June 3, 2019

Betsy Ullrich, Senior Health Physicist
Mail Control No. 610798
USNRC, Region I
Division of Nuclear Materials Safety
2100 Renaissance Boulevard
King of Prussia, PA 19406

SUBJECT: Response to Request for Examples of Site Specific Plