within acceptable safe levels.

The following requirements must be met during the Permit Required Confined Space Entry:

- Communication must constantly be maintained between the attendant and entrants to enable the attendant to monitor entrant status;
- Entrants must use equipment specified on the permit or certificate accordingly;
- All permit or certificate requirements must be followed;
- Entrants must evacuate the space upon orders of the attendant or entry supervisor, when an alarm is sounded, or when a prohibited condition or dangerous situation is recognized; and
- Entrants and attendants must inform the entry supervisor of any hazards confronted or created in the space or any problems encountered during entry.

The Confined Space Entry Program is located in Appendix H.

5.2.18 Fire Protection and Prevention

The following fire protection and prevention methods shall be followed throughout the RDRA activities.

- Portable fire extinguishers will be located as determined by the FS/HSO. A monthly visual inspection will be made to ensure that extinguishers are fully charged and in an operable condition. Hoses, nozzles, brackets, and supports will be inspected for deficiencies and corrected. Gauge pressure will be checked monthly by the HSO on pressurized units to ensure units are fully charged. An inspection tag will be attached to each extinguisher to designate that it has received proper inspection;
- Flammable liquids must be handled only in approved, properly labeled metal safety cans equipped with flash arresters and self-closing lids. Transfer of flammable liquids from one container to another will be done only when the containers are electrically interconnected (bonded);
- Equipment motors will be shut off during fueling operations; and
- Flammable liquids stored in metal drums will be equipped with self-closing safety faucets, vent bung fittings, and drip pans. Such metal drums will be properly grounded.

5.2.19 Housekeeping

FS/HSOs shall perform daily inspections to ensure combustible material storage remains protected and in accordance with Site requirements.

5.2.23 Fire Extinguishers

Currently, several portable fire extinguishers are installed on-site. The FS/HSO shall inform all personnel of the location and type of extinguishers located on-site to ensure all personnel are

familiar with their locations. Throughout RD/RA activities, additional fire extinguishers will be provided as necessary.

5.2.23.1 Type & Placement

- Construction equipment (cranes, bulldozers, drilling rigs, etc.) will be shipped with a functioning fire extinguisher of 10 ABC units or higher;
- Each vehicle dedicated to on-site activities will be equipped with a fire extinguisher of 5 ABC units or higher;
- Temporary offices will be equipped with a fire extinguisher of 10 ABC units or higher;
- At least one portable fire extinguisher of 20 ABC units will be located not less than 25 ft nor more than 75 ft from any flammable liquid storage area; and
- Only "Multi-Purpose" Class A-B-C dry chemical fire extinguishers, twenty (20) pound minimum with a pressure gauge, are to be used at the Site.

5.2.23.2 Training

Whenever fire extinguishers are provided employees will be trained by a Qualified Trainer in the general principles of fire extinguisher use and the hazards involved with incipient stage firefighting. The FS/HSO will document all Fire Extinguisher Training. Fire Extinguisher Training requires annual Recertification.

5.2.23.3 Inspections

Fire extinguishers shall be inspected by a FS/HSO monthly for the following:

- Location in designated place;
- No obstructions to access or visibility;
- Operating instructions on nameplate legible and facing outward;
- Safety seals and tamper indicators not broken or missing;
- Examinations for obvious physical damage, corrosion, leakage, or clogged nozzle;
- Pressure gauge reading or indicator in the operable range or position; and
- Label in place.

In addition, annual maintenance checks will be performed in full compliance with NFPA-10-6.

5.3 WORK PLANS, PERMITS & JSAS

All work conducted at the Site is governed by written work plans and/or permits. Work plans shall provide overall guidance for management of the RD/RA. It is anticipated that specific contractor construction submittals along with task specific work plans will provide detailed guidance on conduct of sub-tasks required for the completion of RD/RA work. Job Safety

Analysis shall also be utilized to inform workers of task specific hazards. The following describes the primary documents to be used for managing safety.

5.3.1 Task Specific Work Plans

Task specific work plans are procedural documents developed for complex tasks not governed by "skill of the trade" and where the RD/RA project management team deems a detailed written approach to work as a more effective means for communicating and controlling the conduct of the work. Task specific work plans may address the following:

- The scope of the task being performed;
- The equipment and materials needed to perform the task;
- The prerequisite actions needed prior to start of work. Examples are training, notifications and permit completion;
- The steps in as close to sequential order as can practically be written;
- Hold points or required inspections, certifications, sampling and/or measurements to be made as required during task implementation;
- Close-out elements to determine and verify completion of the task; and
- Documentation that needs to be produced and maintained.

All necessary safety elements should be integrated into the procedural steps.

5.3.2 Job Safety Analysis (JSA)

JSAs should be prepared for tasks with the potential to cause injuries and tasks in which one simple human error can lead to an accident or injury. FS/HSOs shall ensure JSAs are available and personnel review these documents in accordance with their Health & Safety programs. All personnel involved in a task shall have the opportunity to revise an existing JSA based on site conditions and/or personal knowledge/experience.

5.3.3 Permits

High hazard activities typically require permits that provide additional controls to govern the conduct of the work. Examples of permits required for work on this project are those permits required for entry into a Permit Required Confined Space Entry, and Hot Work Permits (HWPs). The instructions or minimum requirements for each of these permits can be found in the following Appendices to this HASP. Examples are:

Permit Required Confined Space Permit – Appendix H

Hot Work Procedures – Appendix B

5.4 RADIATION PROTECTION PROGRAM

The Radiation Protection Program (RPP) requirements are outlined in Appendix A. In addition to those program requirements, implementing procedures will be written to provide instructions to the radiation protection staff, contractor managers and workers for specific aspects of the radiological control program. The RPP procedures will, at a minimum, provide guidance and instructions on the following:

- Maintaining exposures and waste volumes "As Low As Reasonably Achievable" (ALARA)
- Personnel monitoring
- Instrumentation
- Operations (access controls, surveys, and Radiation Work Permit (RWPs)
- Respiratory protection
- Radioactive Material (RAM) control, packaging and shipping
- Contamination control
- Unconditional release of material
- Radioanalytical laboratory analysis
- Engineered controls-ventilation/containment
- Records and reporting

As a CERCLA site, the Site is not subject to any state or Nuclear Regulatory Commission (NRC) licensing. Nonetheless, the RPP will adhere to the NRC requirements in 10 CFR 19 and 20 to provide site personnel with the most conservative working conditions possible.

5.5 CHEMICAL PROTECTION PRACTICES

The chemical hazards at the Site are principally associated with potential inhalation and direct contact with residual contamination (chemical and radiological) in soil, sediment and former building components (ex. drain lines, building foundation, etc.). Radiological protection controls are addressed separately in Appendix A, Radiation Protection Program.

COCs at the Site include fragments, dust asbestos, beryllium, PCBs, copper, VOCs /SVOCs and radionuclides. Exposure pathways to COCs include dermal contact, inhalation, ingestion, and direct exposure.

A list of chemicals brought to the Site for the performance of the work as well as their Safety Data Sheet (SDSs) will be kept and processed in accordance with the site HAZCOM Program

5.5.1 Safety Data Sheets (SDSs)

SDSs are maintained by the FS/HSOs in the site field office. The SDSs will be available for all workers to review at any time while on-site. The site orientation training program will provide a

review of the site specific HAZCOM Program, which shall include information regarding the location and procedures regarding SDSs as well as container labeling and other requirements.

5.5.2 Medical Surveillance and PPE

Medical surveillance and PPE requirements will be based upon the nature of the work, the type of contaminant and the level of contamination. Field supervisors shall review the TSWP and/or JSAs for additional detailed information for PPE and process controls to minimize worker exposure. Sections 6 and 9 provide additional information on the PPE and medical surveillance programs, respectively.

5.5.3 Chemical Exposure Standards

Threshold limit values (TLV) will be the primary work exposure control parameter used for potential worker exposures. Where a substance specific standard exists within the OSHA regulations, that standard's action level and exposure limits will be used to control worker exposures. Where no TLV or OSHA Permissible Exposure Limit (PEL) exist, the National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limit (REL) or an industry established standard will be used.

ALARA practices will be used, regardless of exposure limits, to minimize worker exposure to chemical contaminants.

5.6 LIFTING AND REPETITIVE MOTION CONTROL PRACTICES

FS/HSOs shall ensure that workers are aware of tasks that may pose an increased risk of developing MSDs and implement solutions to control these hazards such as the use of mechanical devices (forklifts, etc.) Workers are encouraged to report early signs and symptoms of MSDs to reduce the progression of symptoms and subsequent development of serious injuries. Methods of preventing MSDs include:

- Limiting load lifts for a single person to 50 pounds
- Reviewing lifting techniques at the safety brief prior to conduct of the work task
- Field observation by an independent observer to assess lifting techniques (e.g. use of NIOSH lifting equation)
- Use of mechanical advantage equipment to reduce or eliminate manual lifting by personnel
- Rest periods or periodic personnel "switching" to reduce strain from repetitive tasks
- Use of two individuals to lift heavy or unusually shaped objects
- Securing the shortest path with the least obstacles for movement of materials

Individuals with concerns about lifting up to 50 pounds may request a medical surveillance screening from their OSHA physician's review of the worker's capability to physically perform the assigned project tasks.

5.7 HOT WORK

Any hot work (i.e., welding, burning, grinding, etc.) conducted must comply with the guidelines established in the Hot Work Procedures, Appendix D. The FS/HSO and SPM require prior notification when hot work is required on-site, and copies of all Hot Work Permits must be submitted to the FS/HSO upon completion.

The Hot Work procedures are in Appendix B.

5.8 NOISE

A hearing conservation program will be implemented if exposures equal or exceed an 8-hour Time Weighted Average (TWA) of 85 decibels (dB). As part of the criteria for the medical surveillance program established for the Site, audiometric testing is conducted by a qualified OSHA physician to monitor each worker's ability to hear. Sound level measuring will be conducted initially at the Site work zones and whenever new tasks are started, or additional equipment is brought onto the Site that has not previously had its sound level quantified. Enough monitoring data exists to require the use of hearing protection when operating hand power tools such as reciprocating, saws, circular saws, hammer drills, etc.

Engineering controls, such as mufflers and baffles, should be utilized when feasible to reduce noise. Hearing protection, such as disposable ear plugs, earmuffs, etc., is required to be worn by personnel working with or around equipment that can generate noise levels in excess of 85 dBA. The Hearing Conservation Program and requirements are further detailed in Appendix C to this HASP. Personnel may request and use hearing protection even if noise levels are less than 85 dBa.

5.9 SLIPS, TRIPS & FALLS

Prevention measures such as good housekeeping, level work surfaces, and defined walkways will be utilized. Use of ladders for elevated work may be required. Field Supervisors shall ensure good housekeeping is performed each day. In addition, a formal pre-use inspection is required document all aerial lifts used on-site, including rentals. Only Extra heavy duty (Type 1A) or Special Duty (Type 1AA) ladders are permitted for use on-site. Ladders must be properly stored and inspected by the HSO in accordance with manufacturer requirements.

A fall protection system (typically full body harness and lanyard) will be used to protect site workers who are exposed to unprotected sides or edges of surfaces that present a fall hazard of six (6) feet or more to a lower level and/or use aerial boom-lifts. Fall protection shall be in accordance with 29 CFR 1926 Subpart E, 1926.95, 1926.104, 1926.106, M and L, and 1926.451. Field supervisors shall notify the SPM when a fall protection system, or additional fall

protection is required. Field supervisors are required to document that site personnel are trained, and all fall protection is maintained in good condition and inspected in accordance with manufacturer requirements.

5.10 HEAT AND COLD STRESS

Heat and cold stress intervention programs are described in Appendices I and J, respectively. Field supervisors shall ensure their employees are knowledgeable on the signs and symptoms of heat and/or cold related injuries and monitor their personnel during periods of extreme weather conditions. All heat and cold related illnesses shall be reported to the FS/HSOs and the SPM.

5.11 BIOLOGICAL HAZARDS

Biological hazards that may be encountered at the Site include spores and viruses from animal dung, bacteria in soils (tetanus and hepatitis A), through ingestion of fecal contaminated materials (investigation and removal of septic field). Exposure to bacteria transmitted from ticks can result in transmission of Rocky Mountain spotted fever, Lyme disease and/or other Blood-Borne Pathogens. Less likely, is exposure to viruses through animal bites such as rabies. Employers shall ensure that workers are current with vaccinations (ex. tetanus) and receive a two-dose series hepatitis A vaccine where increased potential for exposure exists. Exposure shall also be limited though the use of PPE and good sanitary procedures (ex. frequent handwashing, etc.). Protection against insect bites include the use of insect repellent with at least 20% DEET, wearing light colored clothing, and performing tick checks throughout the day.

Although unlikely, personnel exposure to bloodborne pathogens in the event of a worker injury is also a potential. The Bloodborne Pathogen Protection Program is outlined in Appendix D of this HASP. At a minimum all workers assigned first aid duties will participate in the Bloodborne Pathogen Protection Program.

5.12 EXCAVATION AND TRENCHING

Extensive excavation and trenching work will be completed as part of the RDRA. Field supervisors will ensure that excavation and trenching activities at the Site, are performed in accordance with the Excavation and Trenching Procedure (Appendix E) and 29 CFR 1926.652. Failure to do so will result in a work stoppage.

Personnel must be protected from cave-in when an excavation is four (4) feet or more in depth. Protective systems such as sloping or benching soils as well as shield or shoring systems can be used to protect workers against the hazards associated with excavating and trenching work. Protective systems for excavations of twenty (20) feet in depth or greater must be designed by a Registered Professional Engineer (RPE) in accordance with 29 CFR 1926.652 (b) and (c).

Field supervisors are required to notify the SPM as to who shall serve as the competent person for excavation and/or trenching work as well as provide copies of daily inspections once complete.

5.13 SANITATION

5.13.1 Water

An adequate supply of drinking water will be available on-site. Liquids will be dispensed in an approved potable water system and in a manner, which prevents contamination between the consumer and dispenser. Outlets dispensing non-potable water will be posted "Non-Potable Water." Systems furnishing non-potable water and systems furnishing potable water will remain completely independent of one another.

5.13.2 Toilets

Toilets shall be provided on-site in accordance with 29 CFR 1926.51 at a minimum. Arrangements will be made for the routine servicing and cleaning of these units.

5.13.3 Trash Collection

Adequate trash receptacles will be appropriately placed for trash collection. Radiologically contaminated trash will be segregated from sanitary trash. Receptacles constructed of smooth, corrosion resistant, easily cleanable, or disposable materials, shall be provided and used for the disposal of waste food. The number, size, and location of such receptacles shall encourage their use and not result in overfilling. They shall be emptied not less frequently than once each working day, unless unused, and shall be maintained in a clean and sanitary condition. Receptacles shall be provided with a solid tight-fitting cover unless sanitary conditions can be maintained without use of a cover. Trash containers will be surveyed for unconditional release prior to being removed from the Restricted Area.

6.0 PERSONAL PROTECTIVE EQUIPMENT

6.1 LEVELS OF PROTECTION

The following is a brief description of the PPE reviewed and found appropriate for both radiological and chemical hazards expected at the Site. The PPE described may be potentially required during various phases of the project. The EPA terminology for protective equipment will be used: Levels A, B, C, D and D-modified. Contractors and their Field Supervisors shall identify the need and type of PPE to be used during the implementation for each phase of work in which they are involved and in accordance with their HASP. FS/HSOs are required to review the PPE requirements for their personnel with the SPM and RSO prior to the start of work.

6.1.1 Level A Protection

Level A protection is not anticipated during this project.

6.1.2 Level B Protection

Level B is required under circumstances requiring the highest level of respiratory protection, with lesser level of skin protection. Level B protection is not anticipated but may be required if identified as a necessary part of a hazard assessment. A reduction in the level of respiratory protection to Level C can be completed based on the results of the personal monitoring data. Contractors and or their subcontractors required to perform work where there is a potential for an upgrade to Level B shall have the equipment and training necessary to support this work.

Examples of Level B protection include positive-pressure, full face-piece self-contained breathing apparatus (SCBA) or positive pressure supplied air respirator with escape SCBA, inner and outer chemical-resistant gloves, face shield, hooded chemical resistant clothing, coveralls, and outer chemical-resistant boots.

6.1.3 Level C Protection

It is expected that Level C protection may be required for some work activities at the Site. Level C protection will be used when all the following conditions are met:

- The types of air contaminants have been identified, concentrations have been measured, and an air-purifying respirator is available that can remove contaminants.
- The substance has adequate warning properties and all criteria for the use of an air-purifying respirator have been met.
- The area is not immediately dangerous to life and health (IDLH).

Level C protective equipment at a minimum will consist of:

- Steel-toed, heavy duty, PVC boots – or boot covers over steel-toed boots;

- Tyvek coveralls with hoods and elastic wrists and ankles (poly-coated when there is a potential for contaminated liquid contact);
- Nitrile inner gloves;
- Nitrile or work gloves (outer);
- Hearing protection (if necessary, as determined by the Field Supervisor, HSO, and/or RSO);
- ½ Face mask air-purifying respirator (APR) with safety glasses or full-face APR/powered air-purifying respirator (PAPR) or supplied air respirator (SAR);
- Hard hat; and
- Duct tape to cover openings (ankles, wrists, and respirator).

6.1.4 Level D Protection

Level D PPE will only be used in areas where the following conditions are met:

- Work functions preclude significant splashes, immersions, and the potential for unexpected inhalation of, or contact with, hazardous concentrations of harmful contaminants.
- Atmospheric concentrations of contaminants are less than one-tenth the TLV/PEL.
- The potential for inhalation of radionuclides is minimal.

Level D PPE at a minimum will consist of:

- Steel-toed (and/or Safety Toe), heavy duty, PVC boots
- Safety glasses
- Hearing protection (if needed for hearing protection as specified in the JSA or work plan);
- Splash shield (if needed for face protection as specified in the JSA or work plan);
- Hard hat; and
- Leather palm gloves (if needed for hand protection as specified during the hazard assessment or work plan).

6.1.5 Level D Modified Protection

Level D Modified PPE will only be used in areas when the following conditions are met:

- There is a potential for minor splashes, immersions, or contact with harmful contaminants.
- Modeled or measured airborne concentrations of the contaminants are less than one-fourth the TLV/PEL or 1/10 the Derived Air Concentration (DAC) for uranium.

- The potential for the inhalation of radionuclides is minimal.

Level D Modified PPE at a minimum will consist of:

- Steel-toed (and/or safety toe), heavy duty, PVC boots;
- Tyvek coveralls with hoods and elastic wrists and ankles (polycoated when there is a potential for contaminated liquid contact);
- Nitrile inner gloves;
- Nitrile outer gloves;
- Hearing protection (if necessary, as determined by the HSO/RSO);
- Splash shield (if necessary, as determined by the HSO/RSO);
- Hard hat;
- Safety glasses; and
- Duct tape to cover openings (ankles, wrists).

6.2 RESPIRATORY PROTECTION

Respiratory protection measures may be used to protect workers from a variety of radiological and non-radiological airborne hazards. Radiological airborne hazards at the site are particulate materials that may be re-suspended during demolition of concrete foundation slabs and excavation activities.

Non-radiological hazards include oxygen deficient atmospheres, particulates, and vapors. Respiratory protection in this HASP is based on requirements in 29 CFR 1910.134 for non-radiological hazards, and Nuclear Regulatory Commission (NRC) Regulatory Guide 8.15, "Acceptable Programs for Respiratory Protection" for radiological hazards.

Respiratory requirements are determined by the FS/HSO and RSO during assessment of work plans, evaluating conditions in the work area, and reviewing available historical data on the airborne hazards for a particular job. The evaluations include measuring airborne concentrations or oxygen content prior to working in an area. Follow-up measurements will be made to evaluate airborne concentrations during work.

Respiratory protection equipment will be selected using allowed respiratory protection factors to ensure that individual limits on intake or exposure are not exceeded. Engineering controls and work practices that eliminate the need for respiratory protection will be assessed by the FS/HSOs and RSO for work feasibility before any respiratory protection (except in emergencies) is assigned.

Appendix F contains the minimum requirements of a respiratory protection program that will be followed as part of this project.

7.0 SITE CONTROL

All workers will maintain a "buddy" or line of sight system of communication when working on the site. Cell phones or radios will be left "on" and used for communications with Field Supervisors or individuals assigned by the FS/HSO to monitor the safety and location of personnel performing the work.

7.1 ZONES

To prevent both exposure of unprotected personnel and migration of contamination due to tracking by personnel or equipment, work areas and associated PPE requirements will be clearly identified. Designated work areas or zones are required as stated in the "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities," NIOSH/OSHA/United States Coast Guard/USEPA, November 1985.

Areas of the Site where work activities will be conducted will be subdivided into three zones: an Exclusion Zone; a Contamination Reduction Zone (CRZ); and a Support Zone.

Additional zones may be created subject to potential exposure to radiological hazards and/or chemical hazards assessed by the FS/HSO and RSO in individual areas of the Site.

7.2 EXCLUSION ZONE

The Exclusion Zone isolates the area of activity and serves to restrict the spread of potential contamination from work areas of the Site to support areas and off-site locations. The Exclusion Zone is demarcated by a tape line or physical barrier. Personnel entering the Exclusion Zone must: (1) enter through the CRZ; (2) wear the prescribed level of protection; and (3) otherwise be authorized to enter the Exclusion Zone. Any personnel, equipment or materials exiting the Exclusion Zone will require radiological screening in the CRZ before entering in the Support Zone. (See Section 8 for decontamination requirements). Equipment and materials will either be subject to decontamination or containerized in uncontaminated devices for decontamination at the designated off-site location.

The EPA HAZWOPER terminology uses the term "Exclusion Zone" to define where the highest level of hazardous work is occurring and where the strictest level of worker protection must take place. Because several areas contain specific contaminants or combinations of contaminants, areas that are delineated as Chemically Restricted Areas (ex. PCBs, etc.) or Radiologically Restricted Areas will be considered synonymous with the term Exclusion Zone. In support of the extensive excavation work planned for the site, a restricted area will be established by the RSO and/or FS/HSO that includes an appropriate area for the heavy equipment operation. Other restricted areas will be designated as necessary. Specific access for emergency services to areas of site operations will be established by the FS/HSO and SOM.

7.3 CONTAMINATION REDUCTION ZONE

The CRZ is a transition zone between the Exclusion Zone or Restricted Area and support areas central to the demolition activities. It is designated by a tape line between the Exclusion Zone and the beginning of the CRZ, and by a control line between the CRZ and the support areas. Field personnel, equipment or materials which leave the Restricted Area require decontamination. After undergoing the decontamination process or containerization, personnel, equipment or materials will be permitted to exit the CRZ.

Within the CRZ is the Contamination Reduction Corridor (CRC). In the CRC, materials necessary for field personnel and portable equipment decontamination and certain safety equipment associated with normal work-related incidents are staged. Separate areas at the Site may be designated by the FS/HSO, SPM and/or RSO for the decontamination of heavy equipment.

7.4 SUPPORT ZONE

A Support Zone will be established in an appropriate area at the Site and will contain the necessary support facilities for site operations and general administrative and logistic purposes. It also will serve as the communications center, storage of sampling equipment and PPE, and source of emergency assistance for operations in the Exclusion Zone and CRZ. The Support Zone shall be set up by the FS/HSO and/or RSO in an area of the Site that is known to be or is likely to be free of contamination.

The Field Supervisors are required to monitor and ensure their workers entering the Restricted Areas have met all training and medical surveillance requirements. The FS/HSO and/or RSO or his designee shall maintain a log of all persons entering and exiting any of the Restricted Areas on the site.

8.0 DECONTAMINATION/DISPOSAL

All personnel, equipment and materials leaving the restricted site work areas shall be subject to decontamination and those areas will be identified by the FS/HSO and/or RSO during the work planning for each phase of the RD/RA project.

8.1 PERSONNEL DECONTAMINATION

Decontamination procedures will be followed by all personnel leaving impacted work areas. If specific COC levels are detected by field instrumentation, an Exclusion Zone, CRZ and Support Zone will be set up by the RSO at the perimeter of the work area (Section 7). Decontamination of personnel will take place only in the CRZ. Except for emergency evacuation, personnel must follow decontamination procedures prior to leaving the work area. In the event PPE Level B or Level C upgrades are deemed necessary by the FS/HSO and/or RSO, a contamination control boundary will be established.

Generalized procedures for removal of protective clothing are as follows:

1. Put down tools, monitors, samples and trash at designated drop stations, i.e., plastic containers or drop sheets.
2. All PPE will be frisked and cleared for radiological contamination. If detected, dry decontamination methods, i.e., Maslin dust cloths or paper towel, will be used to reduce or eliminate the quantities of liquid radioactive waste generated. The equipment will be surveyed for total and removal contamination in compliance with the RPP.
3. Equipment meeting the site release criteria will then be chemically decontaminated if needed.
4. Tape will be removed from outer boots, and boots will then be removed and discarded in approved waste container.
5. Tape will be removed from outer gloves, and gloves will then be removed and discarded in disposal container.
6. If a worker has left the Exclusion Zone to change the air tank on his/her SCBA, or the battery on his/her air purifying respirator, this will be the last step in the decontamination procedure. The tank or battery should be exchanged, and new outer gloves and boot covers donned. Openings at the wrists and ankles will be taped before the worker returns to duty.
7. Outer garments will be removed and discarded in the proper disposal container.
8. Respirator will be removed, cleaned and placed or hung in the designated area.
9. Inner gloves will be removed and discarded in the disposal container.
10. If there are additional requirements under the RWP, personnel will also follow those requirements.

NOTE: Disposable items, e.g., Tyvek coveralls, inner gloves, hearing protectors, etc., will be discarded each time leaving the exclusion zone and new coveralls and inner gloves shall be used when upon reentry unless there is reason to change sooner. Dedicated work boots, overshoes or other durable shoe covers may be reused if they are maintained within the restricted area boundary. Respirator cartridges used for organic vapors will be changed daily unless more frequent changes are deemed appropriate by site surveillance data or personnel using the respirators.

Spray bottles or other designated equipment will be available in the decontamination area for wash down and cleaning of personnel samples and equipment.

Respirators, if utilized, will be decontaminated daily and in accordance the Respiratory Protection Program for the site (Appendix F) as well as manufacturer requirements. In general, the masks will

be disassembled, the cartridges appropriately disposed and all other parts either sprayed and/or placed in a cleansing solution. After an appropriate time in the solution, the parts will be removed and rinsed with water. Old cartridges will be discarded in the contaminated trash container for disposal. At the beginning of the next work shift, the masks will be reassembled, and new cartridges installed. Personnel will inspect their own masks and readjust the straps for proper fit.

Additional guidance on decontamination procedures is provided in Appendix A, RPP and in site-specific Radiation Work Plans (RWPs).

Decontamination procedures for work performed at Sweepings and Fill Area Soil (AOI-8) and the Cooling Water Recharge Pond Surface Water, Sediment, and Bank Soil (AOI 4) shall comply with 40 CFR § 761.79 – Decontamination Standards and Procedures for PCB concentrations ≥ 50 ppm.

8.2 SMALL EQUIPMENT DECONTAMINATION

Small equipment will be protected from exposure as much as possible by wrapping, draping, masking or otherwise covering the instruments with plastic (to the extent feasible) without hindering operation of the unit. For example, the dust and aerosol monitor can be placed in a clear plastic bag to allow reading the scale and operating the knobs. The sensor can be partially wrapped keeping the intake and exhaust port clear to allow air analysis to continue.

Decontamination of small equipment will take place in the CRZ. Equipment will be taken from the drop area and the protective coverings removed and disposed in appropriate containers. Radiological monitoring and decontamination using dry methods will be performed as necessary prior to chemical decontamination. This equipment will be brushed or wiped with a disposable paper wipe. The units will be checked, standardized and recharged as necessary for the next day's operation, and then prepared with new protective coverings.

If work has been conducted in an area considered to be a radiologically Restricted Area a contamination survey will be conducted by the RSO and documented on all equipment before it can be removed in accordance with the RWP.

As previously stated, decontamination procedures for work performed at Sweepings and Fill Area Soil (AOI-8) and the Cooling Water Recharge Pond Surface Water, Sediment, and Bank Soil (AOI 4) shall comply with 40 CFR § 761.79 – Decontamination Standards and Procedures for PCB concentrations ≥ 50 ppm.

8.3 HEAVY EQUIPMENT DECONTAMINATION

Heavy equipment decontamination will take place at a location predetermined by the radiation protection team.

Equipment will first be surveyed for radiological contamination by the RSO or designee in compliance with the RWP. Loose material will be removed to the extent possible with (hand

tools, shovels, brushes, etc.). The person performing this activity will be provided the same level of protection utilized by the personnel who operated the subject equipment.

A decontamination pad will be set up to allow collection and storage of decontamination fluids in DOT approved 55-gallon drums or other approved storage containers.

If work has been conducted in a radiologically Restricted Area under the RPP, a contamination and/or radiation survey will be conducted by the RSO or designee and documented on all equipment before any is allowed to be removed in accordance with the specific RWP.

As stated above, Decontamination procedures for work performed at Sweepings and Fill Area Soil (AOI-8) and the Cooling Water Recharge Pond Surface Water, Sediment, and Bank Soil (AOI 4) shall comply with 40 CFR § 761.79 – Decontamination Standards and Procedures for PCB concentrations ≥ 50 ppm.

8.4 DISPOSAL OF CONTAMINATED MATERIALS

All protective gear, decontamination fluids (for both personnel and small equipment) and other disposable materials will be collected in the CRZ, properly containerized and stored at a designated location. Radiological materials will be handled and disposed of in accordance with the RPP.

Decontamination fluids will be collected into DOT approved 55-gallon drums and stored at the designated location. Disposable materials (e.g., gloves and Tyvek) will be collected into plastic trash bags and stored "as is" or placed into appropriate containers and stored at the designated Site location. Waste bags containing PPE shall be labeled "PPE or PPE Waste" to ensure proper handling and disposal methods are used. Materials and fluids will be disposed pursuant to and in accordance with all federal, state and DOT standards. Compliance with the PCB regulations at 40 CFR Part 761 shall be maintained during all phases of work involving ≥ 50 ppm PCB-contaminated soils and/or sediments.

8.5 SITE EVACUATION AND EMERGENCY COMMUNICATIONS

Although extremely unlikely, a potential does exist to encounter previously unknown chemical or radiological contamination or unidentified underground utility (e.g., natural gas pipeline).

The SPM, FS/HSOs and or RSO may declare an Emergency and order a Site Wide Evacuation. Unless directed differently by the HSO and/or RSO, all site personnel will gather at the designated rally point identified in the Emergence Response Plan (RDWP Appendix H). The FS/HSOs will perform a "head count" and will verify all personnel are accounted for to the SPM and/or RSO. In the event a site worker cannot to accounted for, the Field Supervisor will immediately inform the SPM. The SPM, FS/HSO and/or RSO will determine the last know location of the missing worker, hazards present at that location and the best and safest method(s) to search for this missing worker.

Emergency communications with outside agencies (police, fire, etc.) will be performed by the SPM or PC (if present on site). The SPM or PC will be the point of contact for information from the FS/HSO and/or RSO to any responding Agencies.

The Emergency Response Plan (ERP) is discussed in Section 12. A separate ERP is included as Appendix H of the RDWP.

9.0 Exposure Monitoring/Air Sampling Program

9.1 RADIOLOGICAL MONITORING

The Radiation Protection Program is included as Appendix A. The following summarizes the key elements of that program:

- Personnel and equipment will be scanned for radioactive contamination by the RSO or designee whenever they exit a radiologically Restricted Area.
- Personnel monitoring for external radiation will be provided for workers expected to exceed 1 mSv/yr while working at the Site.
- Monitoring for intakes of radioactive material will be performed primarily through air sampling.
- Periodic radiation, contamination and airborne monitoring surveys will be performed to determine work area exposure rates, contamination levels and the efficacy of controls to limit airborne generation of radioactive contaminants. These surveys will be performed at the perimeter of the Site as well as within office trailers

9.2 CHEMICAL EXPOSURE MONITORING

9.2.1 Monitoring Instruments and Action Levels

Chemical and dust exposure monitoring will be conducted during field work operations to determine employee exposure to airborne contaminants and to ensure that the PPE and engineering controls utilized at the Site are sufficient to ensure worker safety. The monitoring results will dictate work procedures and the selection of PPE. At a minimum, this monitoring will include evaluations for hazardous concentrations of airborne particulates contaminated with uranium, beryllium, metals (copper, lead, and arsenic), and VOCs and SVOCs. Weather conditions, including the prevailing wind direction, will be observed and recorded for each day of site activities.

Air monitoring to be conducted on-site includes:

- Use of an O_2/Lower Explosive Limit (LEL) meter to measure oxygen content and lower explosive limit of the work environment when work in confined spaces is occuring. Air

monitoring will be conducted continuously with the O_2/LEL meter if flammable/explosive vapors are suspected exceeding 10% LEL.

- Using personal sample pump(s) and mixed cellulose ester filter sampling media to collect air samples for metals (beryllium, copper, etc.). Additional sampling medial may be utilized for the collection of Personal Breathing Zone (BZ) air samples to evalutate PCBs (OSHA versatile sampler, OVS-2), VOCs (sorbant tube , CSC Tube (100/50 mg sections, 20/40 mesh), [SKC 226-01]) or respirable silica (Dorr-Oliver cyclone).
- Samples will be collected over an entire shift (assumed to be 10-hours maximum), over a time period determined by the FS/HSO and/or RSO.
- Depending on sampling results, a work task may be designated as having a Negative Expsoure Assessment (NEA), and air sampling and use of respiratory protection reduced based upon the conditions stated in the NEA. The SPM, FS/HSO and RSO must be notified of an NEA to a specific task.
- Nuisance dust monitoring will be performed using a ThermoElectron pDR 1000 or equivalent. The associated action level for imposition of dust controls for workers is a sustained reading of 1 mg/m^3. If dust is visible, engineering controls will be implemented to suppress it.
- Monitoring of radioactive particulates (dust) will be performed in accordance with the requirements outlined in Appendix A to this HASP and the supporting implementing procedures.
- Asbestos monitoring, if required, will follow the OSHA requirements at 29 CFR 1926.1101.
- Photoionization detector (PID) 11.7 or 11.8 electron volt (eV) lamp for measuring total VOCs in the breathing zone (BZ). Real-time monitoring for VOCs will be performed during the conduct of all activities having the potential for personnel exposure to VOCs. Default action levels for VOC monitoring will be a continuous reading of 2 ppm or higher. A more stringent action level may be used based upon the known chemical contaminant and its associated PEL or TLV.

9.3 MONITORING EQUIPMENT MAINTENANCE AND CALIBRATION

- Direct reading instrumentation calibrations will be conducted under the approximate environmental conditions the instrument will be used. Instruments must be calibrated in accordance with manufactured requirements before and after use, noting the reading(s) and any adjustments that are necessary. Chemical exposure monitoring equipment calibrations, including the standard used for calibration must be documented on the Field Activity Daily Log or the calibration log. Completed health and

safety documentation/forms will be maintained by the FS/HSO or if radiological detection equipment by the RSO.

- Chemical exposure monitoring equipment will be maintained and calibrated in accordance with the specific manufacturers' procedures. Preventive maintenance and repairs will be conducted in accordance with the respective manufacturer's procedures. When applicable, only manufacturer-trained and/or authorized personnel will be allowed to perform instrument repairs or preventive maintenance.
- If an instrument is found to be inoperative or suspected of giving erroneous readings, the HSO will immediately remove the instrument from service and obtain a replacement unit. If the instrument is essential for safe operation during a specific activity, that activity must cease until an appropriate replacement unit is obtained. The FS/HSO is responsible for obtaining a replacement unit and/or initiating repairs on the defective equipment.

9.4 RADIATION AND CHEMICAL EXPOSURE MONITORING DOCUMENTATION AND NOTIFICATION

The following radiation and chemical exposure monitoring documentation will be completed as part of the air quality monitoring program:

- Radiological air monitoring and wipe sample analysis will be performed on site and results documented in accordance with the RPP implementing procedures for air and contamination monitoring and analysis.
- Chemical air samples and wipes will be set to an American Industrial Hygiene Association (AIHA) accredited laboratory under chain-of-custody protocol.
- All monitoring results will be recorded in a field logbook or other permanent form of record keeping.

The FS/HSO and/or the RSO (for radiological monitoring results) will evaluate the sample results to determine if additional site engineering controls are necessary, and if the level of protection is adequate for the task/activity.

Site chemical exposure monitoring records must be complete and incorporated into the project file. The following monitoring information is required and contained with sample documentation:

- Employee name, The date, time, pertinent task information, exposure information
- Description of the analytical methods, equipment used, and calibration data
- Type of PPE worn

- Engineering controls used to reduce exposure (when applicable)

Personal monitoring sample results will be communicated to all site workers within ten (10) days of receipt. Copies of analytical results and a description of the tasks performed during sample collection will be placed in each employee's file whose exposure is represented by the particular sample. When results indicate that the representative employee exposure exceeds the PEL, the employee notification must state that the PEL was exceeded and must provide a description of the corrective action taken to reduce exposure to a level below the PEL.

All sample results shall be retained as specified in 29 CFR 1926.33 (equivalent to 29 CFR 1910.1020). A copy of the field notes and analytical results will be forwarded to the employee's company for filing in the employee's health and safety file.

9.5 VISITORS

Visitors are not subject to individual monitoring, record keeping, and reporting requirements described above. Visitor entries will not be permitted into areas where either personal monitoring for external radiation or personal air sampling for chemical or radiological contaminants is required unless training and medical surveillance requirements are met, or hazards are temporarily mitigated (ex. intrusive work temporarily suspended). Visitors will not receive dose greater than 1 mSv (100 mrem) during the current year at the Site without prior approval, in writing, by the RSO and prior written consent of the visitor.

10.0 TRAINING REQUIREMENTS

10.1 WORKER CLASSIFICATIONS FOR TRAINING

To ensure that training and medical surveillance requirements are appropriately applied based on the potential exposures at the Site, all individuals present on site during the RDRA are categorized as follows:

Visitors: Are personnel who are not assigned to the Site, only perform observations and do not perform any physical work at the Site or supervise those who are performing physical work.

Site Administrative Support Staff: Personnel assigned to the Site but whose work does not require entry into the Exclusion Zone or CRZ. Examples of these workers are clerical staff and security personnel.

Service Workers: Personnel who perform one specific function while on-site and only occasionally visit the Site to perform that function. Examples of service workers are Telephone Company, electrical utility company or trucking company employees.

RD/RA Workers: Personnel assigned full time to the project and their supervisors and are likely to enter the Exclusion Zone or CRZ at the Site. Anyone who must[1] don a respirator for protection against airborne contaminants will also be considered a RDRA Worker.

Radiological Workers: RDRA workers whose duties require them to enter radiologically Restricted Areas.

10.2 VISITOR TRAINING

Visitors must receive the Site Visitor Briefing as developed by the HSO and RSO. Visitors must be escorted all times when on-site apart from entries to the parking lot and administrative areas.

10.3 SITE ADMINISTRATIVE SUPPORT STAFF

The site administrative support staff will receive Orientation Training developed and approved by the RSO and SPM. The training will ensure the following enabling objectives are achieved:

- Staff can identify areas where they require an escort or additional training before entry
- Staff can explain the various warning signs and labels likely to be used on the Site
- Staff can list the various hazards associated with site operations
- Staff can describe actions to be taken in the event of an emergency

[1] Does not apply to "Voluntary Use" of respirators which is governed by another portion of the OSHA regulations.

10.4 SERVICE WORKERS

Service Workers will receive the same training as the Site Administrative Support and will receive specific hazard training for the areas in which they will be working.

If a Service Worker's exposure to contaminants is expected to be detectable for chemical contaminants (i.e., a positive analysis on an air sample) then the worker requires the following additional training:

- 24-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training in accordance with 29 CFR 1926.65(e)(3)(ii).
- Substance specific training as required by that substance's specific control program contained in 29CFR1926 Subpart Z.

Service Workers who are likely to have exposures that exceed the TLV/PEL or the Derived Air Concentration (DAC) will be classified as Site Workers and their training must then rise to meet those requirements.

10.5 RD/RA WORKERS

The Training and Medical Surveillance described in Section 11 lists the training requirements for RD/RA Workers. In addition, some training requirements in the matrix are optional to some as they involve workers who may be exposed to chemicals or other potential hazards specific to their job requirements.

10.6 RADIOLOGICAL WORKERS

Radiological Workers are those that, in accordance with the RPP, may be exposed to an external dose greater than 1mSv in a year or enter a radiologically contaminated or airborne radioactivity area. The training for Radiological Workers is outlined in Appendix A.

10.8 SITE-SPECIFIC TRAINING

Site-specific health and safety training will be provided for all RDRA Workers and their supervisors. The initial training will meet the requirements of 29 CFR 1926.65(e)(2).

Radiological Safety Training, consistent with Appendix A, Radiation Protection Program, will be provided to workers (and their supervisors) who enter radiologically controlled areas of the Site.

In addition to the above training elements, newly hired workers must complete an initial 24 hours of work under the supervision of a trained supervisor that has received 8 hrs. of additional supervisory training. Copies the signed acknowledgement forms that document compliance with this requirement shall be provided to the FS/HSO upon request.

10.9 TRAINING DOCUMENTS

10.9.1 Acknowledgement Forms

All training will require a signature of the individual trained and that of the trainer or person providing the briefing. The form will be an acknowledgement the person has received the training and has had the opportunity to ask questions.

10.9.2 Training Certificates and Training Equivalency

Certificates of training for workers who have obtained training off-site must contain the date of the training, the location, a specific notation as to the regulatory standard which the training was directed toward, and the signature of the trainer. A copy of all required training certificates for RDRA Workers to perform their essential job functions on-site shall be provided to the HSO.

Certificates will be reviewed by the FS/HSO or designee and maintained as part of the worker's training file.

Equivalent training to that being presented on-site is acceptable provided the FS/HSO and/or RSO review the request for declaration of equivalency and provide a note to file as to the rationale for accepting equivalency.

11.0 MEDICAL SURVEILLANCE

11.1 MEDICAL EXAMINATION

All personnel classified as RDRA Workers will require participation in a medical surveillance program. Non-RDRA classified workers will require medical surveillance participation if the task being performed is a task where medical surveillance is required as part of 29CFR1926 Subpart Z.

11.1.1 Initial Examination

An initial examination by a physician or other licensed health care professional (PLHCP) must be completed prior to personnel working within an Exclusion Zone or CRZ at the Site.

The following information will be provided to the examining PLHCP:

- Copy of 29 CFR 1910.134 (29CFR1926.103 considered equivalent) and Appendices A through D in 1910.134;
- Regulatory Guide 8.15;
- Description of employee's duties;
- Contaminants potentially exposed to;
- Description of the PPE to be used;
- Substance Specific OSHA standard;[2] and
- Information from previous medical exams if made available by the employee or already in possession of PLHCP.

The medical surveillance provided to the employee includes a judgment by the medical examiner of the ability of the employee to perform the assigned tasks in their job description and wear the PPE likely to be assigned for performing the task. Each subcontractor will ensure their workers are medically qualified to perform work associated with the RDRA project. The subcontractor will provide the FS/HSO with a copy of the physician's statement for each employee that states they are medically qualified prior to their arrival on-site.

11.1.2 Periodic Examinations

All personnel working at the Site will receive annual physical examinations. The results of these physical examinations are to be compared to previous results and the baseline physical by the PLHCP to determine if any effects due to exposure have occurred or if the employee has suffered an impairment impacting the employee's ability to perform the essential functions of their work.

[2] Where one exists for the contaminant the employee will be exposed to in the work environment.

Additional exams may be warranted if an employee suffers a work or on-work related exposure/injury that the FS/ HSO believes may have a health impact on the employee.

Each subcontractor is responsible for following the recommendations made by their PLHCP for each of their employees.

11.2 Medical Records

Medical and personal exposure monitoring records will be maintained according to the requirements of 29 CFR 1926.65 and will be kept for a minimum of 30 years. Confidentiality of employee medical records will be maintained in accordance with the Health Insurance Portability and Accountability Act of 1996 (HIPAA).

The medical exam data needed for the site records consists of a medical clearance letter signed by the PLHCP stating the employee can perform their assigned tasks and wear the task-required PPE.

An additional declaration by the PLCHP is required for personnel expected to wear respiratory protection. Employees voluntarily using tight-fitting respirators must follow the medical surveillance requirements for respirator users as specified in this section and Appendix H of this HASP.

Work restrictions identified by the PLHCP must be clearly noted on the PLHCP's medical clearance letter.

11.3 Medical Restrictions

Each subcontractor is required to follow any employee work restrictions identified by their PLHCP and communicate same to their employees and their FS/HSO who in turn will communicate with the SPM.

12.0 EMERGENCY RESPONSE PLAN AND CONTINGENCY

A separate Emergency Response Plan (ERP) has been developed and will be used for emergency response actions on this project. The ERP is included as Appendix H of the RDWP. The objective of the ERP is to minimize hazards to human health or the environment from fires, releases of hazardous constituents or other emergency conditions. The ERP describes the actions personnel must take in response to emergencies or unplanned releases at the Site during the RD/RA, arrangements with local, state and federal emergency responders to coordinate emergency services, identification of the roles and responsibilities of the emergency coordinator and alternates, supply and maintenance of onsite emergency equipment, and stop work and emergency evacuation planning. The ERP includes a hazard communications plan and names and contact information for planned notifications in the event of an emergency. The ERP is presented as Appendix D of the RDWP.

13.0 RECORD KEEPING

Proper record keeping and data management are an essential component of this HASP. The forms associated with the record keeping and data management requirements must be completed in legible writing in an accurate, timely fashion and filed with the appropriate entities. It is the responsibility of the FS/HSO and RSO to ensure that the forms are properly completed and filed. Completed forms will be kept and maintained at the Site. These records will be maintained in accordance with project requirements. Subcontractors will also be responsible for maintaining a copy of the forms pertaining to their personnel.

13.1 CHANGES TO THE HEALTH AND SAFETY PLAN

The HASP is considered a "living document" and may be updated to reflect the needs of the project.

Any individual or subcontractor directly involved in the project or EPA may request a change to the requirements of the HASP. Requests must made in writing to the SPM requesting the change and the request should state the specific change to be made and the basis for the change

The FS/HSO (RSO if it involves a Radiological Protection Program change) and the SPM will make an initial determination whether a proposed change is administrative or substantive in nature. In general, administrative changes involve organization names, position titles, other non-technical issues, but may also involve program changes where the degree of protection provided employees ~~is~~ not lessened.

The PC will make the final decision regarding whether a change is administrative or substantive. The PC will have final approval for all administrative changes. All administrative changes will be distributed to EPA and MassDEP.

Change requests will be evaluated and acted upon expeditiously. Administrative changes should be completed within 30 days. Substantive changes require approval of the EPA prior to implementation.

13.2 TEMPORARY CHANGES TO THE HEALTH AND SAFETY PLAN

To provide a means to respond quickly to changing situations, temporary changes or exceptions to the requirements of the HASP may be approved by the FS/HSO and SPM provided the PC review and approve the change.

13.3 LOGS

The FS/HSO and RSO will maintain logs to track inspections, audits and incidents. Additional field information will be recorded on separate log forms for air monitoring, sampling, equipment calibration inspections, and incident reporting.

13.4 INSPECTIONS AND AUDITS

All inspection and audit reports including the follow-up corrective actions will be maintained on site. FS/HSOs are required to provide follow-up information regarding the implementation of corrective actions to the SPM and/or RSO when requested.

14.0 ACRONYMS

ACA	Airborne Contamination Areas
AIHA	American Industrial Hygiene Association
ALARA	As Low As Reasonably Achievable
AOC	Administrative Order of Consent
AOI	Area of Investigation
APR	Air-Purifying Respirator
ARAR	Applicable or Relevant and Appropriate Requirement
BBS	Behavioral Based Safety
BZ	Breathing Zone
CD	Consent Decree
C&D	Construction and Demolition Debris
CCA	Contamination Controlled Area
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cm^2	Square Centimeter
CNC	Computer Numerical Code
COC	Contaminant Of Concern
COMP	Cognizant Occupational Medicine Physician
CPR	Cardiopulmonary Resuscitation
CRC	Contaminant Reduction Corridor
CRZ	Contaminant Reduction Zone
CSEP	Confined Space Entry Permit
DAC	Derived Air Concentration
dB	Decibel
DOT	Department Of Transportation
DPM	Disintegrations Per Minute
DU	Depleted Uranium
ERP	Emergency Response Plan
eV	Electron Volt
FS	Field Supervisor
FSP	Field Sampling Plan
GC	General Contractor
GFCI	Ground Fault Circuit Interrupter
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response

HB	Holding Basin
HEPA	High Efficiency Particle Arresting
HIPAA	Health Insurance Portability and Accountability Act of 1996
HSM	Health and Safety Manager
HSO	Health and Safety Officer
HWP	Hot Work Permit
IDLH	Immediately Dangerous to Life or Health
IDW	Investigation Derived Waste
ISS	In-Situ Sequestration
JSA	Job Safety Analysis (aka: Activity Hazard Analysis or AHA)
LEL	Lower Explosive Limit
MassDEP	Massachusetts Department of Environmental Protection
MADPH	Massachusetts Department of Public Health
MADPH-RCP	Massachusetts Department of Public Health - Radiation Control Program
MDT	Memorial Drive Trust
mg/m3	Milligrams per Cubic Meter
mrem	Millirem
MSD	Musculoskeletal Disorder
NEA	Negative Exposure Assessment
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
NMI	Nuclear Metals, Inc.
NRC	Nuclear Regulatory Commission
NRR	Noise Reduction Rating
NTCRA	Non-Time Critical Removal Actions
OSHA	Occupational Safety and Health Administration
PAHs	Poly Aromatic Hydrocarbons
PAPR	Powered Air Purifying Respirator
PC	Project Coordinator
PCB	Polychlorinated Biphenyl
PDI	Pre-Design Investigation
PDWP	Pre-Design Work Plan
PEL	Permissible Exposure Limits
PID	Photoionization Detector
PLHCP	Physician or other Licensed Health Care Professional
PPE	Personal Protective Equipment
PPM	Parts Per Million

PRSC	Post Removal Site Control
PVC	Polyvinyl Chloride
QAPP	Quality Assurance Project Plan
RAM	Radioactive Material
RAWP	Removal Action Work Plan
RCA	Radiologically Controlled Area
RCP	Radiation Control Program
RCRA	Resource Conservation and Recovery Act
RD/RA	Remedial Design/Remedial Action
RDWP	Remedial Design Work Plan
R&D	Research & Development
REL	Recommended Exposure Limit
RI	Remedial Investigation
RIFS	Remedial Investigation Feasibility Study
RPP	Radiation Protection Program
RSO	Radiation Safety Officer
RWP	Radiation Work Permit
SAP	Sampling and Analysis Plan
SCBA	Self-Contained Breathing Apparatus
SD	Settling Defendants
SDS	Safety Data Sheet
SFA	Settling Federal Agency
SMIP	Site Monitoring and Inspection Plan
SOM	Site Operations Manager
SOW	Statement of Work
SPM	Site Project Managers
SRP	Separate Emergency Response Plan
SVOC	Semi-Volatile Organic Compound
SWA	Stop Work Authority
TLV	Threshold Limit Values
TS	Treatability Studies
TSWP	Treatability Studies Work Plan
TWA	Time Weighted Average
U	Uranium
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VOC	Volatile Organic Compound(s)

15.0 REFERENCES

Code of Federal Regulations, 29 CFR PART 1910 Occupational Safety and Health Standards

Code of Federal Regulations, 29 CFR PART 1926 Safety and Health Regulations for Construction

Code of Federal Regulations, 10 CFR Part 20 Standards for Protection Against Radiation

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USEPA, Nuclear Metals, Inc. Superfund Site, *Administrative Settlement Agreement and Order on Consent for Non-Time Critical Removal Action*, Docket No. CERCLA-01-2011-004, January 2011

USEPA, Nuclear Metals, Inc. Superfund Site, Record of Decision, September 2015

RD/RA Consent Decree and Statement of Work

APPENDIX A

RADIATION PROTECTION PROGRAM

RADIATION PROTECTION PROGRAM

NUCLEAR METALS, INC. SUPERFUND SITE
REMEDIAL DESIGN/REMEDIAL ACTION
CONCORD, MASSACHUSETTS

General Contractor:

de maximis, inc.

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MARCH 2020

RADIATION PROTECTION PROGRAM

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SECTION 1

PURPOSE AND SCOPE

The purpose of this Radiation Protection Plan (RPP) and implementing procedures are to inform and properly train workers on the necessary precautions to be observed when working directly with or in areas adjacent to ionizing radiation or radioactive material at the Nuclear Metals Inc. Superfund Site (Site) in Concord, MA under the Remedial Design/Remedial Action (RD/RA) activities. This information can then be utilized by the workers to maintain exposures As Low As Reasonably Achievable (ALARA). *de maximis* is committed to meeting all State and Federal laws and safety regulations with respect to controlling exposure to radioactive materials and radiation. This scope of work shall conform to the applicable guidance of Title 10 Code of Federal Regulation (CFR) 19 & 20, and DOE Standard 1136-2000, No.3, "Guide of Good Practices for Occupational Radiological Protection in Uranium Facilities."

The following RPP provides the management structure and is supported by implementing site specific health physics procedures. These procedures provide the detail so that each **c**ritical element of the RPP can be implemented in the field. These health physics procedures are presented in the Field Sampling Plan (RDWP Appendix I) and include:

- HP-NMI-01 - Conduct of Radiological Work
- HP-NMI-02 - HP Definitions
- HP-NMI-03 - Radiological Worker Training Manual
- HP-NMI-05 - Radiological Surveys
- HP-NMI-06 - Personnel Monitoring and Decontamination
- HP-NMI-07 - Radiological Posting and Labeling
- HP-NMI-08 - Radiation Exposure Limits and Monitoring
- HP-NMI-09 -Sealed Source Accountability and Leak Checks
- HP-NMI-10 - Radiological Air Sampling
- HP-NMI-11 - Radiological Work Permits
- HP-NMI-12 -Radioactive Material Receipt and Shipment
- HP-NMI-13 -Environmental Monitoring
- HP-NMI-14 - Exposure Investigation
- HP-NMI-15 - Instrument Response Checks
- HP-NMI-16 – Ludlum Model 3 Operation
- HP-NMI-17 - Employee In-Out Processing
- HP-NMI-18 – Ludlum 3030 Operation
- HP-NMI-19 – Waste Classification and Packaging
- HP-NMI-20 – Ludlum 2350-1 Operation
- HP-NMI-21 – Ludlum 2224-1 Operation
- HP-NMI-22 – Tennelec Series 5 Operation
- HP-NMII-23 - Ludlum Model 3 with 44-10 Probe
- HP-NMI-24 - Operation of Falcon 5000 HPGe Spectrometer
- HP-NMI-25 – Heavy Equipment Decontamination and Free Release

- HP-NMI-26 – Ludlum Model 19 Operation
- HP-NMI-27 – Waste Conveyance Handling and Shipping
- HP-NMI-28 - Exterior Perimeter High Volume Sampling

Personnel entering radiation work areas are required to be properly trained (Section 6) and to be issued dosimetry as required and submit to a baseline bioassay (Section 4) as required. Direct reading dosimeters may be used for visitors/tours of the controlled areas as long as they are escorted by trained personnel.

The scope of work requiring radiological controls will focus on site wide activities as they relate to implementing feasibility studies, foundation removal, excavation, in-situ stabilization, barrier wall installation, soils remediation and groundwater treatment. The NMI property is approximately 46 acres bordered by Main Street (Route 62) and several commercial and residential properties to the north, residential properties to the east, Town-owned open space, a residential condominium complex and a children's summer camp to the south and southwest, and woodland and commercial/industrial properties to the west. The Assabet River is situated approximately 300 feet north of the property, on the opposite side of Rt. 62.

In addition to the above features, there are two wetlands at the Site, the Sphagnum Bog and the Northeast Wetland located north of the Cooling Water Recharge Pond. The Sphagnum Bog is a palustrine, broad-leafed evergreen, scrub-shrub, saturated, acidic wetland. The bog is located approximately 75 feet east of the Cooling Water Recharge Pond and the Holding Basin. The bog covers an area of approximately 3.5 acres. The bog is composed primarily of sphagnum peat. The substrate of the bog varies from growing sphagnum at the surface, to decomposed peat below the surface. The Sphagnum Bog has no inlets or outlets and receives the bulk of its moisture from precipitation and run-off.

The Northeast Wetland is located approximately 200 feet north of the Cooling Water Recharge Pond, and just south of Route 62. This wetland possibly was formed by the construction of Main Street to prevent further runoff to the north. It is a palustrine, forested, broad-leafed, deciduous wetland, subject to seasonal flooding. The low lying area associated with this wetland covers approximately 0.8 acres.

The existing land use at the NMI property is a mix of industrial use property, fenced undeveloped property, and unfenced undeveloped property. The industrial portion of the NMI property is represented by the remaining building foundations and associated paved parking lots, paved staging areas, and small landscaped areas (mowed grass). A security fence with locking gates restricts access to the southern and eastern sides of the portion of the property where the buildings are located. The fence extends from that area to the Sphagnum Bog, encompassing the Cooling Water Recharge Pond, Holding Basin, and Old Landfill areas. This area is essentially 'restricted' open space and is unpaved with varying amounts of vegetation (e.g., brush and grass) and wooded areas. The unfenced portion of the property is located outside of the security fence.

This area is open space that is generally wooded. The Northeast Wetland and the Sphagnum Bog are within this area.

SECTION 2

ORGANIZATION AND RESPONSIBILITIES

A. Site Radiation Safety Officer (RSO)

The Site RSO is responsible for oversight of the day-to-day radiation protection program, including communication with project management regarding program implementation and compliance status, and to provide advice and assistance on radiological safety matters.

It is the responsibility of the Site RSO to ensure that all applicable workers have read, understand and comply with the Site Radiation Protection Plan. No individual shall be allowed to work with ionizing radiation or radioactive material until that person completes and comprehends appropriate radiation safety training. Radiation safety training shall be given to each worker prior to commencing work in areas with radioactive materials. No person will be allowed to enter restricted areas without appropriate radiation safety training unless escorted with a trained individual, i.e., visitors, inspections.

Specifically, the Site RSO shall have responsibility for assuring that the following activities are performed:

1. Direct the operations of the Health Physics staff;
2. Advise personnel on matters related to radiation safety;
4. Approve all work with respect to radiation safety protocols;
5. Be able to impose reasonable conditions of work, restrictions on work, and termination of work involving sources of radiation as necessary to protect personnel, the public, or the environment or to ensure regulatory compliance;
6. Maintain and review both personnel exposures and radiological conditions in the work area;
7. Serve as the point of contact with project management and regulatory professionals on matters related to radiation safety and control;
8. Ensure radiation safety training is provided to all on-site personnel;
9. Determine the need for dosimetry, distribute and process dosimeters, determine the need for bioassays, evaluate the results of dosimetry and bioassay and recommend appropriate actions;
10. Supervise and coordinate radiological air monitoring;
11. Perform or arrange for leak tests on sealed sources as required;
12. Perform or arrange for calibration of radiation survey instruments;

13. Maintain inventory and control of radioactive materials on site;

14. Maintain records; and

15. Maintain radiation protection procedures to ensure program implementation and compliance.

B. Health Physics Staff

Health Physics staff are responsible for surveillance of all operations involving ionizing radiation or radioactive material during execution of work at the Site. Specifically, the Health Physics staff shall:

1. Be able to impose reasonable conditions of work, restrictions on work, and termination of work involving sources of radiation as necessary to protect personnel, the public, or the environment or to ensure regulatory compliance;

2. Maintain radiation protection records including approved procedures, radiological survey records, and access control records;

3. Provide support in the event of an incident or emergency while reporting to the Site RSO and the appropriate responding emergency agency, as appropriate;

4. Perform job related radiological assessments to ensure work is completed safely and compliantly;

5. Provide information and guidance on matters related to radiation safety; and

6. Perform and document routine and conveyance surveys to verify appropriate controls are maintained related to radiation and radioactive materials.

C. Workers

Each person who works with radioactive material who is exposed to ionizing radiation at levels greater than background must take responsibility for their own protection and for reporting any condition, which, in the person's opinion, constitutes unsafe or improper working conditions. Each person is responsible for:

1. Maintaining for their own exposures to radiation and radioactive materials ALARA;

2. Following procedures and accepted safe work practices so as not to endanger himself or herself, the public, or the environment; and

3. Reporting any unsafe working conditions, violations of the rules prescribed in this document, or violations of the applicable regulations of each respective state to their supervisor and/or to the HPT and/or the Site RSO.

SECTION 3

CONTROL AND LIMITATION OF RADIATION EXPOSURES

The effects of chronic low doses of radiation (in the range of 0 - 5000 millirem per year), as typically received by occupationally exposed persons, are not well known. Conversely, acute high doses of radiation (>100,000 millirem in one exposure) are known to cause direct effects to the blood and organs. By extrapolating the dose-effect relationship from high doses to low doses using the linear no-threshold theory, as is assumed in current State and Federal regulations for the control of radiation exposures, increased risks for stochastic effects can be estimated even for very low radiation doses. However, possible health risks of radiation exposure may only be estimated with a reasonable degree of scientific certainty at radiation levels that are orders of magnitude greater than levels established by regulators for protection of the public. These data and models lead to the conclusion that there is no dose that is one hundred-percent "safe," i.e., completely without risk. However, natural and man-made background radiation is ubiquitous, providing an average annual radiation dose of 360 mrem to every U.S. citizen. Large fluctuations in background radiation, by geographical location, have not been shown to result in any measurable increase in risk of any health effect. Nevertheless, any radiation dose received occupationally will be in excess of the background radiation dose received and will be assumed for the purposes of radiation protection regulation to carry with it some additive risk.

State and Federal regulations therefore establish a system of dose justification, limitation and optimization. Individual doses are limited to ensure that deterministic effects (such as radiation burns, or skin erythema) are avoided and that total lifetime risks of stochastic effects (such as cancer and hereditary effects) do not exceed overall health risks for those persons working in safe industries. However, regulations also require that licensees further optimize radiation doses to individuals to the extent practical, social, economic and technological factors taken into account. This concept or philosophy is given the special name ALARA, which is an acronym for As Low As is Reasonably Achievable, or more recently "optimization" per the International Commission on Radiation Protection (ICRP) 103.

In this interest, Site activities will be assessed and protective measures implemented in an effort to ensure workers' doses remain ALARA. The primary document that governs work activities from a radiological perspective will be the Radiation Work Permit (RWP). The RWP is a task specific document that describes not only the scope of work, but also health, safety, operational, and radiological precautions that must be taken as well as a description of the associated hazards that are being protected against. For example, one facet of each RWP will outline Personal Protective Equipment (PPE) that is required to perform the prescribed work. Disposable PPE will be used except for respiratory PPE and dedicated steel-toed footwear.

A. Radiation Dose Limits

Legal exposure limits

The following exposure limits SHALL NOT be exceeded in any calendar year:

a. 5000 mrem total effective dose equivalent (TEDE)

b. 15,000 mrem lens of the eye dose equivalent (LDE)

c. 50,000 mrem shallow dose equivalent to the extremities (SDE-ME) or to the skin (SDE-SK)

d. 5000 mrem committed effective dose equivalent (CEDE)

e. 50,000 mrem committed dose equivalent (CDE)

Administrative Limits

The following Administrative Limits shall not be exceeded without prior written authorization from the Radiation Safety Officer and *de maximis* management:

f. 2000 mrem TEDE

g. 6000 mrem LDE

h. 20,000 mrem SDE

i. 2000 mrem CEDE

j. 20,000 mrem CDE

3. **Individual Members of the Public**

a. < 2 mrem in any one hour

b. Total Effective Dose Equivalent (TEDE) - < 0.1 rem/y (100 mrem/y)

4. **Occupational Dose Limits for Minors** (under 18 years of age)

a. None, no individuals under 18 years of age will be employed for work on this Site.

5. **Dose to an Embryo/Fetus of a Declared Pregnant Woman**[1]

k. Total Effective Dose Equivalent (TEDE) - <500 mrem over entire pregnancy

l. TEDE should not vary substantially above 50 mrem in any month

B. Routes of Exposure

Exposures may be received from radiation fields that are external to the body (external exposure), or from radioactive materials that are inside the body (internal exposure), or both.

[1] Contact the RSO for assistance.

C. Means of Exposure Control

Common external exposure controls include the use of time, distance, and shielding to minimize radiation doses. These concepts shall be thoroughly presented and demonstrated in radiation safety training but should also be continually reinforced by field personnel during operations. In addition, exposure control may be accomplished through the use of PPE to limit exposure pathways (i.e., respiratory protective measures) or by providing a protective barrier between contamination and the worker (i.e., Tyvek© coveralls).

The site activities will utilize a proactive radiation protection philosophy. This philosophy is based upon data collection and then assigning precautions and measures adequate to protect against the measured hazards. For instance, it is anticipated that many site activities will not require routine respiratory protection. Should daily air sample data analysis not confirm that assumption, the RWP for that task will be modified to include respiratory protection. It is for this reason, as well as internal dose assessment, that air samples will be collected on a daily basis. Air sampling pumps, contamination meters, dose rate meters, industrial hygiene samplers, passive dosimetry, and a wipe test counter will be used to gather information for maintaining the radiation protection program. This project may elect to include additional instrumentation and equipment to assist in gathering data.

Visitor escorts must point out any hazardous area that a visitor may be entering and must ensure that all radiation safety rules and precautions are observed at all times.

D. Respiratory Protection

If engineering controls and administrative controls are deemed inappropriate, ineffective or unfeasible for protecting individuals from inhalation of radioactive material, respiratory protection may be specified by a RWP. We do not expect that respiratory protection will be required during the implementation of the RD/RA since most activities will occur in open air environments while handling materials with lower concentrations of radiological contaminants.

1. Use of respiratory protection devices shall be in accordance with the NTCRA HASP Appendix F - Respiratory Protection Program and 29 CFR 1910.134.
2. Only respiratory protection devices approved for use by National Institute of Occupational Safety and Health (NIOSH) and approved by DDES shall be used.
3. Respiratory protection may be provided if an ALARA evaluation indicates use of such device is warranted to protect individuals from unnecessary intake of radioactive material and if such use is likely to maintain the total effective dose equivalent ALARA.
4. The following actions shall be taken prior to using respiratory protection:

a. The individual shall be trained in the use of respiratory protection equipment. Training shall be repeated at intervals not to exceed 12 months.

b. The individual shall be examined and deemed medically qualified by a Physician. Examination shall be repeated at intervals not to exceed 12 months.

c. If using a tight-fitting respirator, the individual shall be fit tested for the specific facepiece type and size to be used. Fit test shall be repeated

    i. At intervals not to exceed 12 months;

    ii. Prior to using a new type of tight-fitting respirator;

    iii. After oral or facial surgery;

    iv. After significant weight loss or gain (more than 10% of body weight).

d. No fit test is required for positive pressure loose-fitting hoods/helmets, i.e. PAPR

e. Failure to meet any one of the requirements in a, b, or c above shall disqualify the individual from respirator use until all requirements have been met.

SECTION 4

RADIATION DOSIMETRY

The purpose of the radiation dosimetry program is to measure radiation dose received by occupationally exposed individuals. The measured results serve to verify and document compliance with the applicable dose limits (see Section 3) as well as to identify problems and monitor the effectiveness of existing radiation safety controls. Workers shall inform the RSO of their previous exposure history, using an NRC Form 4 or equivalent.

Radiation dose may be received in two ways: from radioactive materials that are external to the body (external dose) or from radioactive materials that are deposited inside of the body (internal dose). These doses shall be monitored as described below:

A. External Radiation Dosimetry

1. Radiation dosimeters appropriate for the radiation to be monitored shall be issued to full time workers engaged in specific RWP governed work. At a minimum, the Site RSO shall require dosimetry to be worn by fulltime workers in Radiologically Controlled Areas where exposure rates are likely to exceed 0.5 mR/hr and:

    a. Adults and declared pregnant women likely to receive, in one year from sources external to the body, a dose in excess of 10% of the applicable dose limits (ref. Section 3), or

    c. Individuals, who are likely to exceed 10% of the applicable extremity absorbed dose limit.

2. Radiation dosimeters

    a. Dosimeters are issued to only one person. Dosimeters shall not be shared.

    b. Dosimeters in storage and not being worn shall be stored in a non-restricted area away from sources of radiation and near control dosimeters

    c. Dosimeters should not be exposed to high heat, chemical or physical insults, or washed in a washing machine.

    d. No person shall wear dosimeters issued during this project while working for another employer or institution without prior approval from the RSO. Employees shall notify the RSO if they are concurrently working for another employer and working with sources of ionizing radiation.

    g. Dosimeters shall be kept on-site when not in use and shall not be taken off site by individuals.

3. Lost or damaged dosimeters shall be reported to the HPS as soon as possible.

4. Persons who have lost or damaged their dosimeters shall be required to provide documentation of work activities and radioactive material uses as necessary for the RSO to assess dose.
5. Personal Location Where Dosimeters Are Worn:
    a. Whole body dosimeters shall be worn at the location on the torso/whole body likely to receive the highest dose (refer to definition of "whole body" in glossary),
    b. For fetal monitoring for a declared pregnant female, a dedicated, whole body dosimeter shall be worn on the abdomen.
6. Workers shall collect and return used dosimeters to the HPS promptly after receiving replacement dosimeters at the beginning of a new wear period.
7. Workers that are issued dosimetry on this project may request a copy of their dose records in writing at any time. All contact with the radiation badge service company is to be made through the Site RSO, or designee.
8. After termination of employment, a dose report (termination report) shall be provided at a minimum to all persons who received doses exceeding 10% of any radiation dose limit in the applicable reporting period. Dose reports for persons who received doses under 10% of any radiation dose limit in the applicable reporting period will be made available on request.
9. Area monitoring dosimetry will also be deployed at the Site RSO's discretion. These data will be collected to help determine dose in the event of lost personal dosimetry and to evaluate the risks associated with the project.
10. Due to the lower concentrations to be handled during the RD/RA, it is not anticipated that external dosimeters will be used throughout the duration of RA Activities. Rather, certain tasks may warrant external dosimetry of which the RSO has the authority to request its use in a case by case and as needed basis.

B. <u>Internal Radiation Dose Assessment</u>

1. All personnel working in radiologically restricted areas will be required to submit a baseline bioassay sample prior to beginning the project and a post bioassay sample when the project has been completed.
2. An assessment will be performed to determine the need and/or frequency of internal dosimetry for specific work groups. Routine bioassay sampling will be required for work groups with the potential to exceed 2% of the Class Y uranium ALI.
3. Baseline urine samples will be collected and analyzed for uranium content prior to starting work with radioactive materials (covering all urinary excretions over a 24-hour period). These analyses shall be performed by the subcontract laboratory.

4. Bioassay samples may be required at the Site RSO's discretion when conditions merit investigation or evaluation. Examples of such situations include elevated results following analysis of routine air samples and personnel contamination incidents. In situations where there is a potential for an intake of greater than 30% of the Class Y uranium ALI, the Site RSO may require daily bioassay samples to establish an accurate biokinetic model for the affected individual(s). It is not expected that daily bioassay samples are warranted for this project.
5. Upon project completion, all workers that are part of the bioassay program will be asked to submit termination urine samples (covering all urinary excretions over a 24-hour period). These samples will be analyzed for uranium content.
6. All bioassay sample results will be reviewed in an effort to determine validity and quantify exposure to radioactive materials internally. This will be accomplished through a process of quality control verification and comparison of bioassay results to. Bioassay samples will be documented in each individual's dose record.
7. In addition to each individual's minimum two bioassay samples and daily work area low-volume air samples, the Site RSO may elect to employ breathing zone (BZ) samples and/or high-volume work area air samples.
8. When determining dose to an individual as a result of an internal exposure, the Site RSO will evaluate all of the collected data related to the incident and will assign dose based on the most reliable and accurate information as determined by the conditions. When it is necessary to evaluate dose from bioassay results, the Intake Retention Fraction (IRF) will be determined based on the assumption that 90% of compounds are Class Y and 10 % of the compounds are Class D per NUREG CR-4884. The determination of IRF/Class of the material will be verified using the bioassay results.

SECTION 5

RADIOLOGICAL SURVEYS, POSTINGS, AND INSTRUMENTATION

Radiation and Contamination Surveys are used to identify and quantify radiological hazards.

A. Types of Surveys

1. Radiation surveys performed to measure exposure or dose rates from sources of radiation. Surveys shall be conducted as necessary to prevent exposures from exceeding limits outlined in Section 3. Exposure and dose rate calculations may be substituted for actual radiation surveys.

2. Contamination surveys performed to assess levels of radioactive material on the surfaces of work areas, packages, conveyances, personnel, etc.

B. Limits

1. Radiation levels

   a. < 2 mrem in any one hour in unrestricted areas - applies to short term (typically less than 24-hour) exposures.

   b. In restricted areas, exposure rates should be kept ALARA (As Low As is Reasonably Achievable). Refer to Section 3, Control and Limitation of Radiation Exposures.

2. Contamination levels

   a. In accordance with NRC Regulatory Guide 1.86 will be used for unrestricted release of materials from the site. Please refer to Table 1 below:

TABLE 1

ACCEPTABLE SURFACE CONTAMINATION LEVELS

NUCLIDE[a]	AVERAGE[b c]	MAXIMUM[b d]	REMOVABLE[be]
U-nat, U-235, U-238, and associated decay products	5,000 dpm α/100 cm^2	15,000 dpm α/100 cm^2	1.000 dpm α/100 cm
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, 1-125, 1.129	100 dpm/100 cm^2	300 dpm/ 100 cm–,	20 dpm/100 cm^2
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, 1-126,1-131,1-133	1000 dpm/100 cm^2	3000 dpm/100 cm^2	200 dpm/100 cm^2
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted	5000 dpm β-γ/100 cm^2	15,000 dpm β-γ/100 cm^2	1000 dpm β-γ/100 cm^2

[a]Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting, nuclides should apply independently.

[b]As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

[c]Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

[d]The maximum contamination level applies to an area of not more than 100 cm2.

[e]The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

C. Postings

1. **Caution (or Danger) Radiation Area** - any area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of 5 mrem in 1 hour at 30 centimeters from the source of radiation or from any surface that the radiation penetrates.

3. **Caution (or Danger) Airborne Radioactivity Area** – any area, accessible to individuals in which airborne radioactivity levels could result in an individual being exposed to a concentration in excess of 10 percent of the applicable DAC.

4. **Caution (or Danger) Radioactive Material(s)** – any area, accessible to individuals in which there is used or stored an amount of licensed material exceeding 10 times the quantity in Appendix C to 10 CFR 20.

5. Signs and postings listed in 1 through 4 above should be removed when conditions no longer warrant that posting.

6. Signs and postings listed in 1 through 4 above shall conform to NRC specifications on wording, symbol, and colors.

D. Labeling

Health Physics Staff shall ensure that each container of radioactive material bears a durable, clearly visible label bearing the radiation symbol and the words "CAUTION, RADIOACTIVE MATERIAL" or "DANGER, RADIOACTIVE MATERIAL." The label must also provide sufficient information (such as the radionuclide(s) present, an estimate of the quantity of the radioactivity, the date for which the activity is estimated, radiation levels, kinds of material, and mass enrichment) to permit individuals handling or using the containers, or working in the vicinity of the containers, to take precautions to avoid or minimize exposures.

E. Requirements on Maintaining Radiation Detection Instrumentation

1. The Site RSO/HPS shall possess radiation detection equipment, i.e. GM Survey Meter, Alpha/Beta Scintillator, Dose Rate Survey Meter, Wipe Test Counter, that is appropriate for detecting the types of radiations emitted by the sources radiation in which the employee is authorized to perform work.

2. Portable radiation detectors shall be calibrated at least annually or after repair of the instrument. Battery replacement or changing a damaged cable is not cause for performing a calibration.

3. When used, instruments will be checked daily to ensure that they respond properly to radiation, are in calibration, are in good physical condition, and batteries have sufficient charge.

SECTION 6

RADIATION SAFETY TRAINING

All individuals who work with or near sources of radiation are required to complete radiation safety training. The extent of the training must be commensurate with the level of hazard to which the individual is exposed. **All training must be documented.** No individual shall be allowed to work unsupervised around radioactive materials until that person completes appropriate radiation safety training.

A. Basic Radiation Safety Training

1. All individuals who work with radioactive material or routinely access restricted areas are required to satisfactorily demonstrate and comprehend basic knowledge of radioactivity and radiation safety by scoring at least 80% on a test administered by the Site RSO. In addition, the Site RSO shall provide site-specific training per HP-NMI-03 Radiological Worker Training to include instruction on current radiological conditions of the site.

2. Health Physics Staff will be responsible for providing and documenting situation-specific training to individuals who work with radioactive materials under the supervisor's control. This training shall include:

   a. Area restrictions - restrictions on the use of radioactive materials or occupancy;

   b. Location and procedures for equipment operation;

   c. Posting locations for required signs and notices;

   d. Walk-through review of work protocols;

   e. Special operating techniques that will minimize exposures when working around radioactive materials;

   f. Availability of protective equipment and clothing;

   g. Biological effects of ionizing radiation;

   h. Concepts and philosophy of ALARA;

   i. Methods to maintain doses ALARA; and

   h. Types and uses of radiation detection equipment.

3. All individuals will be required to participate in an Emergency Response Training Drill as outlined in the project Health and Safety Plan.

4. All training shall be documented and maintained in compliance with HP-NMI-03. Training documentation shall include:

a. Content of the training (outline, course description, etc);

b. Instructor name;

c. Date and duration of training;

d. Printed name of trainee(s); and

e. Signature or initials of trainee(s).

5. Copies of individual employee training records will be maintained.

SECTION 7

INCIDENTS AND EMERGENCIES

In the event of a radiological incident or emergency, the Site RSO must be notified immediately. In instances where there is doubt about whether such notification is necessary, contact shall be made to allow the Site RSO to assess the situation and initiate the appropriate response. Individuals working in areas shall have access to 2-way radios, cellular phones, etc. in order to be in constant communication with the Site RSO and Site Project Manager.

A. What Constitutes an Incident?

1. Loss or theft of any radioactive material or radiation-producing devices.
2. High or potentially high radiation exposure to an individual or to a member of the public. Examples of radiation exposures include:
    a. Greater than 500 mrem in one month or less to any occupationally exposed individual;
    b. Greater than 5000 mrem in one month or less to the extremity of any occupationally exposed individual; and
    c. Greater than 10 mrem to any member of the public.
3. Intake or potential intake of radioactive materials by inhalation, ingestion, absorption through skin, or injection through skin or wound exceeding 100 mrem.
4. Personnel contamination that cannot be completely removed after two washes with only soap and water.
5. Any personnel injuries that may involve radioactive contamination or radiation exposure.

B. Personnel Injury Involving Actual or Suspected Contamination or Exposure to Radiation

1. First determine if the incident area is safe to enter to render aid to the worker

    If area is safe to enter and worker's injury is immediately life-threatening render aid but ensure someone calls for additional medical support

2. Call for medical support if injury requires an ambulance and EMTs

    Treatment of the injury is first priority; therefore, contamination controls and decontamination should only be performed if the injury is first aid treatable and any contamination control does not worsen the injury.

SECTION 8

RECORD KEEPING

A. General Record-Keeping Requirements

1. All records related to performance of this work shall be maintained by *de maximis* upon completion of the project. These records will be retained for the duration as required by the NRC or the Environmental Protection Agency, whichever is longer. These records include, but are not limited to the following:

    a. Radiation surveys as required by job-task assignment

        i. Radiation field surveys in restricted areas, and

        ii. Radiation field surveys in unrestricted areas.

    b. Survey instrument calibrations

    c. Personnel records

        i. Worker/user lists

        ii. Training records

        iii. Dose records

    b. Standard operating procedures, radiation work permits, emergency procedures, and overview plans.

2. In addition to maintaining duplicates of all records, the Site RSO shall maintain the following records, which are available for review during normal office hours:

    a. Availability of regulations relating to radiation control and safety;

    b. Inspection reports;

    c. Current version of all policy manuals and procedure manuals;

    d. Dosimetry records; and

    e. Survey instrument calibrations.

B. Information Required on Specific Records

1. Radiation surveys

    a. Records shall be in units of dpm, Becquerel (Bq), Ci, R/h, or rem/h, as appropriate. Units of “cpm” or “counts” are not acceptable as final values but should be included to verify efficiency calculations for quantitative survey records

    b. Records shall uniquely identify the source of the radiation

c. Records, by use of a map, shall clearly indicate the areas surveyed

d. Records shall indicate the person performing the survey and date of survey

e. Records shall identify the survey instrument used, i.e., serial number, or other unique description

2. Personnel records shall include individual's full name, duration at project, all exposure monitoring information (internal and external exposure results), training documentation, and other information deemed necessary by the RSO. A folder shall be created for each individual working on site with radioactive materials or routinely accessing the restricted area.

APPENDIX B

HOT WORK PROCEDURES

HOT WORK PROCEDURES

1 PURPOSE

This procedure establishes the occupational safety requirements for employees and subcontractors who are required to perform hot work at the NMI Site. Hot work includes any temporary operation involving open flames or producing heat and/or sparks including welding, cutting, brazing, grinding, soldering, work on metal that would conduct heat through a wall or in contact with a wall, or torch applied roofing.

2 SCOPE

This procedure applies to employees and subcontractors working at the NMI Site. Cutting and grinding that does not generate sufficient heat or sparks to be considered a significant source of ignition to surrounding combustibles does not require a Hot Work Permit and those activities are exempt from the requirements of this procedure.

3 DEFINITIONS/ABBREVIATIONS

ANSI - American National Standards Institute

CFR - -Code of Federal Regulations

Fire Watch – A designated individual trained in specific fire-watch duties and dedicated to both worker safety and property loss prevention for a specified duration (usually one-half hour after completion of hot work).

FR – Flame Resistant

Hot Work - hot work is any temporary operation involving open flames or producing heat and/or sparks including brazing, cutting, grinding, soldering, arc welding or torch applied welding.

Hot Work Permit – Provides an authorization from the issuing authority to perform Hot Work.

Issuing Authority – An individual authorized by management with operating or designated jurisdiction over the facility or area where WBH is to be performed. The issuing authority should have a working knowledge of the facility and a good understanding of the potential hazards that could be involved with WBH operations.

NFPA - National Fire Protection Association

PPE - Personal Protective Equipment

Welding, Burning and Hot Work (WBH) – All methods of welding, arc and torch cutting, and open-flame brazing, open-flame burning, open-flame soldering, and other portable torch open-

flame operations for construction or maintenance activities. Electric soldering and drilling are NOT considered hot-work. If in question, contact Health and Safety.

4 REFERENCE/APPLICABLE DOCUMENTS

- ANSI Z49.1, Safety in Welding and Cutting and Allied Processes
- 29 CFR 1910, Occupational Safety and Health Standards
- 29 CFR 1926, Safety and Health Regulations for Construction
- NFPA Standard 51B, Fire Prevention in Use of Cutting and Welding Processes

5 RESPONSIBILITIES

5.1 Supervisors

Field Supervisors/Health and Safety Officers (FS/HSO) are responsible for compliance with this procedure within their respective areas of responsibility.

5.2 Employees

It is the responsibility of all personnel performing welding, cutting & brazing operations, designing construction or Decommissioning/decontamination work, or planning packages, to comply with the requirements of this procedure and any other project specific requirements.

6 REQUIREMENTS

6.1 General Requirements

Hot Work shall be performed only after obtaining and completing a Hot Work Permit. The permit must be approved and signed by the issuing authority for the project. In addition, all hot work must be reviewed and approved by a representative from Health and Safety.

Because the hot work permit does not address all of the potential hazards with the activity, an Activity Hazard Assessment (AHA) or a Job Hazard Analysis (JHA) must be conducted.

Take all precautions necessary to determine changing conditions that may indicate a deviation from the original scope of activity. IF such a condition occurs, THEN the AHA or JHA must be re-evaluated.

Hot work controls shall include review and approval of adequate fire prevention measures and adequacy of personal protective equipment to ensure worker safety. Prior to performance of Hot Work, personnel approving the activity shall ensure workers understand the fire prevention controls and roles of the fire watch.

6.1.1 Fire Prevention Precautions

- Hot Work shall be permitted only in areas that are or have been made fire safe.

- Hot Work shall only be performed in an area approved as a Permissible Welding Area or in an area specifically authorized by a Hot Work Permit.

- The floor around the area where the Hot Work is to be performed should be swept clean for a radius of 35 feet.

- Combustibles shall be relocated at least 35 feet away from the work area. If relocation is not possible, combustibles shall be protected with flame-proof covers or otherwise shielded with metal or flame-resistant guards or curtains. The edges of covers at the floor shall be tight to prevent sparks from going under the covers.

- Hot Work on pipes and other metal in contact with combustible walls, partitions, ceilings, or roofs shall not be undertaken, if the work is close enough to cause ignition by conduction.

- Fully charged and operational fire extinguishers, appropriate for the type of possible fire shall be available in the work area for Hot Work performed in other than designated permissible welding areas.

- Work in an outside environment requires additional precautions to prevent sparks from migrating to adjacent combustible foliage and trees

Nearby personnel shall be relocated or suitably protected from heat, sparks, slag, arc flashing, or infrared or ultraviolet radiation.

6.1.2 Permissible Welding Areas

Permissible welding areas are designated areas for long term or permanent performance of Hot Work, such as a maintenance shop or detached outside location. Hot Work may be performed within a permissible welding area without a Hot Work Permit.

6.2 Personal Protective Equipment

- Helmets or hand shields will be used during all arc welding or arc cutting operations.

- Helpers or firewatchers will be equipped with proper eye protection.

- Goggles or other suitable eye protection will be used during all gas welding or gas cutting operations.

- All operations and helpers of resistance welding or brazing will use goggles or face shields.

- When required, flame resistant clothing (coveralls, gloves, etc.) shall be worn.

6.3 Individuals Performing Hot Work

Individuals performing the hot work are responsible for the following:

- Obtaining written approval from issuing authority for the hot work permit.

- Ensuring the conditions are safe and hazard free before beginning the hot work.

- Being prepared to contact supervision should conditions change or warrant reassessment while performing the hot work.
- Using appropriate personal protective equipment (PPE) while performing hot work (welding helmets, gloves, jackets, etc.)
- Completing the appropriate section(s) of the hot work permit.
- Returning the completed hot work permit to the issuing authority.

6.4 Firewatch

Individuals performing the Firewatch are responsible for the following:

- Being aware of the inherent hazards involved in the hot work.
- Ensuring safe conditions are maintained during the hot work.
- Ensuring appropriate fire extinguishers are readily available.
- Knowing how and when to report a fire or other emergency situation.
- Maintaining the watch for at least 30 minutes after the work is completed.
- Using the appropriate PPE.
- Completion of the appropriate section of the hot work permit.

6.5 Supervisors

Supervisors are responsible for the following:

- Maintaining cutting or welding equipment in safe operating condition.
- Ensuring the precautions listed on the Hot Work Permit are understood by the person(s) performing the permitted cutting, welding or brazing operations.

7 HOT WORK PROCESS

Hot Work Permit Forms (see attached) should be used for all work at the NMI Site. Contractors may substitute their own form provided the Site Project Manager (SPM) has approved their Hot Work Program.

7.1 Prior to Hot Work

- Obtain hot work permit and post at the location in a highly visible area.
- Inspect the hot work area to identify any fire hazards.
- Remove all flammable or combustible materials within a thirty-five (35)-foot radius of the hot work.

- Properly shield combustibles that cannot be removed from the area with noncombustible blankets or other noncombustible materials.
- Seal all cracks and openings through which hot sparks or slag may enter. As an alternate means, a fire resistant shield may be used to block the openings.
- Sweep floor of all loose combustible debris.
- Place noncombustible or flame resistant screens to protect personnel in adjacent work areas from heat, flames, radiant energy, and welding splatter.
- Protect conveyer systems that may carry sparks of slag to other parts of the building.
- Post the area to warn nearby personnel of the danger.
- Cover sprinkler heads directly above the hot work area with wet rags or other noncombustible materials to not be triggered during the work.
- Cover smoke detectors located in close proximity to the hot work area.

7.2 During Hot Work

- Appropriate fire extinguishing equipment shall be maintained in close proximity to the hot work for its entire duration, plus thirty (30) minutes after completion of work.
- Combustible floors shall be kept wet during the hot work.
- Store acetylene and other fuel cylinders in a secure and upright postion.
- Place hoses to prevent becoming crushed or damaged.

7.3 After Hot Work

- Firewatch will remain at the site for at least thirty (30) minutes following the completion of the hot work.
- Fire extingishing equipment must remain accessible in the area until the firewatch is secured.
- Remove any covers from sprinkler heads immediately when hot work is completed.
- Remove covers from any smoke detectors immediately when hot work is completed.
- Completion of the appropriate section(s) of the hot work permit and the return of the complete form to the issuing authority.

7.4 Hot Work Restrictions

- Areas, including those with confined spaces, where atmospheres of explosive gases, vapors, or dusts exist or could accumulate.

- On metal walls, ceilings, or roofs built of composite, combustible, and sandwhich-type panel construction or having combustile coverings.
- On containers where flammable liquids, solids, or vapors may be present.
- On pipes in contact with combustible walls, ceilings, roofs, or partitions where heat by conduction can cause ignition.
- Removal of paint with known or suspect lead, cadmium or PCB contaminants.

7.5 Storage of Cylinders

- Cylinders will be stored at least twenty (20) feet from highly combustible materials and where the cylinders will not be exposed to excessive rise in temperature, physical damage or tampering by unauthorized persons.
- Cylinders must be chained at all times or otherwise secured to prevent from falling over.
- Oxygen cylinders will be separated from fuel gas cylinders or combustible materials at a minimum distance of twenty (20) feet or by a noncombustible barrier at least five (5) feet high, having a fire resistance rating of a least thirty (30) minutes.

8 TRAINING

8.1 Individuals Performing Hot Work and Firewatchers

All employees performing hot work or acting as the firewatcher must be trained to conduct hot work activities. The training contains at a minimum:

- How hot work fires and explosions start
- How fires can be prevented and what makes hot work fires more severe.
- What are the Hot Work Policy, procedures, and responsibilities.

8.2 Contractors

Contractors are required to provide training to their employees involved in performing hot work. Any job where the contractor fails to follow hot work procedures will be shut down until the infraction has been corrected. All contractors must notify the hot work permit issuing authority of any hot work to be performed.

9 RECORDKEEPING

9.1 Hot Work Permits

All original hot work permits shall be returned to the issuing authority for record retention. Keep a copy for your file. Records of hot work permits should be maintained for

one (1) calendar year. Hot work permits on file should be reviewed for program improvement or modification purposes prior to disposal.

9.2 Training

Copies of training records shall be maintained in accordance with project records management requirements.

APPENDIX D

Hot Work Permit - Example Permit

HOT WORK BEING PERFOMED BY:

☐ EMPLOYEE

☐ CONTRACTOR _____

DATE ISSUED:

LOCATION / BUILDING & FLOOR:

NATURE OF JOB:

NAME OF PERSON(S) PERFORMING HOT WORK:

The above location has been examined. The precautions checked on the Required Precaution Checklist have been taken to prevent fire. Permission is granted for this work.

SIGNED: (Safety Supervisor)

TIME STARTED:	AM PM	TIME FINISHED:	AM PM
PERMIT EXPIRES	DATE:	TIME:	AM PM

FIRE WATCH SIGNOFF

Work area and all adjacent areas to which sparks and heat might have spread were inspected for at least 30 minutes after work was completed and found safe.

Signed: _____

After completion of work, return permit to:

_____

REQUIRED PRECAUTIONS CHECKLIST

☐ Fire sprinklers, hose streams and extinguishers in service.

☐ Cutting and welding equipment in good repair (same for brazing, etc.)

Requirements within 35 ft. of work

☐ Flammable liquids, dust, lint, and oily deposits removed.

☐ Floors swept clean.

☐ Combustible floors wet down or covered with damp drop cloths, or metal shields.

☐ Remove other combustibles where possible. Otherwise protect with fire-resistant tarpaulins or metal shields.

☐ All wall floor openings covered.

☐ Fire-resistant tarpaulins suspended beneath work.

Work on walls or ceilings

☐ Construction is noncombustible and without combustible covering or insulation.

☐ Combustibles on other side of wall moved away.

Work on enclosed equipment

☐ Enclosed equipment cleaned of all combustibles.

☐ Containers purged of flammable liquids.

Fire Watch/Hot Work area monitoring

☐ Fire watch will be provided during and for 30 minutes after completion of work.

☐ Fire watch is supplied with extinguishers and/or hose.

☐ Fire watch is trained in use of this equipment and in sounding the alarm.

APPENDIX C

HEARING CONSERVATION PROGRAM

HEARING CONSERVATION PROGRAM

1. Purpose

The purpose of this Program is to protect personnel from occupational hearing loss due to excessive exposure to noise. This Program addresses the requirements of the OSHA Standard 29 CFR 1910.95. The Company will also comply with other OSHA state or local regulations for noise and hearing conservation as they relate to occupational exposure.

2. Scope

This Program applies to all NMI project employees when working in areas where noise exposure exceeds the Action Level of 85 dBA for an 8-hour TWA.

3. Definitions

Action Level: An 8-hour time weighted average exposure of 85 decibel (dB) measured on the A-scale slow response. This is equivalent to a dose of 50%.

Audiogram: A graph chart or table produced from an audiometric or hearing test that documents an individual's hearing threshold levels at several different frequencies usually in a range from 500 to 6000 hertz (Hz).

Audiometer: An instrument for measuring hearing thresholds for pure tones of normally audible frequencies.

dB(A): The unit representing the sound level measured with the A-weighting network on a sound level meter. The A weighted scale discriminates against very low frequencies as does the human ear at lower noise levels. It is usually the preferred scale for measuring general sound levels with a sound level meter in the work place.

Dampening: To decrease the amplitude of a sound-generating wave caused by vibration.

Decibel: The unit of measurement of sound level abbreviated dB. Decibels are logarithmic units of measurement. An increase of 3 dB represents an approximate doubling of the measured characteristic.

Hz: Abbreviation for hertz frequency measured in cycles per second (1 cycle per second = 1 hertz).

Noise: Sound that is loud, unpleasant, or unwanted.

Noise dosimeter: An instrument that integrates a function of sound pressure over a period of time in such a manner that it directly indicates a noise dose.

Sound level meter: An instrument for the measurement of sound level.

Sound pressure level: The level in decibels of a sound as compared to a reference sound pressure.

Standard threshold shift: A change in the hearing threshold relative to the baseline audiogram of an average of 10 dB or more at 2000 3000 and 4000 Hz in either ear.

4. Responsibilities

a. Employees

Employees shall use only approved and provided noise reduction equipment in accordance with Site Health and Safety Procedures.

b. Site Operations Manager

The subcontractor's Field Supervisor/Health and Safety Officers are responsible for ensuring that all aspects of Sections 5, 6, 7, and 8 are implemented in their operations including ensuring that:

i. Appropriate noise level measurements are made to determine employee exposure.

ii. Feasible engineering and administrative controls are used to reduce noise levels to acceptable levels. Hearing protection is only to be issued:

- While feasible controls are being installed or initiated;
- When feasible controls are not sufficient to reduce noise levels to acceptable levels;
- Emergencies.

iii. Appropriate hearing protection is provided as required by noise monitoring and assessment and that hearing protection is worn where required.

iv. Designated employees are provided with annual audiometric testing as required by this Program.

v. Copies of employees' noise exposure assessments are maintained by the physician or other licensed health care professional (PLHCP).

5. Permissible Noise Exposures

Site personnel shall not be exposed to noise levels while at work exceeding those listed in Table 5-1 below as measured on the A scale of a standard sound level meter at slow response. If noise levels exceed those listed in Table 1 below, hearing protection shall be required.

Table 5-1

Permissible Noise Exposures

Duration per day (hours)	Sound Level db(A)
16	85
12	87
10	88
8	90
6	92
4	95
3	97
2	100
1.5	102
1	102
0.5	110
0.25 or less	115

6. Noise Monitoring

a. General Requirement

All work areas shall be monitored for noise levels upon indication that employees' exposures may exceed 85 dB(A). Any areas where a normal level of speaking cannot be readily heard at a distance of 2 feet will be included in the monitoring. Sound level meters may be used to screen areas or activities for further noise monitoring. Any areas or activities where the maximum noise level is 80 dB(A) or less may be excluded from more comprehensive monitoring.

b. Representative Monitoring

All monitoring being performed to determine employees' inclusion in the Hearing Conservation Program must be indicative of their personal 8-hour time weighted average (TWA) exposures.

c. Equipment

Personal exposure monitoring must normally be carried out using personal noise dosimeters. Only trained health and safety professionals are allowed to carry out personal noise exposure monitoring using a sound level meter and then only with permission of the appropriate Safety and Health Manager (company dependent).

d. Additional Monitoring

Noise monitoring must be repeated whenever there is a significant change in the operation. A significant change includes any change that puts additional employees at risk to noise levels above 85 dB(A) and any change that may create an increase in noise levels such that the assigned hearing protection would be rendered inadequate. For field operations monitoring must also be repeated with any significant change in equipment materials or environment. Historical noise monitoring data may be used for worksites as long as all equipment and materials are comparable and the operation has not changed significantly as described in this paragraph.

e. Records

Noise monitoring data and employees' exposure assessments shall be kept as required.

7. Audiometric Examinations

a. Baseline

Baseline audiograms shall be provided to all employees assigned to job classifications where noise levels have been shown to be above an 8-hour TWA of 85 dB(A) without regard to the attenuation afforded by hearing protection. The baseline audiogram shall be provided within the first 6 months of active employment or change in job classification.

b. Annual

Employees described in shall also undergo annual audiometric testing. Comparisons to the baseline audiogram interpretation of results and ensuring that employees are provided written notification of test results shall be the responsibility of the Physician or other Licensed Health Care Professional (PLHCP) 1 .

c. Low Noise Before Audiogram

Prior to undergoing audiograms employees shall not be exposed to workplace noise for a period of at least 14 hours. Employees shall also be notified to avoid excessive nonoccupational noise exposure during that time period.

d. Standard Threshold Shift

If the audiogram indicates a standard threshold shift has occurred the PLHCP shall determine appropriate follow-up actions.

e. Responsibility for Testing

PLHCP is responsible for ensuring that all audiometric testing facilities and equipment comply with applicable requirements.

8. Hearing Protection

a. Control Priorities

Wherever feasible engineering or administrative controls shall be implemented to reduce noise levels below the action level. Engineering and administrative controls may include such measures as:

- Increasing distance from the noise source - noise levels may be reduced by about 6 dB by doubling the distance between employees and the noise source;
- Isolating the noise source - either with an enclosure or in a separate room;
- Controlling noise producing vibrations – by reducing vibrating surface or by dampening; and
- Use of mufflers – on electric motors, intakes of air compressors, on exhaust of pneumatic hand tools, etc.

b. PPE Assessment

a. Where feasible controls fail to reduce noise levels below the Action Level of 85 dB(A) 8-hour TWA, a hearing protection PPE assessment shall be completed and documented by the FS/HSO certifying the following:

- the name(s) of the person(s) performing the assessment;
- the signature of the person certifying that the assessment and evaluation were performed;
- the workplace job site or task being certified; and
- the date(s) of the hazard assessment.
- Documentation shall be maintained in the project file.

b. Placards containing notice that hearing protection is required in the area shall be posted in every area requiring hearing protection.

c. When PPE Must be Available

Personal hearing protection shall be provided when engineering and administrative controls cannot achieve noise levels below the Action Level or as otherwise required.

d. When PPE Must be Used

Employees shall be required to use provided hearing protection:

- When noise exposures exceed the OSHA permissible noise exposure (see Table 1)
- By employees whose noise exposure meets or exceeds an 8-hour Time Weighted Average (TWA) of 85 dB(A) and
- Who have not had their baseline audiogram, or
- Have experienced a standard threshold shift.

e. Acceptable Protection

The following formula shall be used to determine required hearing protector attenuation unless the HSO approves a different method.

SL = measured sound level in dB(A)

NRR = Noise Reduction Rating as indicated on hearing protection

SL - (NRR-7)/2 = dB

if dB < 85 for peak sustained or 8-hour TWA or < 140 for impulse or impact then the hearing protection is adequate for the task.

Note: If it becomes necessary to combine types of hearing protection to achieve adequate attenuation, contact the HSO for guidance. NRRs of two devices in combination are not simply added.

f. Selection

At least two styles of adequate protection shall be provided at no cost to employees. Employees shall be permitted to select their hearing protectors from the styles provided.

g. Fitting

Employees shall receive assistance in fitting hearing protectors during the training described in 9 of this Program. Additional assistance and fitting instructions shall be provided whenever there is a significant change in hearing protectors or when it is observed that employees are not properly using the hearing protection.

9. Employee Information and Training

a. Who to Train

The following employees shall be provided training:

- All who are exposed to noise levels of 85 dB(A) or greater
- All who receive audiograms and
- All who are required to wear hearing protection.

b. Training Contents

Employee training shall include as a minimum:

- The effects of noise on hearing;
- The purpose of hearing protectors;
- The advantages and disadvantages of different types of hearing protectors including attenuation;
- Instructions on selection, fitting, use, and care of hearing protectors;
- The purpose of audiometric testing and an explanation of test procedures; and
- Information concerning any engineering or administrative controls implemented to reduce their noise exposures.

In addition, posters identifying the correct placement of hearing protection shall be placed in areas requiring hearing protection.

c. When to Train

Affected employees shall receive training prior to being assigned to work in areas where noise levels may exceed an 8-hour TWA of 85 dB(A) and on an annual basis thereafter. The initial and annual training may be incorporated into other annual training programs such as HAZWOPER refresher course or may be offered as standalone sessions.

d. Incorporation of Training with Other Health and Safety Training

Hearing Conservation training may be included as a part of any other health and safety training such as Chemical Hygiene training HAZWOPER training etc. on the condition that all relevant

topics are addressed. Documentation of any such training must clearly show that hearing conservation was addressed during the training session.

e. Exposure Monitoring Results

Employees exposed to an 8-hour TWA of 85 dB(A) or more shall be notified in writing of the results of any personal noise exposure monitoring characteristic of their exposures.

f. OSHA Standard

A copy of the OSHA Occupational Noise Exposure standard 29 CFR 1910.95 shall be made available to employees exposed to an 8-hour TWA of 85 dB(A) or more.

10. Regulatory References

- 29 CFR 1910.1910.95 (OSHA – Hearing Conservation)

APPENDIX D

BLOODBORNE PATHOGENS PROTECTION PROGRAM

Bloodborne Pathogens Protection Program

1. PURPOSE

The purpose of this Program is to provide guidance on the implementation of applicable regulatory requirements associated with work activities that have the potential to expose employees to blood or other potentially infectious materials. Specifically, employees may be assigned, as part of their job duties, responsibilities to provide Cardiopulmonary Resuscitation (CPR) and first aid.

2. SCOPE

- This procedure applies to de maximis activities. Contractors should have their own Bloodborne Pathogens program that is equivalent to or more restrictive than this one. Equivalency is determined by the Site Project Manager (SPM) in agreement with the Field Supervisor/Health and Safety Officer (FS/HSO).
- This program does not address such contact related to Good Samaritans.

3. REFERENCES

29 CFR 1910.1030 – Bloodborne pathogens

29 CFR 1910.1020 – Access to employee exposure and medical records

29 CFR 1926.50 – Medical services and first aid

4. ACRONYMS AND DEFINITIONS

Biological Agents/Organic Materials – Agents (pathogens or allergens) that are derived from or are living organisms (viruses, bacteria and fungi) and can cause negative health effects including allergic reactions, respiratory disorders and hypersensitivity and infectious diseases. Biological agents are infectious through one or more of the following mechanisms of exposure, depending upon the particular type of agent: inhalation, ingestion, contact with the mucous membranes of the eyes, or nasal tissues or penetration of the skin through open cuts (even very small cuts and abrasions of which employees might be unaware). Common examples: Human Immunodeficiency Virus (HIV), Tuberculosis (TB), Hepatitis B and C, etc.

Biohazard – Biological material that can cause harm to other living organisms.

Blood – Human blood, human blood components, and products made from human blood.

Bloodborne Pathogens – Pathogenic microorganisms that are present in human blood and can cause disease in humans. These pathogens include, but are not limited to, hepatitis B virus (HBV) and human immunodeficiency virus (HIV).

Contaminated – The presence or the reasonably anticipated presence of blood or other potentially infectious materials on an item or surface.

5. PERIODIC PROGRAM REVIEWS

The HASP and any JHAs associated with prevention of contact with Bloodborne Pathogens shall be reviewed and updated at least annually and whenever necessary to reflect new or modified tasks and procedures which affect occupational exposure and to reflect new or revised employee positions with occupational exposure.

The review and update of such plans shall also:

- Reflect changes in technology that eliminate or reduce exposure to bloodborne pathogens; and

- Document annually consideration and implementation of appropriate commercially available and effective safer medical devices designed to eliminate or minimize occupational exposure.

6. PERSONNEL PROTECTION

- The employer shall provide hand washing facilities which are readily accessible to employees.

- When provision of hand washing facilities is not feasible, the employer shall provide either an appropriate antiseptic hand cleanser in conjunction with clean cloth/paper towels or antiseptic towelettes.

- When antiseptic hand cleansers or towelettes are used, hands shall be washed with soap and running water as soon as feasible.

- Employees must wash their hands with soap and water immediately or as soon as feasible after removal of gloves or other PPE used to perform first aid.

- Flush mucous membranes with water immediately or as soon as feasible following contact of such body areas with blood or other potentially infectious materials.

- All first aid procedures involving blood or other potentially infectious materials shall be performed in such a manner as to minimize splashing, spraying, spattering, and generation of droplets and aerosols of these substances.

- Equipment which may become contaminated with blood or other potentially infectious materials shall be examined prior to servicing or shipping and shall be decontaminated as necessary, unless the employer can demonstrate that decontamination of such equipment or portions of such equipment is not feasible. Equipment should also be appropriately labeled.

- Contaminated laundry shall be handled as little as possible with a minimum of agitation and shall be bagged or containerized at the location where it was used. Bags and containers will be labeled appropriately.

- When there is occupational exposure to bloodborne pathogens, appropriate PPE will be provided, at no cost to the employee. Appropriate PPE is considered gloves, gowns, laboratory coats, face shields or masks and eye protection, and mouthpieces, resuscitation bags, pocket masks, or other ventilation devices. PPE will be considered "appropriate" only if it does not permit blood or other potentially infectious materials to pass through to or reach the

employee's work clothes, street clothes, undergarments, skin, eyes, mouth, or other mucous membranes under normal conditions of use and for the duration of time which the protective equipment will be used.

• FS/HSOs shall ensure that the employee uses appropriate PPE unless it can be shown that the employee temporarily declined to use PPE when, under rare and extraordinary circumstances, it was the employee's professional judgment that in the specific instance its use would have prevented the delivery of first aid or public safety services or would have posed an increased hazard to the safety of the worker or coworker. When the employee makes this judgment, the circumstances shall be investigated and documented in order to determine whether changes can be instituted to prevent such occurrences in the future.

• The project contractor companies will ensure that appropriate PPE in the appropriate sizes is readily accessible to employees covered by this program.

• Each company shall provide a means to clean, launder, and dispose of PPE at no cost to the employee. As well, repairs or replacements of PPE will also be provided at no cost, and as needed.

• If a garment(s) is penetrated by blood or other potentially infectious materials, the garment(s) shall be removed immediately or as soon as feasible.

• All PPE shall be removed prior to leaving the work area.

• When PPE is removed it shall be placed in an appropriately designated area or container for storage, washing, decontamination or disposal.

• Gloves shall be worn when:

o It can be reasonably anticipated that the employee may have hand contact with blood, other potentially infectious materials, mucous membranes, and nonintact skin;

o The employee performing first aid has cuts, scratches, or other breaks in his or her own skin; • The employee is receiving training in first aid techniques; and

o Handling or touching any potentially contaminated items or surfaces.

• All equipment and environmental and working surfaces shall be cleaned and decontaminated with an appropriate disinfectant immediately after contact with blood or other potentially infectious materials or as soon as feasibly possible.

• Broken glassware which may be contaminated shall not be picked up directly with the hands. It shall be cleaned up using mechanical means, such as a brush and dust pan, tongs, or forceps.

7. VACCINATIONS, EVALUATION AND FOLLOW-UP

The hepatitis B vaccine and vaccination series will be made available by employers to all employees who may have occupational exposure, and post-exposure evaluation and follow-up to all employees who have had an exposure incident. See Attachment 1 for an example of a declaration form to be used.

The vaccination will take place after the employee has received the training and within 10 working days of initial assignment to all employees who have occupational exposure unless the employee has previously received the complete hepatitis B vaccination series, antibody testing has revealed that the employee is immune, or the vaccine is contraindicated for medical reasons.

Each employer shall ensure that all medical evaluations and procedures including the hepatitis B vaccine and vaccination series and post-exposure evaluation and follow-up, including prophylaxis, are:

- Made available at no cost to the employee;
- Made available to the employee at a reasonable time and place;
- Performed by or under the supervision of a licensed physician or by or under the supervision of another licensed healthcare professional; and
- Provided according to recommendations of the U.S. Public Health Service current at the time these evaluations and procedures take place and by an accredited laboratory.

Following a report of an exposure incident, the employer shall make immediately available to the exposed employee a confidential medical evaluation and follow-up, including at least the following:

- Documentation of the route(s) of exposure, and the circumstances under which the exposure incident occurred;
- Identification and documentation of the source individual, unless the employer can establish that identification is infeasible or prohibited by state or local law;
- The source individual's blood shall be tested as soon as feasible and after consent is obtained in order to determine TB, HBV and HIV infectivity.

If consent is not obtained, the employer shall establish that legally required consent cannot be obtained. When the source individual's consent is not required by law, the source individual's blood, if available, shall be tested and the results documented.

Each employee covered by this plan will be provided with a copy of the evaluating healthcare professional's written opinion within 15 days of the completion of any medical evaluations and test results.

8. TRAINING

Training shall be provided at the time of initial assignment to tasks where occupational exposure may take place and at least annually thereafter.

The training program shall contain at a minimum the following elements:

- An accessible copy of the regulatory text of 29 CFR 1910.1030 and an explanation of its contents;
- A general explanation of the epidemiology and symptoms of bloodborne diseases;

• An explanation of the modes of transmission of bloodborne pathogens;

• An explanation of the employer's exposure control plan (i.e., HASP and JHA) and the means by which the employee can obtain a copy of the written plan;

• An explanation of the use and limitations of methods that will prevent or reduce exposure I ncluding appropriate engineering controls, work practices, and PPE;

• Information on the types, proper use, location, removal, handling, decontamination and disposal of PPE;

• An explanation of the basis for selection of PPE;

• Information on the hepatitis B vaccine, including information on its efficacy, safety, method of administration, the benefits of being vaccinated, and that the vaccine and vaccination will be offered free of charge;

• Information on the appropriate actions to take and persons to contact in an emergency involving blood or other potentially infectious materials; •

An explanation of the procedure to follow if an exposure incident occurs, including the method of reporting the incident and the medical follow-up that will be made available;

• Information on the post-exposure evaluation and follow-up that the employer is required to provide for the employee following an exposure incident;

• An explanation of the signs and labels and/or color coding required; and

• An opportunity for interactive questions and answers with the person conducting the training session.

9. EVALUATION OF EXPOSURE INCIDENTS

An exposure determination shall be made, without regard to personal protective equipment (PPE), and will contain the following:

• A list of all job classifications in which all employees in those job classifications have occupational exposure;

• A list of job classifications in which some employees have occupational exposure, and

• A list of all tasks and procedures or groups of closely related task and procedures in which occupational exposure occurs and that are performed by employees in job classifications listed.

10. RECORDKEEPING

Each operation location shall establish and maintain an accurate medical record for each employee with occupational exposure, in accordance with 29 CFR 1910.1020.

11. ATTACHMENTS

Attachment 1 - Hepatitis B Vaccine Declination (Mandatory)

APPENDIX F

ATTACHMENT 1
HEPATITIS B VACCINE DECLINATION (Mandatory)

I understand that due to my occupational exposure to blood or other potentially infectious materials I may be at risk of acquiring hepatitis B virus (HBV) infection. I have been given the opportunity to be vaccinated with hepatitis B vaccine, at no charge to myself. However, I decline hepatitis B vaccination at this time. I understand that by declining this vaccine, I continue to be at risk of acquiring hepatitis B, a serious disease. If in the future I continue to have occupational exposure to blood or other potentially infectious materials and I want to be vaccinated with hepatitis B vaccine, I can receive the vaccination series at no charge to me.

Employee Signature:_____Date:_____

Supervisor Signature:_____Date:_____

APPENDIX E

EXCAVATION & TRENCHING SAFETY PROGRAM

EXCAVATION AND TRENCHING

1. PURPOSE

The purpose of this Procedure is to provide the minimum safety requirements for tasks involving excavation, trenching, or other surface openings.

2. SCOPE

This Procedure applies to all tasks where employees perform, control or work near excavating, trenching, or other surface-opening activities. This Procedure also applies to all tasks where site employees may enter an excavation or an excavation may pose a hazard during project-related field activities, regardless of who performs the excavating.

3. REFERENCES

29 CFR 1926 Subpart P; Excavations
29 CFR 1926 Subpart O; Motor Vehicles, Mechanized Equipment, and Marine Operations

4. ACRONYMS AND DEFINITIONS

Benching - A method of excavation whereby the faces of an excavation are widened progressively outward with respect to the bottom by a specific series of horizontal and vertical cuts to provide protection against the hazards of moving ground.

Cave-in - The separation of a mass of soil or rock material from the side of an excavation, or the loss of soil from under a trench shield or support system, and its sudden movement into the excavation, either by falling or sliding, in sufficient quantity so that it could entrap, bury, or otherwise injure and immobilize a person.

Excavation Safety Competent Person (ESCP) - A person designated by the employer who has had training in and is knowledgeable about soil analysis and the use of protective systems in excavations. The competent person shall also be capable of identifying existing and predictable surrounding hazards, working conditions that are unsanitary, hazardous, or dangerous to employees, and capable of taking prompt corrective measures to eliminate them.

Excavation - A man-made cut, cavity, trench, or depression in an earth surface, formed by earth removal.

High Visibility Safety Apparel – Vests, pants and jacket or other site specific safety clothing made of fluorescent and reflective materials such as yellow, orange or other approved colors to increase visibility of the wearer. Prior to use, the garment is to be inspected to ensure that the color has not faded and the retroreflective properties have not been lost.

Protective System - A method of protecting employees from cave-ins, from material that could fall or roll from an excavation face or into an excavation, or from the collapse of adjacent

structures. Protective systems include support systems, sloping and benching systems, shield systems, and other systems that provide the necessary protection.

Registered Professional Engineer - a person who is registered as a professional engineer in the state where the work is to be performed. However, a professional engineer, registered in any state is deemed to be a "registered professional engineer" within the meaning of this standard when approving designs for "manufactured protective systems" or "tabulated data" to be used in interstate commerce.

Shoring System – A temporary structure for the support of earth surfaces formed as a result of excavation work and that is designed to prevent cave-ins.

Sloping. - A method of excavation whereby the faces of an excavation are laid back to provide protection from moving ground. The angle of incline required varies with differences in soil type, environmental conditions, and imposed loading.

Stable rock - Natural solid mineral matter which can be excavated with vertical sides and remain intact while exposed.

Trench - A narrow excavation made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench at the bottom is not greater than 15 feet (4.6 meters). If forms or other structures are installed or constructed in an excavation so as to reduce the dimension measured from the forms or structure to the side of the excavation to 15 feet (4.6 meters) or less at the bottom, the excavation is also considered to be a trench.

Type A soil – Cohesive soil with an unconfined compressive strength of 1.5 tons per square foot (tsf). Type A soils include clay, silty clay, sandy clay, clay loam, caliche, hardpan, and sometimes silty clay loam and sandy clay loam. No soil should be classified as Type A if it is fissured; subject to vibration from traffic, pile driving, or similar effects; previously disturbed; or part of a sloped, layered system where the slope is four horizontal to one vertical or greater.

Type B soil - Cohesive soil with an unconfined compressive strength greater than .5 tsf but less than 1.5 tsf. Type B soils include granular cohesion-less soils like angular gravel, silt, silt loam, sandy loam, and sometimes silty clay loam and sandy clay loam; previously disturbed soils that are not Type C; fissured soils and soils subject to vibration that would otherwise be classified as Type A; dry rock that is not stable; and material that is part of a sloped, layered system where the layers dip on a slope less steep than four horizontal to one vertical.

Type C soil - Cohesive soil with an unconfined compressive strength of .5 tsf or less. Type C soils include granular soils such as gravel, sand, and loamy sand; submerged soil; soil from which water is freely seeping; submerged rock that is not stable; or material in a sloped, layered system where the layers dip into the excavation at a slope of four horizontal to one vertical or steeper.

5. REQUIREMENTS

All employees involved in excavating, trenching or other surface opening projects or tasks shall be familiar with the potential safety hazards and be knowledgeable in the appropriate safety measures needed to ensure a safe working environment.

All employees working in or around excavations or trenches shall be required to wear personal protective equipment for the head, eyes, lungs, hands, feet and other parts of the body as deemed necessary by the hazards present including high visibility safety apparel.

Employees exposed to heavy equipment or vehicular traffic whether working in an active public or private roadway regardless of whether it is temporary or permanent in design shall wear high visibility safety apparel.

Dust conditions should be kept to a minimum by the use of water, salt, calcium chloride or other acceptable means.

Emergency rescue equipment such as breathing apparatus, a safety harness and line, basket stretcher, etc. shall be readily available where adverse conditions exist.

Employees shall not enter into excavations, especially trench excavations, unless absolutely necessary. No employee shall ever work alone in or around an excavation site.
Employees shall not enter excavations five feet or more in depth that are not adequately protected from cave-in by sloping, shoring, or other appropriate protective system.

Protective systems shall comply with Occupational Safety and Health Administration (OSHA) standards and shall have the capacity to resist, without failure, all loads that are intended or could reasonably be expected to be applied or transmitted to the system.

A Registered Professional Engineer shall design or certify protective systems for excavations greater than 20 feet in depth. The effects of vibration from nearby roads, railways, etc., must be accounted for in the design and installation of protective systems.

Any shoring system, including a trench box, must remain in the excavation when the project site is unattended.

All employees required to enter an excavation or work in close proximity to an excavation shall be trained in job-specific safety procedures, and the operating and safe work practices for working in and around excavations.

An observer or standby person must be present at the surface of any trench excavation at all times when trenches are occupied. Standby personnel must be knowledgeable of the safe work practices applicable to the trench that they are observing.

In addition to the guidelines of this Procedure, all safety precautions and guidelines of the customer facility shall be followed.

All surface encumbrances (e.g. fencing, piping, structure, materials) that can reasonably be expected to create a hazard to employees shall be removed or supported as needed to protect employees.

Employees shall not work in close proximity to an electric power circuit or conductor that they could contact unless employees are protected by locking and tagging out the source, or effectively guarded by safe alternative means approved by the Field Supervisor/Health and Safety Officer FS/HSO.

Hazardous underground utilities that might be encountered during an excavation shall be locked and tagged out until employee protection from the hazardous energy source(s) can be ensured.

In the event that the designated utility locators are either unable to respond in a timely manner (based on State regulations1) or are unable to locate the installations, work may proceed with extreme caution using detection devices or other safe, acceptable means of locating underground installations. Many utility locators will require at least 48-hour advance notice (See Attachment 1).

Where the precise location of installation(s) cannot be located, it may be necessary to excavate by hand until the utility is located or the excavation has reached a depth that ensures that the installation(s) will not be encountered.

Where an excavation will destroy the original markers of underground installation(s), offset markers shall be placed prior to excavating that can be used to determine the location of the installation(s) during the excavation procedure.

While the excavation is open, underground installations shall be protected, supported, or removed as necessary to safeguard employees.

Employees shall be notified of the location of underground installations, the potential hazards the installations present, the protective measures being taken, and the safe work procedures that they are to follow.

Soil classification shall be based on at least one of the following visual analyses:

- Observe samples of soil that are excavated and soil in the sides of the excavation. Estimate the range of particle sizes and the relative amounts of the particle sizes. Soil that is primarily composed of fine-grained material is cohesive material. Soil composed primarily of coarse grained sand or gravel is granular material.

- Observe the soil as it is excavated. Soil that remains in clumps when excavated is cohesive. Soil that breaks up easily and does not stay in clumps is granular.
- Observe the sides of the opened excavation and the surface area adjacent to the excavation. Crack-like openings such as tension cracks could indicate fissured material. If chunks of soil spall of a vertical side, the soil could be fissured. Small spalls are evidence of moving ground and are indications of potentially hazardous situations.
- Observe the open side of the excavation to identify layered systems. Examine layered systems to identify if the layers slope toward the excavation and estimate the degree of slope of the layers.
- Observe the sides of the excavation and adjacent areas for evidence of surface water or water seeping from the sides of the excavation.
- Observe the area adjacent to the excavation and the area within the excavation for sources of vibration that may affect the stability of the excavation face.

Soil classification shall be based on at least one of the following manual analyses:

- The thumb test (ASTM D2488) can be used to determine the unconfined compressive strength of cohesive soil. Type A soils with an unconfined compressive strength of 1.5 tsf can be readily identified by the thumb. They can be penetrated by the thumb but only with great effort. Type C soils with an unconfined compressive strength of .5 tsf can be easily penetrated several inches by the thumb, and can be molded by light finger pressure.
- Determine the unconfined compressive strength by the use of a pocket penetrometer.

The nearest edge of a spoils pile (excavated earth) shall not encroach within two feet from the edge of the excavation unless the height of the pile is included in the calculation of excavation depth when selecting and implementing a protective system. A general rule of thumb for safe operating practices is to keep employees or equipment a distance from the edge of the excavation equal to the excavation depth, when feasible. Materials and equipment should never be allowed on the sloping portion of any excavation

If excavation work interrupts the natural drainage of surface water (such as streams), diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation.

Water discharged from the excavation shall be handled in a manner consistent with environmental regulations applicable to such water, including applicable State and Local regulations, and best management practices.

Employees shall not cross over any excavation four feet or more in depth except via a walkway. Ladders shall extend a minimum of three feet above the top of the trench and be used consistent with safe ladder use. Ramps shall be constructed to allow for employees to exit the trench by walking fully upright

Adequate physical barriers (able to withstand 200 lbs. of vertical pressure) shall be used to protect employees who may be exposed to fall hazards created by the presence of an excavation. Such barriers might include guardrails, barricades, fences, covers, etc. Barrier tape at the point of hazard does not create a sufficient physical barrier to meet this requirement. For excavations greater than 6 feet deep, the contractors Fall Protection Procedure or one approved by the Project HSO shall be implemented.

Temporary excavations shall be backfilled as soon as possible upon completion of excavation or similar operations.

In the event local traffic needs to be interrupted during site operations, the Local Traffic Control Authority shall be contacted for proper procedures.

Excavations below the level of the base or footing of any foundation or retaining wall shall not be permitted except when:

- A support system, such as underpinning, is provided to ensure the safety of employees and the stability of the structure.
- The excavation is in stable rock.
- A Registered Professional Engineer has approved the determination that the structure is sufficiently removed from the excavation so as to be unaffected.
- A Registered Professional Engineer has approved the determination that such excavation work will not pose a hazard to employees.

A designated spotter shall be stationed within viewing distance of the operator of any heavy or mobile equipment in the following circumstances:

- The excavation is adjacent to building footings, sidewalks, buried tanks, or buried or overhead utilities;
- Excavations are being backfilled without barriers;
- Personnel are working in the excavation(s) near the equipment;
- The operators' vision is restricted; or
- Unusual operating conditions exist (e.g., little room to safely work).

Employees shall not be underneath loads handled by lifting or digging equipment.

Employees shall stand away from any truck and associated equipment being loaded or unloaded with soil or similar material. Operators may only remain in the cab of vehicles being loaded or unloaded if the cab is equipped with a suitable cab shield.

No portion of operating equipment shall be closer than the minimum line clearance distance to energized overhead power lines as defined in applicable OSHA regulations.

If unusual, unexpected, or unidentified substances, objects, odors, soils, etc., are encountered, all work within the excavation shall cease, all personnel are to exit the excavation, and the Excavation Safety Competent Person (ESCP) shall be notified. Work will not resume within the excavation until the ESCP has determined that it is safe to resume and/or determined modified procedures that protect employee health and safety.

6. PROCEDURE

Step Number	Action
Site and Contractor Project Managers	
1	Understand the requirements of this Procedure in addition to 29 CFR 1926, Subpart P, prior to beginning any project that will involve excavations.
2	Ensure a Risk Assessment and Job Hazard Analysis has been completed.
3	Ensure appropriate employees have received training associated with all applicable requirements of this Procedure.
4	Ensure a Registered Professional Engineer, who has appropriate working experience in structural design and inspection of excavations, is involved when excavation design or structural inspections are required.
5	Assign an ESCP to be on site daily during excavation activities.
6	Ensure that emergency procedures are documented and in place in case rescue operations are needed, and these include the following:
7	An employee trained in first aid and supplies for high hazard work are required if there are five or more workers on the site.
8	Emergency medical and fire authorities are available within a reasonable distance from the job site.
9	Ensure and document that the ESCP has adequate training and experience to visually identify soils as well as the knowledge to maintain and implement all safe working practices as they relate to the specific excavation(s) they will be working with.
10	Coordinate activities and safe working procedures with the responsible party on a project site.
11	Ensure excavation designs prepared by a Registered
12	Professional Engineer are included in the project documents (i.e., plans and specifications) and that they minimally include the following: -The identity of the Registered Professional Engineer; AND -The magnitude of the slopes and the configurations that were determined to be safe for the particular excavation; OR -A plan indicating the sizes, types, and configurations of the materials to be used in the protective system.
ESCP	
1	Identify existing State and/or Local regulations concerning excavations, including any requirements for permitting, and ensure compliance with such regulations.
2	Ensure that a person qualified in structural design designs structural ramps that are used solely as a means of access to or egress from excavations, and ensure that this is accomplished during the preparation of contract

	documents, consistent with the requirements stated in this Procedure for involvement by a Registered Professional Engineer.
3	Identify existing and potential hazards in and around the job site (e.g., adjacent buildings, sidewalks, streets, areas that may be affected by the excavation) and working conditions that are unsanitary, hazardous, or dangerous to employees on the work site. Stop work if any of these conditions are not mitigated prior to the start of work.
4	Consider the effects that the excavation and any adjacent structures may have on one another, understand the importance of saturation or position of the water table to slope stability, and be familiar with slope protective systems.
5	Assess potential hazardous atmospheres within and around the excavation and implement proper levels of protection when hazardous atmospheres are encountered.
6	Ensure the safety requirements outlined in this Procedure and all additional requirements contained in the OSHA Excavations Standards are followed on excavation or surface opening projects.
7	Conduct daily site safety meetings addressing project specific safety procedures prior to starting work and after changes in working conditions (e.g., after a rain storm).
8	Document and make available at the job site existing and predictable hazards, potential hazardous atmospheres within and around the excavation, and appropriate corrective actions taken to mitigate these hazards.
9	Take prompt corrective action to eliminate hazards including stopping work and removing personnel from the excavation when hazards arise.
10	Ensure that the locations of utility installations, such as sewer, telephone, fuel, electric, water lines, or any other underground installation that can reasonably be expected to be encountered during excavation work, have been determined prior to the opening of an excavation. Massachusetts Call Dig Safe 1-888-344-7233
11	Ensure that all employees entering an excavation are protected from cave-ins by an adequate protective system except when there is no indication of a potential cave-in and the excavation is less than five feet in depth or made entirely in stable rock.
12	Classify each soil and rock deposit at the excavation site as Stable rock, Type A, Type B, or Type C soil.
13	Ensure that a stairway, ladder, ramp, or other safe means of egress is located in trench excavations that are four feet or more in depth so as to require no more than 25 feet of lateral travel.
14	Ensure walkways constructed or placed over excavations meet the requirements of OSHA Standards for guardrails, handrails, toe boards, and covers (29 CFR 1926.500).
15	Complete The Excavation Daily Inspection Form or Contractor company equivalent prior to the start of work each day and after any rainstorm or other hazard increasing occurrence (See Attachment 1). Include a copy of each report in the project file.

16	Ensure materials or equipment used on the project are prevented from falling or rolling into an excavation by placement at least two feet from the edge of a vertical excavation, use of suitable retaining devices, or a combination of these measures.
17	Ensure warning systems, such as mobile equipment barricades, hand or mechanical signals, or stop logs are provided to alert equipment operators of the edge of an excavation.
18	Ensure air monitoring is carried out in any excavation greater than 4 feet in depth where one might reasonably expect a hazardous atmosphere to be present or to develop (e.g., oxygen deficiency, flammable atmospheres, or toxic contaminants). Coordinate with the FS/HSO for details on monitoring potentially hazardous atmospheres.
19	Ensure no work is allowed in excavations where water is accumulating unless adequate precautions have been taken to protect against the hazards posed by water accumulation. The precautions necessary vary with each situation, but could include special support or shield systems to protect from cave-ins, water removal to control the level of accumulating water, or use of a safety harness and lifeline.
20	Ensure all excavations are barricaded or covered when the project site is unattended. Covers shall be capable of supporting two times the maximum anticipated load, installed to prevent accidental displacement, and marked clearly with the words “COVER” or “HOLE”.

7. RECORDS

All documents generated as a result of the implementation of this Procedure shall be kept within the project file by the HSO.

8. ATTACHMENTS

Attachment 1 - Excavation Daily Inspection Form

APPENDIX G

ATTACHMENT 1
Excavation Daily Inspection Form

Project Name: _____ Location: _____

Weather Condition: _____ Rainfall amounts 24 hours previous _____

Any "No" answers requires additional comments – use back of form.

	INITIAL	Yes	No	N/A
1.	Have Utility companies been notified by the "One Call"?			
2.	Is the Excavation less than 5 feet deep?			
3.	Is the area free of other construction activities?			
4.	Is there adequate clearance from any overhead power lines?			
5.	Has the soil been classified (Type A____, B ____, or C ____)?			
6.	Are there trees, boulders or other hazards in area?			
7.	Is excavation free of hazards (e.g., contaminated soil or groundwater, etc.) that would make it a confined space?			
	Comments:			

	DAILY	Yes	No	N/A
1.	Are barricades or covers in place, secure and in good condition?			
2.	Are open excavations covered at the end of the work shift?			
3.	Is excavated material at least 2' from the edge of the excavation?			
4.	Are excavation walls free of any evidence of shrinkage cracks?			
5.	Is the excavation free of any evidence of significant fracture planes in soil or rock?			
6.	Are the bottom and walls of the excavation free of any water seepage?			
7.	Are soil conditions as anticipated (no zones of unusually weak soils or materials, no dramatic dips or bedrock)?			
8.	Is the excavation free of any evidence of caving or sloughing of soil since the last inspection?			
9.	Is traffic adequately away from trenching operation?			
10.	Have vibrations from equipment or traffic, close to trenching operation been controlled?			
11.	Are GFCI's used on ALL temporary electrical cords?			
12.	Will workers be entering the excavation? (if no, stop here)			
13.	Is access and egress located within 25 feet of entrants?			
14.	Is hazardous atmospheric testing done on a regular basis?			
15.	Has rescue procedure been established and is equipment immediately available?			

16.	Were slopes cut at angle in design documents or as required by 29 CFR 1926, Subpart P?			
17.	Are tops of slopes free of any tension cracks?			
18.	Are trench box(s) certified?			
19.	Is the shoring being used secure?			
20	Are hydraulic shores pumped to design pressure?			
21.	Is the bracing system installed in accordance with the design?			

Inspected By: Date:

COMMENTS

_____

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Copies of this form are to be kept at the job site for review by the Sub-Contractor H&S representative, the Project HSO or the Project Site Operations Manager.

APPENDIX F

RESPIRATORY PROTECTION PROGRAM

RESPIRATORY PROTECTION PROGRAM

1. Purpose and Scope

The purpose of this program is to protect all employees of working at the NMI site from respiratory hazards, and to ensure that invasive activities are performed in compliance with OSHA 29 Code of Federal Regulation (CFR) §1910.134(c) Respiratory Protection Standard. Conditions at the site exist in which, engineering controls to control airborne hazards may not be feasible for many remediation operations at the NMI site. In situations where airborne contaminants cannot be controlled within regulatory limits, respiratory protection and other types of personal protective equipment must be used to safeguard employees' health.

Mandatory use of respirators

NMI site workers are required to wear respiratory protection and other personal protective equipment (PPE) when the following situations exist:

- There is potential exposure to air contaminants above a specific action or exposure limit;
- If respirators or PPE are necessary to protect employee health;
- During specific routine work practices, processes or tasks identified by the job hazard assessment or radiation work permit as requiring use of a respiratory protection and PPE.

In all cases, employees participating in respiratory protection programs do so at no cost to themselves. The expenses associated with training, medical evaluations and equipment will be paid by the company contracted to perform each scope of work requiring the use of respiratory protection.

Voluntary use of respirators

If an employee desires to wear a respirator during certain operations in areas where airborne contaminants do not mandate the use of respiratory protection (non-hazardous areas), the Field Supervisor/ Health and Safety Officer (FS/HSO) will review each such request on a case-by-case basis.

An employee may use the respirator provided or may provide his/her own for voluntary use, if:

- doing so does not jeopardize the employee's health or safety, or that of his/her coworkers,
- the equipment itself does not create a workplace hazard and
- HSO has approved the use.

All employees voluntarily wearing respirators are required to receive a copy of "**Information for Employees Using Respirators When Not Required Under the Standard**." See Attachment 1.D (page D-12). The FS/HSO must review this OSHA information with each employee prior to their voluntary use of respiratory protective equipment.

In addition, employees voluntarily using tight-fitting respirators must follow the medical surveillance, cleaning, maintenance and storage procedures in this program. Employees voluntarily

wearing dust masks (filtering facepiece) or escape-only respirators are not subject to the program's medical evaluation. However, their equipment must be clean and free of contamination, and not interfere with the employee's ability to work safely. These employees are also provided a copy of Attachment 1.D and given a review of the information before their use of dust masks.

2. Program Administration

FS/HSO Responsibilities

The FS/HSO will act as the Respiratory Protection HSO and is responsible for administering the Respiratory Protection Program. The FS/HSO's duties include the following:

- Developing and issuing (together with RSO if required) the Job Hazard Assessment for each site activity;
- Identifying work areas, processes, or tasks that require workers to wear respirators, and evaluating the associated hazards;
- Selecting appropriate, approved respiratory protection options;
- Monitoring respirator use to ensure that respirators are used in accordance with their certifications;
- Arranging for and or conducting training;
- Ensuring proper storage and maintenance of respiratory protection equipment;
- Conducting qualitative fit testing;
- Administering the medical surveillance program;
- Maintaining required program records;
- Evaluating this respiratory protection program; and,
- Updating the written program, as necessary.
- Ensure supervised employees (including all new hires) receive appropriate training, fit testing, and annual medical evaluations.
- Ensure the availability of appropriate respirators and accessories.
- Be aware of tasks requiring the use of respiratory protection.
- Enforce the proper use of respiratory protection.
- Ensure that respirators are properly cleaned, maintained, and stored in accordance with the program.
- Monitor work areas and operations with sufficient frequency to identify respiratory hazards and select proper equipment.
- Coordinate with the RSO, as applicable, on how to address respiratory hazards or other concerns regarding the program.

Employee Responsibilities

Each employee must wear his or her respirator when and where required, under the conditions specified by this program. They are also obligated to use the equipment according to the training procedures for each model. Employees are also responsible for the following:

- Being familiar with this program.
- Caring for and maintaining the respirators as instructed and store them in a clean sanitary location.

• Informing the supervisor if the respirator no longer fits well and request a new one that fits properly.
• Informing the FS/HSO of any potential respiratory hazards or other concerns regarding the program.

3. Program Elements

Medical Evaluation

Any employee who is required to wear a respirator, or chooses to wear an air-purifying respirator (APR) voluntarily, must first pass a medical examination and have medical approval before wearing the equipment on the job.

Employees refusing the medical evaluation cannot work in areas requiring respirator use. The evaluation is conducted using the questionnaire provided in Attachment 6 or an actual physical examination by a physician or other licensed health care professional (PLHCP) that obtains the same information.

Evaluation Procedures

• Every employee requiring medical evaluation is given a copy of the confidential medical questionnaire in ATTACHMENT 6 to be given to the PLHCP.
• To the extent feasible each company is required to accommodate employees unable to read the questionnaire. At an employee's request someone other than HSO may be asked to assist in reading the document. If this is not possible, the employee will be sent to the PLHCP for a medical evaluation.
• Follow-up medical exams are given to employees as required by the OSHA standard, or as deemed necessary by the PLHCP.

All employees can speak with the PLHCP about their medical evaluation.

• Any employee required by medical reasons to wear a positive pressure air purifying respirator will be provided a powered air purifying respirator.
• After an employee has received approval and started using a respirator, an additional medical evaluation is conducted for the following reasons:

1. The employee reports signs and/or symptoms related to his/her ability to use a respirator, such as shortness of breath, dizziness, chest pains, or wheezing;
2. The PLHCP informs the FS/HSO of a reevaluation need
3. Information from this program, including observations made during fit testing and program evaluation, indicates a need for reevaluation; or
4. A change occurs in the workplace conditions that may result in an increased physiological burden on the employee.

Determination of fitness

The PLHCP evaluates the completed health care questionnaire. Prior to making a formal determination of fitness the PLHCP must be provided with the following information on respirator usage:

- the equipment's type and weight;
- use frequency and duration;
- expected work effort;
- additional personal protective clothing/equipment to be used; and
- estimated temperature and humidity extremes expected in the work area where the respirator is to be used.

The PLHCP provides an assessment of each employee's physical ability to wear a respirator and perform the assigned work. Such evaluations will be provided in writing according to one of the following three formats:

- The employee is qualified to perform assigned work and wear the assigned respirator.
- The employee is not qualified to perform assigned work and wear the assigned respirator.
- The employee is qualified to perform assigned work and wear the assigned respirator with the following limitations: (insert limitations and other considerations).

Follow-up medical examination

If an employee responds positively to any of questions 1 through 8 in Section 2 of the questionnaire, or if the PLHCP deems it necessary, a follow-up exam is provided. This exam includes any medical tests, consultations, or diagnostic procedures that the PLHCP needs to make a final determination for safe respirator usage.

Respirator Selection

The FS/ HSO will perform a job hazard analysis for all project tasks. The hazard analysis will identify the respiratory hazard(s) associated with the task and prescribe appropriate engineering and administrative controls to protect workers. The FS/HSO will determine the need for respiratory protection in compliance with the requirements of 29 CFR § 1910.1000, Air Contaminants Standard and 10 CFR Part 835 Appendix C, Derived Air Concentrations (DAC). Based on this information, and in accordance with the applicable OSHA Standards, the FS/HSO will select the respirator to be used for specific operations.

Respirator Fit Testing

Fit testing is required for employees wearing respirators with a negative or positive pressure tight-fitting facepiece. The fit test is conducted using the respirator the employee will be wearing on the job. Fit testing is conducted:

- Prior to initial use of the respirator.
- If a different respirator facepiece (size, style, model or make) is used.
- On an annual basis.
- If the employee, FS/HSO, PLHCP, or Site Project Manager makes a visual observation of changes in the employee's physical condition that could affect respirator fit. This might include: facial scarring, dental changes, cosmetic surgery or a drastic change in weight.

A qualitative fit test (QLFT) or a quantitative fit test (QNFT) method as designated in Table 2 is required prior to respirator use. If an employee passes either test, but notifies the employer that the fit is unacceptable, the employee is allowed to select a different respirator, and will be retested.

Table 2 Acceptable Fit-Testing Methods		
	QLFT	**QNFT**
Half-Face, Negative Pressure, Air Purifying Respirator (<100 fit factor)	Yes	Yes
Full-Face, Negative Pressure, Air Purifying Respirator (<100 fit factor) used in atmospheres up to 10 times the PEL	Yes	Yes
Full-Face, Negative Pressure, Air Purifying Respirator (>100 fit factor)	No	Yes
PAPR	Yes	Yes
Supplied-Air Respirators, or SCBA used in Negative Pressure (Demand Mode) (>100 fit factor)	No	Yes
Supplied-Air Respirators, or SCBA used in Positive Pressure (Pressure Demand Mode)	Yes	Yes
SCBA-Structural Fire Fighting, Positive Pressure	Yes	Yes
SCBA/SAR-IDLH, Positive Pressure	Yes	Yes
Mouth-bit Respirators	Fit-testing is not required	
Loose-fitting Respirators (e.g., hoods, helmets)	Fit-testing is not required	

Respirator Use

General Use Instructions

Each time a respirator is worn, the wearer must conduct a "user seal check." Employees may select either the positive or negative pressure check. Additional PPE, combined with respirator use, may be necessary to adequately prevent exposure. The use of eye, face or skin protection may be required during certain processes. Employees must consult supervision for the required equipment.

Tight fitting facepiece respirators are not permitted for use if:

- An employee has facial hair that interferes with either the sealing surface of the respirator and the face, or interferes with the valve function.
- Corrective glasses/goggles or other personal protective equipment interferes with the seal of the facepiece.
- Any other condition interferes with the facepiece seal.

The employee must vacate the respirator use area for the following reasons:

- To wash his/her face and respirator facepiece, as necessary to prevent respirator- induced eye or skin irritation;
- If vapor or gas breakthrough is detected;
- If there is a change in breathing resistance;
- If there is facepiece leakage; or
- To replace the respirator/filter or change the cartridge/canister.

Cleaning, Maintenance, and Storage

Respirators are to be regularly cleaned and disinfected according to the manufacturer's instructions. APR's are to be cleaned and disinfected as often as necessary, but at least once each day they are used. SARs and emergency use respirators are to be cleaned and disinfected after each use.

Cleaning

These seven steps are to be followed for cleaning and disinfecting respirators, unless the manufacturer directs otherwise:

- Disassemble respirator, removing all filters, canisters, or cartridges.
- Wash the facepiece and associated parts in a mild detergent with warm water. Do not use organic solvents or bleach.
- Rinse thoroughly in clean, warm water.
- Wipe the respirator with disinfectant wipes (70% isopropyl alcohol).
- Air dry in a clean area. If a clean area is not available, use clean disposable paper towels to blot excess moisture.
- Reassemble the respirator and replace any defective parts (noting the condition of the head straps and valve flaps).
- Place in a clean, dry plastic bag or other airtight container.

The FS/HSO is responsible for ensuring there is an adequate supply of cleaning and disinfecting supplies. If supplies are low, employees must notify their supervisor or the FS/HSO.

Maintenance

After leaving the respirator use area, employees can do limited maintenance on their equipment only in an area that is free from respiratory hazards.

Maintenance involves a thorough visual inspection for cleanliness and/or defects. Worn or deteriorated parts must be replaced prior to equipment use. No components are replaced or repairs made beyond those recommended by the manufacturer. Regulator or alarm repairs of atmosphere-supplying respirators are to be conducted by the manufacturer.

Respirator Inspection Checklist:

- Facepiece: cracks, tears, holes, facemask distortion, cracked or loose lenses/face shield.
- Head straps: breaks, tears, broken buckles/clasps, overstretched elastic bands.
- Valves: residue/dirt, cracks or tears in valve material, absence of valve flap.
- Filter/Cartridges: proper cartridge for hazard, approval designation, intact gaskets, cracks or dents in housing.
- Air Supply Systems: breathing air quality/grade, condition of supply hoses, hose connections, settings on regulators and valves.

Defective respirators or those with defective parts are taken out of service immediately. Employees should notify their supervisor about all respirator defects. It is the supervisor's responsibility to give the defective equipment either to the FS/HSO or to the individual charged with replacement/repair. The appropriate person then decides whether to:

- Temporarily take the respirator out of service until it can be repaired;

- Have it repaired; or
- Dispose of it if the problem is irreparable.

Storage

APRs are stored in a clean, dry area and following the manufacturer's recommendations. Employees inspect and clean their own respirators according to the provisions of this program. The equipment is stored in plastic bags or airtight containers. Each bag/container is marked with an employee name, and only that particular employee can use it for their equipment storage.

Cartridge and Canister Change Out Schedules

Organic vapor/acid gas cartridges/canisters with a P-100 prefilter that are used in areas where volatile organic compounds are present must be changed after 8 hours of use or at the end of the shift, whichever is shorter.
Employees wearing APR with P-100 filters for protection against other particulates must change their cartridges when they experience difficulty breathing (i.e., resistance).

Equipment Malfunction

Air-Purifying Respirators (APR)

If an APR or any of its components malfunctions (breakthrough, facepiece leakage, or faulty valve), the wearer must leave the respirator use area immediately and notify the supervisor about the malfunction. The supervisor is then responsible for ensuring that the employee receives the necessary repair parts or a new functional respirator.

Supplied-Air Respirator (SAR)

Usually, employees using SAR work in pairs. If one experiences an SAR malfunction, then he/she notifies the partner of the problem by using hand signals. The partner then escorts the affected employee outside the respirator use area.

Supplied-air respirators use only Grade D breathing air as described in ANSI/Compressed Gas Association Commodity Specification for Air, G-7.1-1989. The oxygen content (v/v) is between 19.5% and 23.5%; hydrocarbon (condensed) content must be less than 5 mg/m3; and carbon monoxide must be less than 1 mg/m3.

4. Training

The FS/HSO provides training to respirator users on:

- Contents of the respiratory protection program;
- Responsibilities of employees and supervisors;
- Requirements of OSHA's respiratory protection standard.

All training occurs prior to any respirator use in the workplace. Supervisors receive their training prior to supervising employees required to use respirators.

The training program covers the following topics:

- All elements of the respiratory protection program;
- The information covered under OSHA Standard 29 C.F.R. 1910.134;
- The information covered under OSHA Standard 10 C.F.R. 835;
- Respiratory hazards encountered at the worksite;
- Proper selection and use of respirators;
- Additional PPE;
- Respirator limitations;
- How to perform user seal (fit) checks;
- Fit testing;
- Emergency respirator use procedures;
- Respirator maintenance and storage;
- Medical signs and symptoms limiting effective respirator use.

Employees are required to demonstrate their understanding of the topics covered in the training through hands-on exercises and a written quiz. The FS/HSO documents respirator training. This documentation includes the type, model, and size of respirator on which each employee has been trained and fit tested. Employees are retrained annually, or as needed.

5. Program Evaluation

The FS/HSO will conduct periodic evaluations of the workplace to ensure that the provisions of this program are being implemented.

These evaluations include regular consultations with both the employees using respirators and their supervisors. This is done to identify areas for improvement and to address problems. Records' reviews, site inspections and periodic air monitoring also assist in program review.

6. Documentation and Recordkeeping

The FS/HSO maintains the following records:

- A written copy of this program and the OSHA standard. This information is available to any interested employee.
- All training and fit testing records. These records are updated as new employees are trained; when existing employees receive refresher training; and/or when new fit testing is conducted.
- All written recommendations from the PLHCP on an employee's ability to use respirators. (Medical evaluations are maintained in accordance with the OSHA Medical Records Standard 29 C.F.R. 1910.1020.)

APPENDIX G

ENERGY CONTROL PROGRAM

ENERGY CONTROL PROCEDURE- LOCK-OUT/TAG-OUT PROGRAM

1 PURPOSE

This appendix establishes the policies and provides administrative requirements for the hazardous energy control program for work conducted at the site.

2 SCOPE

This procedure applies to de maximis activities. Contractors should have their own Lock-out Tag-out program that is at a minimum equivalent to this one. Equivalency is determined by the Site Project Manager (SPM)

This Appendix is applicable for the control of energy during servicing and maintenance of machines and equipment in which the unexpected energization or startup of the machines or equipment, or release of stored energy could cause injury to employees.

This Appendix is not applicable to normal production operations, unless the servicing or maintenance requires:

- An employee to remove or bypass a guard or other safety device; or
- An employee to place any part of his or her body into an area or piece of equipment where work is actually performed upon the material being processed (point of operation) or where an associated danger zone exists during a machine operating cycle.

This Appendix is not applicable under the following circumstances.

- Minor tool changes and adjustments, and other minor servicing activities, which take place during normal production operations, provided:
- The activities are routine, repetitive, and integral to equipment use for production, and
- The work is performed using alternative measures which provide effective protection
- Work on cord-and-plug connected electric equipment and unplugging the equipment controls hazardous energy sources, and the plug is under the exclusive control of the employee performing the servicing or maintenance.

This Appendix establishes **minimum** locking, tagging, and trying requirements to isolate a component or system for servicing and maintenance. This procedure is applicable for systems recognized as having potential sources of hazardous energy including:

- Pneumatic
- Electrical
- Mechanical

- Chemical
- Compression
- Thermal
- Hydraulic

3 DEFINITIONS

3.1 Affected Employee

An employee whose job requires him/her to operate or use a machine or equipment on which servicing or maintenance is being performed under lock-out or tag-out, or whose job requires him/her to work in an area in which such servicing or maintenance is being performed.

3.2 Authorized Employee

A person who locks out or tags out machines or equipment in order to perform servicing or maintenance on that machine or equipment. An affected employee becomes an authorized employee when that employee's duties include performing servicing or maintenance covered under this procedure.

3.3 Capable of Being Locked Out

An energy isolating device is capable of being locked out if it has a hasp or other means of attachment to which, or through which, a lock can be affixed, or it has a locking mechanism built into it. Other energy isolating devices are capable of being locked out, if lockout can be achieved without the need to dismantle, rebuild, or replace the energy isolating device or permanently alter its energy control capability.

3.4 Energized

Connected to an energy source or containing residual or stored energy.

3.5 Energy Isolating Device

A mechanical device that physically prevents the transmission or release or energy, including but not limited to the following:

- Manually operated electrical circuit breaker;
- Disconnect switch;
- Manually operated switch by which the conductors of a circuit can be disconnected from all ungrounded supply conductors and, in addition, no pole can be operated independently;
- Line valve;
- Block; and
- Similar device used to block or isolate energy.

Note: Push buttons, selector switches and other control circuit type devices are not energy isolating devices.

3.6 Energy Source

Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.

3.7 Lockout

The placement of a lockout device on an energy isolating device, in accordance with an established procedure, ensuring that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed.

3.8 Lockout Device

A device that utilizes a positive means such as a lock, either key or combination type, to hold an energy isolating device in the safe position and prevent the energizing of a machine or equipment. Included are blank flanges and bolted slip blinds.

3.9 Normal Production Operations

The utilization of a machine or equipment to perform its intended production function.

3.10 Servicing and/or Maintenance

Workplace activities such as constructing, installing, setting up, adjusting, inspecting, modifying, and maintaining and/or servicing machines or equipment. These activities include lubrication, cleaning or un-jamming of machines or equipment and making adjustments or tool changes, where the employee may be exposed to the unexpected energization or startup of the equipment or release of hazardous energy.

3.11 Tagout

The placement of a tagout device on an energy isolating device, in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

3.12 Tagout Device

A prominent warning device, such as a tag and a means of attachment, which can be securely fastened to an energy isolating device in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

4 ENERGY CONTROL PROGRAM PROCEDURAL REQUIREMENTS AND POLICIES

The following actions will result in disciplinary action up to and including termination or prohibiting site access for employees or contractors;

- Failure to follow instructions on an approved and hung tag.
- Operating or attempting to operate a component with a lock and tag attached.
- Otherwise operating or performing maintenance work in a manner, which could reasonably cause injury to personnel or equipment damage.

Energy isolating devices, when used, will be locked out and tagged.

Only Authorized Employees may lock and tag isolation devices. Sub-contractors will identify authorized employees specifically by name or title. The subcontractor is responsible for maintaining an Authorized Employees List and annually reviewing the list to ensure personnel continue to meet the requirements to qualify as an Authorized Employee.

Locks, tags, and other materials and hardware will comply with 29 CFR 1910.147 (c)(5), Protective materials and hardware.

A Safety Operating Procedure will be developed, documented, and used for lock out tag out of potentially hazardous energy during servicing and maintenance. The procedure will address:

1. Shutting down, isolating, blocking, and securing machines or equipment to control hazardous energy;

2. Placement, removal, and transfer of lockout devices and responsibility for devices;

3. Testing a machine or equipment to determine and verify effectiveness of lockout devices, tagout devices, and other energy control measures;

4. Requirements of this procedure and the following sections of 29 CFR 1910.147:

- 1910.147(c)(8) Energy isolation,
- 1910.147(c)(9) Notification of employees
- 1910.147(d) Application of control,
- 1910.147(e) Release from lockout or tagout, and
- 1910.147(f) Additional requirements.

5. NFPA 70E: Standard for Electrical Safety in the Workplace Training will be provided in accordance with Section 5.0, Training. Inspections will be performed in accordance with Section 6.0, Inspections.

5 TRAINING

Training will be provided to ensure the purpose and functions of the energy control program are understood by employees and that the knowledge and skills required for the safe application, usage, and removal of the energy controls are acquired by employees. The training will include the following:

- Each authorized employee will receive training in the recognition of applicable hazardous energy sources, the type and magnitude of the energy available in the workplace, and the methods and means necessary for energy isolation and control;
- Each affected employee will be instructed in the purpose and use of the energy control procedure; and
- All other employees whose work operations are or may be in an area where energy control procedures may be utilized, will be instructed about the procedure, and about the prohibition relating to attempts to restart or reenergize machines or equipment which are locked out or tagged out.

• Although tagout systems are not used (in lieu of lockout), employees should be trained in the following limitations of tags.

• Tags are essentially warning devices affixed to energy isolating devices, and do not provide the physical restraint on those devices that is provided by a lock.

• When a tag is attached to an energy isolating means, it is not to be removed without authorization of the authorized person responsible for it, and it is never to be bypassed, ignored, or otherwise defeated.

• Tags must be legible and understandable by all authorized employees, affected employees, and all other employees whose work operations are or may be in the area, in order to be effective.

• Tags and their means of attachment must be made of materials, which will withstand the environmental conditions encountered in the workplace.

• Tags may evoke a false sense of security, and their meaning needs to be understood as part of the overall energy control program.

• Tags must be securely attached to energy isolating devices so that they cannot be inadvertently or accidentally detached during use.

Employee Retraining

• Retraining will be provided for all authorized and affected employees whenever there is a change in their job assignments, a change in machines, equipment or processes that present a new hazard, or when there is a change in the energy control procedures.

• Additional retraining will also be conducted whenever a periodic inspection reveals, or whenever the employer has reason to believe, that there are deviations from or inadequacies in the employee's knowledge or use of the energy control procedures.

• The retraining will reestablish employee proficiency and introduce new or revised control methods and procedures, as necessary.

• Certification will be provided that employee training has been accomplished and is being kept up to date. The certification will contain each employee's name and dates of training. Records of training will be maintained by the each subcontractor for each employee trained under their LOTO Program.

6 LOCKS, TAGS, AND OTHER HARDWARE REQUIREMENTS

Locks, tags, chains, wedges, key blocks, adapter pins, self-locking fasteners, or other hardware will be provided by the employer for isolating, securing or blocking of machines or equipment from energy sources.

Lockout devices and tagout devices will be singularly identified; will be the only device(s) used for controlling energy; will not be used for other purposes; and will meet the following requirements:

• Durable

• Lockout and tagout devices will be capable of withstanding the environment to which they are exposed for the maximum period of time that exposure is expected.

• Tagout devices will be constructed and printed so that exposure to weather conditions or wet and damp locations will not cause the tag to deteriorate or the message on the tag to become illegible.

• Tags will not deteriorate when used in corrosive environments such as areas where acid and alkali chemicals are handled land stored.

6.1 Standardized

Lockout and tagout devices will be standardized within the facility in at least one of the following criteria: Color; shape; or size, and additionally, in the case of tagout devices, print and format will be standardized.

6.2 Substantial

6.2.1 Lockout Devices

Lockout devices will be substantial enough to prevent removal without the use of excessive force or unusual techniques, such as with the use of bolt cutters or other metal cutting tools.

6.2.2 Tagout Devices

Tagout devices, including their means of attachment, will be substantial enough to prevent inadvertent or accidental removal. Tagout device attachment means will be of a non-reusable type, attachable by hand, self-locking, and non-releasable with a minimum unlocking strength of no less than 50 pounds and having the general design and basic characteristics of being at least equivalent to a one-piece, all environment tolerant nylon cable tie.

6.3 Identifiable

Lockout devices and tagout devices will indicate the identity of the employee applying the device(s).

Tagout devices will warn against hazardous conditions if the machine or equipment is energized and will include a legend such as the following: Do Not Start. Do Not Open. Do Not Close. Do Not Energize. Do Not Operate. Inspections.

Periodic inspection of the energy control procedure will be performed at least annually to ensure procedures are being followed and requirements of 29 CFR 1910.147 are being met.

The periodic inspection will be performed by an authorized employee other than the one(s) utilizing the energy control procedure being inspected.

The periodic inspection will be conducted to correct any deviations or inadequacies identified.

Where lockout is used for energy control, the periodic inspection will include a review, between the inspector and each authorized employee, of that employee's responsibilities under the energy control procedure being inspected.

An Energy Control Program Periodic Inspection Record form (see attachment 3) will be used to document and certify the inspection.

The FS/HSO will ensure inspections are performed at least annually and will be responsible for filing completed Energy Control Program Periodic Inspection Record.

7 REFERENCES

29 CFR 1910.147, The Control of Hazardous Energy (lockout-tagout)

U.S. Department of Labor, Occupational Safety and Health Administration (OSHA). 29 CFR 1910.147. The Control of Hazardous Energy. OSHA: Washington, DC.

U.S. Department of Energy, Manual 5480.19, Chapter 9. Lockouts and Tagouts. Washington, DC.

U.S. Department of Labor, Occupational Safety and Health Administration (OSHA). 29 CFR 1910.333. Lock and Tag Requirements for Electrical Systems. OSHA: Washington, DC.

National Safety Council (NSC). 1992. Accident Prevention Manual for Industrial Operations: Engineering and Technology, 10th Edition, 1992. NSC: Chicago, IL.

American National Standard Institute (ANSI) 244.1. 1982. For Personnel Protection Lockout/Tagout of Energy Sources-Minimum Safety Requirements. ANSI: New York. U.S.

Department of Labor, Occupational Safety and Health Administration (OSHA). 1991. Publication 3120. Control of Hazardous Energy, (lockout/tagout). OSHA: Washington, DC.

APPENDIX H

CONFINED SPACE ENTRY PRORAM

Confined Space Entry Procedure

1. Purpose

This program is written to outline the proper procedure for entering or working in a confined space. This Confined Space Entry Program complies with the rules and regulations of the Occupational Safety & Health Administration (OSHA) for General Industry (29CFR1910.146).

2. Scope

This procedure provides guidelines that all contractors should follow for confined space entries on the Non-Time Critical Removal Action (NTCRA) NMI project. Contractors must have a confined space entry procedure at least as stringent as the requirements within this procedure.

With concurrence from the de maximus Site Project Manager and Field Supervisors/ Health and Safety Officer (FS/HSO) this procedure may be used by any contractor as their confined space entry procedure.

3. Definitions

Attendant – An individual stationed outside one or more permit-required confined spaces (permit spaces) who monitors the authorized entrants and performs all attendants' duties assigned in accordance with this procedure.

Authorized Entrant – A worker who is authorized and trained to enter a permit – required space.

Confined Space – A space that has one or more of the following characteristics:

- Is not designed for continuous employee occupancy.
- Restricted entry and exit
- Oxygen deficient atmosphere
- Open pits or trenches with a four feet or greater depth
- Has limited or restricted means for entry or exit.
- Limited ventilation

Hazardous Atmosphere – An atmosphere that may expose employees to risk of death, incapacitation, impairment of ability to self-rescue (i.e., escape unaided from a permit space), injury, or acute illness.

Hot Work Permit –A written authorization to perform operations, which could provide a source of ignition, such as riveting, welding, cutting, burning, or heating. Document hot work conditions on project Entry Permit.

Immediately Dangerous to Life and Health (IDLH) – Any condition that poses an immediate or delayed threat to life or that would cause irreversible adverse health effects or interfere with an individual's ability to escape unaided from a permit space.

Non-permit Confined Space – A confined space that does not contain or, has the potential to contain any hazard capable of causing death or serious physical harm.

4. Procedure

a. General

Contractor FS/HSOs are responsible for ensuring evaluation of the workplace to determine if any spaces are permit-required or non-permit-required. Figure 1 below provides a flow chart summary of classification and entry requirements. If it is determined that the workplace is a permit-required area, the following action will be taken:

- Employees must be made aware of the locations of the permit-required areas by posting danger signs. “DANGER: PERMIT-REQURED CONFINED SPACE, DO NOT ENTER”.
- If the FS/HSO or designee decides that no entry into the permit-required area will be authorized, barriers or other physical barricades will be used.
- If authorization for entry is granted by the project manager or designee then this confined space entry program or equivalent must be implemented and training must be conducted with affected employees.
- When changes occur to a confined space, the FS/HSO or designee will reevaluate the space and reclassify it accordingly.
- The FS/HSO or designee is responsible for all employees, including contracted individuals from another employer, and must make available information about the confined space hazards.

b. NON-PERMIT-REQUIRED SPACE

The FS/HSO or designee may determine that a location is a non-permit-required space if ALL of the following conditions are met:

- It can be verified that the confined space neither contains nor has the potential to contain any hazard capable of causing death or serious physical harm.
- The use of continuous forced air ventilation is sufficient in maintaining a safe entry.
- Entrants are made aware of the above conditions and provided supporting data.
- Confined spaces will be tested prior to and periodically during entry, for toxic, combustible, or oxygen deficient atmospheres.
- If a hazardous atmosphere does develop during entry, the entrants must immediately exit and the space must be tested and evaluated to prevent recurrences before any new entry is authorized.
- The superintendent must verify that all the above conditions have been met with a written certification that includes the date, location of the confined space, and the signature of the authorizing individual.

c. PERMIT-REQUIRED CONFINED SPACE

A permit-required confined space contains one or more of the following:

- Contains or has the potential to contain a hazardous atmosphere.
- Contains a material that has the potential for engulfment.
- Possesses an internal configuration in which a person could be trapped or asphyxiated by floors that slope downward and taper to smaller sections, or inwardly converging walls.
- Contains any other recognized serious safety or health hazard.

5. ENTRY PERMIT

Before authorization for entry, the entry permit (see attachment 1 for example Entry Permit) must be prepared, and the completed permit made available to all authorized entrances by posting it near the entrance of the confined space. The entry permit will not exceed the time required to complete the task, and will be canceled by the superintendent. The entry permit will identify the following:

- The permit-required area to be entered
- The purpose of the entry
- Date and authorized duration of the entry permit
- The authorized entrants within the permit-required area
- Personnel serving as attendants
- The individual serving as the entry supervisor
- The hazard of the permit-required area to be entered
- Any measures used to isolate the permit-required area
- Acceptable entry condition
- Results of initial and periodic testing rescue and emergency services
- Communication procedures used between attendants and entrants
- Testing, communications, rescue, and personal protective equipment
- Additional information and/or permits

Entry Procedures

An entry permit will be completed prior to entry into a confined space. The permit is authorization and approval in writing specifying the location and type of work to be done, and certifies that all existing hazards, (i.e., lockout/tag out, hot work, atmospheric hazards) have been evaluated by a competent person.

Atmospheric Monitoring

Atmospheric monitoring will be conducted before entry or reentry into any permit space. As a minimum, monitoring will be conducted for oxygen deficiency and flammable gases or vapors. The superintendent will determine the need for monitoring for toxic gases on the basis of characteristics of the permit space and work activities to be conducted. The appropriate intervals in which to monitor or the need for continuous monitoring shall be determined. If entry requires the use of respirators, refer to the Respiratory Procedure.

Figure 1- Confined Space Determination Flow Chart

6. Training

Before any employee can enter a confined space or be an attendant, they must be specifically trained for the space. Training shall be done prior to entry or whenever a change in the space occurs. Employees shall be trained in the associated hazards, use of personal protective equipment and confined space rescue/ retrieval gear. Training shall be document employees' names, signatures of trainers, and dates of training.

7. Responsibilities

a. Entry Supervisor/ Superintendent/Foreman

The entry supervisor is responsible for the following:

- Knowing the hazards that may be faced during entry.
- Verifies all tests specified by the permit have been performed.
- Verifies that rescue services are available.
- Verifies that means to summon rescue are operable.
- Prohibits unauthorized individuals from entering spaces.
- Ensure that entry operations remain consistent with procedures.
- Terminate and cancel permit as required.

b. Authorized Entrants

The Authorized entrants are responsible for:

- Awareness of hazards that may be faced during entry.
- Understand how monitoring equipment operates and how alarms react.
- Trained in the proper use of equipment.
- Maintaining constant communication with the attendant.
- Exiting from space when ordered, or an alarm is activated.

c. Attendant

The attendant is responsible for:

- Understanding the hazards and controls before anyone enters space.
- Performing no duties that might interfere with duties to monitor and protect the entrants.
- Summoning rescue and other emergency services.
- Having no other duties to interfere with primary duty.

- Continuously maintains accurate count of entrants.
- Being aware of behavioral effects caused by contaminates or deficient air.
- Maintaining constant communication with entrants.
- Summoning rescue and other emergency services as necessary.
- Monitoring activities inside and outside of space.

d. Administration / Project Management

Administration / Contractor Project Managers shall be responsible for ensuring implementation of the requirements of this procedure or equivalent procedure on all confined space entries on this project.

e. Superintendents/Supervisors/Foremen

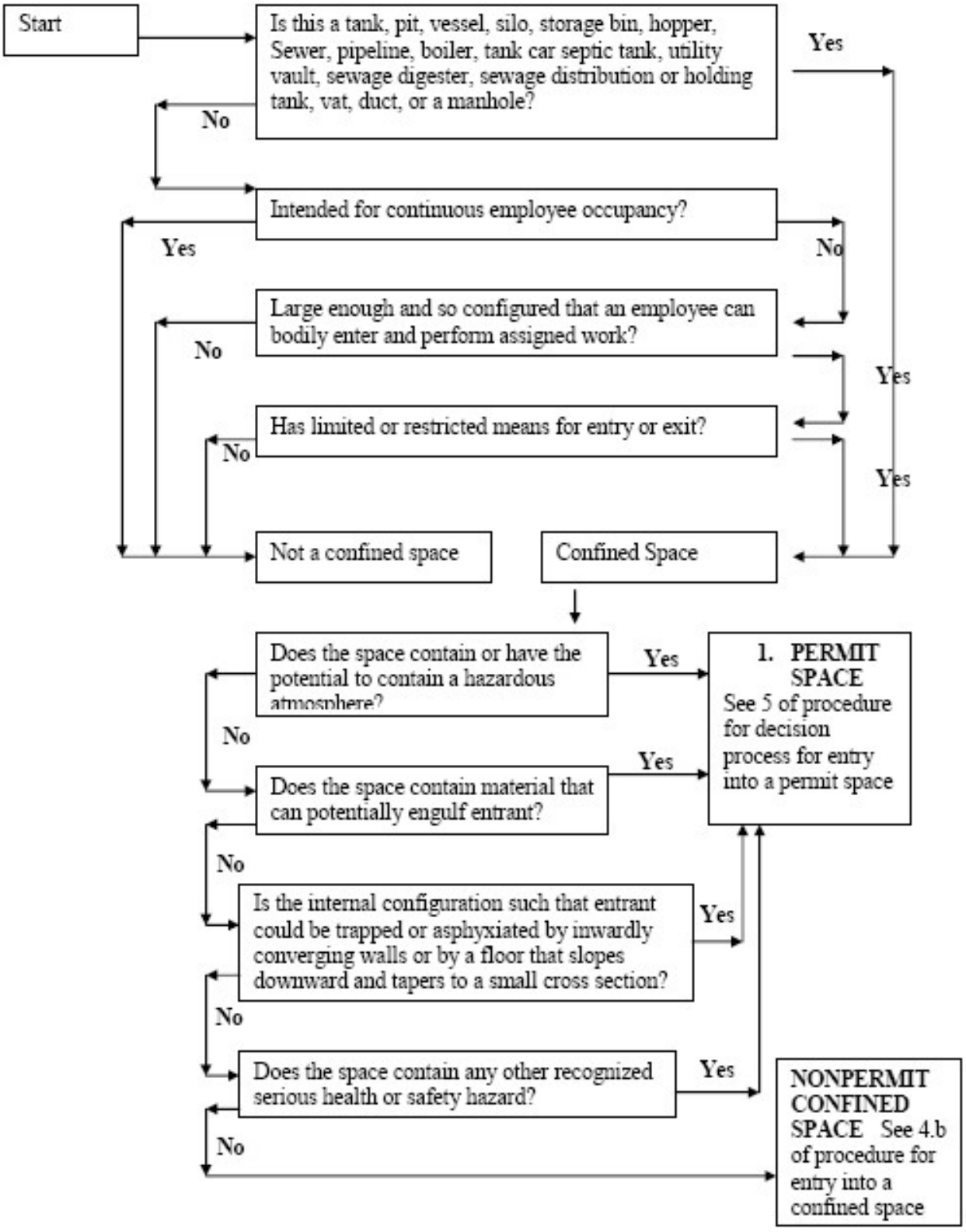
Superintendents/Supervisors/Foremen have the overall responsibility for the safety of employees. They shall evaluate the workplace to determine if any spaces are permit required or non-permit-required and shall ensure procedural compliance.

f. Health & Safety

Health & Safety personnel shall support management enforcement of the requirements of this procedure, as well as assist with training requirements, technical guidance, and determination of permit vs. non-permitted spaces.

APPENDIX J

Figure 1- Confined Space Determination Flow Chart



APPENDIX J

Location:_____ Space #:_____

Description of Confined Space:_____

Describe Hazards of Confined Space (Chemical and Physical) _____

Purpose of Permit:_____

CHECKLIST	***YES***	***DOES NOT APPLY***
All lines leading to and from the space have been blinded or disconnected.		
Electrical service disconnected or locked out.		
All grounding and bonding cables in place.		
All lighting, fittings, power equipment, and extension cords are rated for anticipated atmosphere.		
Ground Fault Circuit Interrupter (GFCI) checked and functioning.		
All ignition sources have been isolated.		
All respiratory equipment and alarms checked and functional.		
All safety harnesses and lifelines checked.		
All required PPE checked and in use.		
Have all entrants, attendants, and entry supervisors received appropriate training?		
Attendant(s) trained in non-entry rescue procedures.		
Rescue service has been identified and will be available for entry rescue.		
Has rescue service passed evaluation?		
Appropriate rescue equipment available and checked.		
Mechanical ventilation system in use and effective.		
All tests have been completed and indicate that entrance requirements have been met.		
Appropriate warning signs have been posted and unauthorized personnel have been excluded from the PRCS.		
IF ANSWER TO ANY OF THE ABOVE QUESTIONS IS *NO*, ENTRY IS NOT PERMITTED.		

PERSONAL PROTECTIVE EQUIPMENT :(Circle)

EYE/FACE

Chemical Goggles Face Shield Safety Glasses

EXTREMITIES

Hard Hat Hoods Boot Covers

Gloves (Material:_____)

Boots (Material :_____)

BODY

(Level:_____ Material:_____)

RESPIRATORY

SCBA Supplied Air Egress System

Air-Purifying (Cartridge:_____)

Powered Air Purifying (Cartridge:_____)

Date:_____

Sequence No.:_____

APPENDIX J

OTHER

Hearing Protection Harness & Lifeline

Chest or Full Body Harness

RESCUE EQUIPMENT

Mechanical Extraction Device First Aid Kit SCBA

Other: (Specify) _____

_____

_____

COMMUNICATION METHOD:

Lifeline Tug Signals:_____

Air Powered Horn Signals (list signal): _____

Other _____

_____

_____

Other Permits Issued for Work in Confined Space: _____

_____

Other Hazard Control Procedures or Instructions:

Rescue Procedures: _____

_____

In the event of an emergency, organizations _____ can be contacted by calling _____from a cell phone.

Date:_____

Sequence No.:_____

APPENDIX J

TEST DATA
Oxygen, Flammability, and Toxic Contaminant(s)

Time	Percent Oxygen	Percent LEL	(Other)	(Other)	(Other)	(Other)	(Other)	Tester's Initials	Comments

Tester's Signature:

Authorized Entrants:		**Authorized Attendant(s):**
		Rescue Personnel:

Diagram the confined space, indicate location of man-ways and ventilators. Indicate location(s) where tests are conducted.

)(	Man-way
4	Ventilator
X	Test Location

Date:_____
Sequence No.:_____

APPENDIX J

Acceptable Entry Conditions:		
1. Entry Permit completely filled out.	2. Oxygen between19.5% and 23.5%.	
3. Combustible gases below 10% LEL	4. Permissible levels of toxic gases: (please list below)	
5. Other:		

Confined Space Safe for Entry:

Date/ Time:_____/_____

Name of Entry Supervisor:_____ Signature:_____

Entry Permit Expires (no longer than one shift): Date/ Time: _____/_____

Entry Permit Cancelled:

Date/ Time:_____/_____

Signature:_____

Reason(s):_____Work Complete _____Authorized Conditions Not Met _____Incident

Problems During Entry and Resolution: (Please Describe): _____

_____

_____

_____

Reclassification to Non-Permit Required Confined Space:

Describe hazard removal methods, without use of ventilation:_____

_____

Testing Verification Shown at Time:_____ (on data chart above)

Date/ Time:_____/_____ Entry Supervisor's Signature:_____

Reviewed by: _____ _____

Health and Safety Representative Signature Date

Date:_____

Sequence No.:_____

APPENDIX I

HEAT STRESS PROGRAM

Heat Stress Measurement & Control

I. Purpose

Provide instructions for methods for control and monitoring heat stress during periods of work in elevated temperature environments.

II. Scope

Elevated temperatures and the use of impermeable PPE are indicators for when monitoring and controls should be considered:

- Work involving the wearing of impermeable PPE in environments with temperatures greater than 70 °F
- Work involving high metabolic activity for durations greater than one hour and in environments with temperatures greater than 80 °F

Note: work of shorter duration and of low metabolic activity does not preclude use of heat stress control strategies, only implementation of all the methods of this procedure is not required.

This procedure applies to all NMI employees and their contractors. Contractors may use their own equivalent program provided that program has been reviewed and determined equivalent by the de maximis Site Project Manager.

III. Responsibilities

Field Supervisors / Health & Safety Officers

Field Supervisors/Health and Safety Officers (FS/HSOs) are responsible for determining which heat stress monitoring and control methods outlined by this procedure will be used for the tasks performed by their company.

Workers

Recognizing heat stress symptoms they are experiencing or noticing symptoms in fellow workers and reporting same to supervisors.

IV. Precautions

Individuals, who smoke, drink excessive quantities of alcohol, are overweight and otherwise in poor physical health or fitness are at high risk of heat stress regardless of the measures implemented using this procedure.

Humidity and airflow play a limited role in heat stress when the worker is wearing impermeable clothing; these factors will be significant for the area a worker is assigned to rest in after performing work in an elevated temperature environment.

V. Prerequisites

Personnel affected by this procedure require the following prior to their participation in the monitoring and control measures recommended by this procedure:

a) Medical examination by a licensed physician

b) Training in the symptoms of heat stress and emergency response measures to be taken for worker's experiencing extreme heat stress reactions

c) Personnel performing the monitoring requirements recommended in this procedure should be knowledgeable of the operation of monitoring equipment and interpretation of the readings.

Personnel performing the monitoring requirements recommended in this procedure should be knowledgeable of the operation of monitoring equipment and interpretation of the readings.

VI. Initial Hazard Assessment

Moderate or heavy work in elevated temperature environments are candidates for heat stress impact work. FS/HSOs need to determine the following when assessing the risk of heat stress hazards to workers under their cognizance.

1.1.1. Determine the type of work to be performed and the relative level of metabolic activity.

1.1.2. Estimate the work area temperatures likely to be experienced and the sources of those temperatures.

1.1.3. The duration of the work to be performed.

1.1.4. Identify any factors that can affect the work environment such as use of protective clothing, flow air or presence of cooling/heat sources, humidity of environment, radiant heat from sun absence (night work) or presence (day work), and use of labor saving devices/tooling.

VII. Monitoring and Control for Heat Stress

Note: There are three personal monitoring methods provided in this section. Each method has advantages and limitations. Ideally, individual worker objective monitoring such as pulse rate or body temperature is more likely to identify a potential heat stress effect than surrogate criteria such as WBGT or dry bulb measurements. Further these surrogate criteria and recommended controls were not designed to be used with elevated levels of personal protective equipment. The company or project Health & Safety Officer is designated as responsible for determining the best method for monitoring personnel for the task conditions.

A majority of invasive site activities will require the use of elevated levels of PPE (Tyvek Coveralls, respiratory protection, etc.) based on the levels of contaminants. The project team will rely on physiological monitoring combined with engineering and administrative controls to protect site works from heat stress. Personal monitoring can be done by checking the heart rate, body temperature, or extent of body water loss.

Note that no single method is perfect for changing site conditions and for a group of employees with varying health, weight, age, and background. The Site FS/HSO shall consider all available factors when determining work and rest cycles for each task.

1. Heart Rate Monitoring

Pulse rate monitoring is perhaps the simplest method but requires a rapid assessment once the worker leaves the elevated temperature environment.

i. Measurement

The recovery heart rate can be checked by comparing the pulse rate taken at 30 seconds (P1) with the pulse rate taken at 2.5 minutes (P3) after the rest break starts. The two pulse rates can be interpreted using the Heart Rate Recovery Criteria as listed below.

ii. Control

Use the heart rate recover tool on the table below, to determine follow-up actions

Heart Rate Recovery Pattern	***P3***	***Difference between P1 and P3***
Satisfactory Recovery	<90	--
High Recovery (Conditions may require further study)	90	10
No Recovery (May indicate too much Stress)	90	<10

2) Body Temperature

Body temperatures are taken through the ear canal.

i. Measurement

The worker will obtain body temperature measurements through the ear canal when required.

ii. Control

Body temperature above 102 °F requires that the worker be excluded from performing anymore high metabolic activities for the remainder of the day.

Body temperatures above 100.4 °F require either an increase in rest time or decrease in workload.

3) Body Water Loss

Body water loss can be measured by weighing the worker on a scale at the beginning, after each break and at the end of each work day. The worker's weight loss should not exceed 1.5% of total body weight in a work day. If a weight loss exceeding this amount is observed, fluid intake should increase.

VIII. Engineering Controls

Prior to and in addition to implementation of heat stress measurement and controls consideration should be given to implementing the following engineering controls

- Ice vests, vortex cooling tubes to inhibit increases in body temperature

- Fans for increasing air speed in area to enhance evaporative cooling effect
- Shielding for any radiant heat sources
- Cooling of supply air
- Dehumidification to enhance evaporative cooling of sweat from skin surfaces
- Local exhaust ventilation to remove heat at the source
- Isolation of worker from heat environment
- Use of labor-saving tooling to decrease metabolic load

IX. Work Practices

The following work practices should be employed

Acclimatize worker(s) to elevated temperature environment by using first six days with increased rest regimen with gradual phase in of work time until table maximums are reached.

a) Permit self-limitation of exposures and encourage co-worker observation to detect signs and symptoms of heat strain in others.

b) Counsel and monitor those who take medications that may compromise normal cardiovascular, blood pressure, body temperature regulation, renal, or sweat gland functions.

c) Provide cooled drinking water and sports drinks to employees during rest periods. Encourage employees to frequently drink small amounts (about one cup ever 15-20 minutes).

d) Perform work during early morning, or cooler evening hours when possible.

e) Place workers when resting in cool environment or one where fans/ cooling units are located.

f) Ensure workers are aware of diet affects on response to heat stress; attempt to schedule high metabolic load environment well apart from meal taking.

X. Worker Recovery Periods

a) Workers are allowed a recovery period from physiological strain after being exposed to a Heat Stress environment.

b) Recovery areas are located outside Heat Stress work area, and where the temperature is < 80 degrees F.

c) Cool drinks are provided for worker consumption in the recovery area.

d) When the physiological state of a worker has returned to pre-exposure conditions, then their recovery period is considered completed.

XI. Records

Records, logs and recordings are maintained on site until termination of the project.

a) Upon termination of project, the records should be forwarded to the Corporate Safety Officer.

b) Upon individual employee termination from the project, the records associated specifically with that individual should be supplied to the Corporate Safety Officer and these records will then be added to the employee's medical records and exposure file.

XII. Definitions

Acclimatization - Series of physiological and psychological adjustments that occur in an employee during initial exposures to hot environmental conditions that increase the employee's tolerance to elevated work environment temperature.

Maximum Heart Rate - Amount of work (beats) per minute a healthy person's heart can be expected to safely deliver. Maximum heart rate (MHR) is calculated by subtracting an employee's age from 200.

XIII. Attachments

Attachment 1, Heart Rate & Body Temperature Monitoring Form

Attachment 2, Body Water Loss Monitoring Form

APPENDIX L

Heat Stress, Heart Rate & Body Temp Monitoring

NMI

Date:	Work Area:	Weather:	Stay Time:

Name	Rest Start Time	Heart & Recovery Rate					Body Temp Monitoring					Rest End Time	Total Rest Period
		P1 Start Rest (30 Sec Into)	>110 BPM? (Yes-Shorten Work Period By 1/3)		P3 At Rest (2.5 min into)	(P3-P1) Recovery Heart Rate	Temp (Ear)	>100.4 (Yes-Increase Rest Or Decrease Work Load)		>102 F (Yes-Remove Worker For Day)			
			Yes	No				Yes	No	Yes	No		

APPENDIX L

Heat Stress, Body Water Loss Monitoring

NMI

Work Area:	Date:	Stay Time:

Name	Weight In		Weight Out		1.5% Total Body Weight	Δ Weight	>1.5% Total Body Weight (If Yes Increase Fluid Intake)	
	Time	Lbs	End Time	Lbs			Yes	No

APPENDIX J

COLD STRESS PROTECTION PROGRAM

Cold Stress Prevention

I. Purpose

This Procedure is to provide the minimum safety requirements and practices for prevention of temperature-related illnesses associated with exposure to cold environments.

II. Scope

This Procedure applies to all NMI RD/RA operations where employees may encounter working conditions and/or environments that can reasonably be anticipated to cause cold-related illnesses.

III. REFERENCES

a. 29 CFR 1910.1200 – Hazard Communication

b. 29CFR 1910.120 – Hazardous Waste Operations and Emergency Response

c. HASP Medical Surveillance Program

IV. ACRONYMS AND DEFINITIONS

Administrative Controls – The use of measures such as management involvement, training of employees, rotation of employees in and out of exposure areas, warning signs, controlled access to areas, air sampling, biological sampling, and medical surveillance to protect individuals.

Cold Stress - Body heat is lost to the environment by four different routes: Radiation is the loss of body heat to the colder air in the environment due to the temperature difference; conduction is loss of heat through direct contact between objects, heat transfer; in convection, warm molecules against the surface of the body are moved away and replaced with cold molecules. Wind chill is an example of the effects of air convection, the wind chill table (Table 3) gives a reading of the amount of heat lost to the environment relative to still air temperature; in evaporation, heat and fluid is lost to the environment from sweating and respiration, a decreased fluid level makes the body more susceptible to hypothermia and other cold injuries.

Engineering Controls – The methods of controlling employee exposure to contaminants by measures such as process change, substitution, isolation, ventilation, or source modification.

Personal Protective Equipment (PPE) - Specialized clothing or equipment worn by an employee for protection against a hazard. General work clothes (e.g., uniforms, pants, and shirts) are not considered to be personal protective equipment.

Wind Chill - The cooling rate felt on exposed skin resulting from the loss of body heat due to air temperature and wind velocity. While increased wind speed does not reduce the actual air temperature, it does increase how quickly heat is lost, thus effecting a person's perception of the air temperature.

V. REQUIREMENTS

a. General Requirements

i. Safety hazards created by extreme cold include the following:

• Decreased body temperature and physical discomfort promote irritability, anger, and other emotional states which can affect workers alertness and attitudes towards safe work practices.

• Eyeglasses can become fogged and walking surfaces slippery increasing the risk for slips and falls.

ii. Workers should refrain from drinking alcoholic beverages while off duty (alcohol consumption is never permitted on the job) because the resultant dilation of blood vessels can permit a rapid loss of body heat, increasing the risk of hypothermia.

iii. Dehydration can occur in cold environments as well as hot ones, increasing employees 'susceptibility to thermal injury. In order to maintain the body's fluid level and to provide necessary calories, warm, sweet drinks and/or soup may be provided at the work site. However, caffeinated drinks (e.g., coffee, tea, cola drinks, soft drinks etc.) should be discouraged because it increases water loss and can lead to dehydration. In addition, it increases blood flow at the skin surface which can increase the loss of body heat. Non-caffeinated versions of the above are acceptable. The following are some guidelines for maintaining hydration:

• Maintain water temperature at 50° to 60°F (10° to 15.6°C);

• Provide small disposable cups that hold about 4 ounces (0.1 liter);

• Have employees drink 16 ounces (0.5 liters) of fluid (preferably water or dilute drinks) before beginning work.

b. Training shall include at least the following:

• Recognition of predisposing factors, danger signs and symptoms of cold-related illnesses (See Attachment 1);

• Methods that can be taken to prevent cold stress;

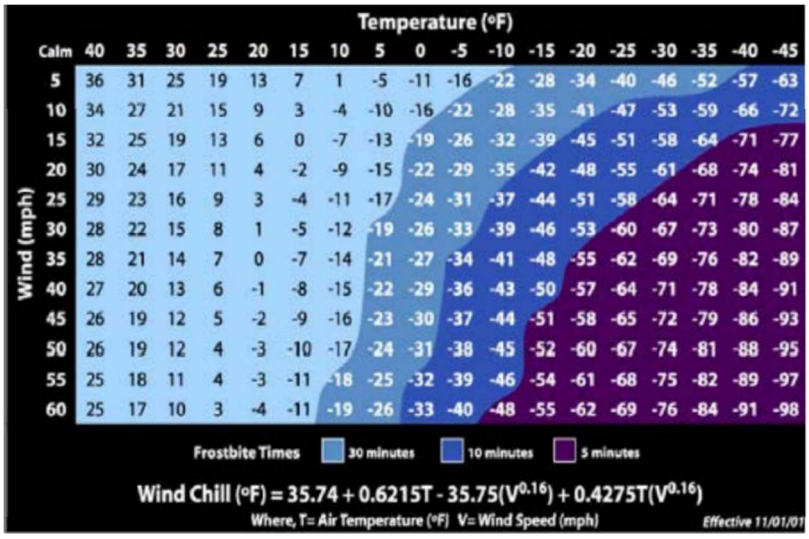
• Methods for physiological monitoring and implementing control measures;

• Procedures for first-aid and responding to cold stress emergencies.

c. Cold Stress Prevention Instructions

i. In order to calculate wind chill (see Table 1), both the temperature and wind speed shall be monitored or checked every 4 hours. This data shall be recorded in the project log book or log form approved by the FS/HSO.

Table 1 - Wind Chill Chart



ii. Employees who have a medical condition (e.g., cardiovascular disease, diabetes, hypertension) or are taking medication (e.g., drugs that act on the cardio-respiratory system) that interferes with normal body temperature or tolerance to the cold shall not be assigned to field work where temperatures are below 32°F.

iii. A work-warm regimen (with breaks at least 10 minutes long) shall be instituted when work is being conducted in environments where the wind chill temperature is below 20°F. Heated warming shelters shall be available or provided on or nearby the work site, as appropriate. Table 4 contains the requirements for the number of breaks per 4 hour shift for extremely low temperatures. An employee experiencing any of the following symptoms shall return immediately to the warming shelter: heavy shivering; frostnip; excessive fatigue; irritability; or euphoria. Employees should also use the buddy system and be alert for these symptoms in their co-workers as well.

Table 2 - Work/Warm Schedule[11]

Air Temperature Sunny Sky	No Noticeable Wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind	
	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks
-15 to -19 °F	Normal Breaks	1	Normal Breaks	1	75 min	2	55 min	3	40 min	4
-20 to -24 °F	Normal Breaks	1	75 min	2	55 min	3	40 min	4	30 min	5
-25 to -29 °F	75 min	2	55 min	3	40 min	4	30 min	5	Non emergency work should cease	
-30 to -34 °F	55 min	3	40 min	4	30 min	5	Non emergency work should cease			
-35 to -39 °F	40 min	4	30 min	5	Non emergency work should cease					
-40 to -44 °F	30 min	5	Non emergency work should cease							
-45 °F and below	Non emergency work should cease									

[1] From the Occupational Health & Safety Division, Saskatchewan Department of Labor. Schedule applies to any 4-hour period with moderate to heavy work activity and an extended lunch break. For light to moderate work, apply one step lower. This applies to employees in dry clothing.

iv. For work in temperatures below 40°F, insulating clothing must be used. Employees should select their clothing based on the planned activities and the predicted air temperature and winds speed. Layering of clothing and wearing a hat and insulating gloves or mittens is highly recommended. Wet clothing should be changed as soon as possible.

v. Outdoor field work shall be suspended when wind chill temperatures reach -74°F. Suspension of field work at temperatures greater than -74°F may be required due client requirements or work conditions.

VI. RECORDS

All documents generated as a result of the implementation of this Procedure shall be kept in the project file.

VII. Attachments

Attachment 1 - Cold Illness Description

APPENDIX M

Attachment 1

COLD STRESS ILLNESSES

Chilblains

Description	A chronic condition due to an abnormal reaction of the body to cold affecting the skin and peripheral capillary circulation, resulting from prolonged exposure of the bare skin.
Signs and Symptoms	Small, red swelling on the skin which can be very itchy and gradually becomes very painful.
Causes	Chilblains can occur in temperatures at or below 60°F and usually occur on the smaller toes, but can occur on the finger, face and the nose or on a pressure bearing area such as a bunion .
First Aid	Do not rub or scratch chilblains, avoid direct heat (ie do not expose the feet to a heater), but keep the feet warm by the use of woolen socks and footwear, use soothing lotions (eg calamine lotion), and if the skin is broken, use an antiseptic dressing to prevent the chilblains becoming infected
Prevention	Stop exposure to cold, remove any wet or constrictive clothing, gently wash and dry the injured area, elevate it, cover it with layers of loose warm clothes and allow to rewarm. Smoking also interferes with the circulation in the small blood vessels and increases the risk of getting chilblains.

Immersion Foot (trench foot)

Description	Formerly called trench foot, it is a cold injury resulting from prolonged exposure to near-freezing temperatures when standing or walking on wet or swampy ground.
Signs and Symptoms	Severe pain, tingling, itching in feet and legs, edema, blisters, and reduced touch sensation.
Causes	Caused from wet feet and exposure to cold temperatures above freezing.
First Aid	Get into a warm room as soon as possible, cover the person or area in warm blankets, avoid walking on feet or toes to avoid more serious damage, immerse the areas affected into warm (not hot) water, the area should be gently washed, dried, and wrapped in sterile bandages and kept clean to avoid infection, consult your physician regarding the use of an oral antibiotic or topical ointment.
Prevention	When possible, air-dry and elevate your feet, and exchange wet shoes and socks for dry ones to help prevent the development of trench foot. Treatment for trench foot is similar to the treatment for frostbite. Take the following steps: • Thoroughly clean and dry your feet. • Put on clean, dry socks daily.

Immersion Foot **Prevention** **(Cont.)**	• Treat the affected part by applying warm packs or soaking in warm water (102° to 110° F) for approximately 5 minutes. • When sleeping or resting, do not wear socks. • Obtain medical assistance as soon as possible. If you have a foot wound, your foot may be more prone to infection. Check your feet at least once a day for infections or worsening of symptoms

Frostbite

Description	A freezing of the hands, feet, ears, and parts of the face as a result of exposure to very low temperatures. Frostbite occurs when ice crystals form in the fluid in cells of the skin and tissue. Most often, frostbite affects the nose, ears, cheeks, chin, fingers, or toes, and can permanently damage the body, even leading to amputation in severe cases. The risk of frostbite is increased in persons with reduced blood circulation, those with constriction of blood flow because of gloves or boots that are too tight, and in persons not dressed for extremely cold temperatures. Exposed hands and feet are the most vulnerable. There are three stages of frostbite: incipient frostbite (frostnip), superficial frostbite, and deep frostbite: • Frostnip – Incipient form of frostbite that affects the skin only. Typically does not require medical treatment. • Superficial Frostbite – A form of frostbite that affects the skin and tissues immediately beneath the skin. • Deep Frostbite – The most serious form of frostbite with damage that affects deeper tissue and even bone.
Signs and Symptoms	Redness or pain in a skin area, a white or grayish-yellow skin area, skin that feels unusually firm or waxy, and/or numbness.
Causes	Exposure to extremely low temperatures.
First Aid	Get into a warm room as soon as possible, cover the person or area in warm blankets, avoid walking on frostbitten feet or toes to avoid more serious damage, immerse the areas affected by frostbite into warm (not hot) water, warm the affected area using body heat, avoid rubbing or massaging the affected area as this can cause further damage, do not use anything hot, such as a heating pad, stove, or furnace, to warm the affected area, as these areas are numb and may burn easily due to a lack of sensation, the frostbitten area should be gently washed, dried, and wrapped in sterile bandages and kept clean to avoid infection, consult your physician regarding the use of an oral antibiotic or topical ointment.
Prevention	Keep exposed extremities with isolative clothing; avoid smoking or drinking alcohol.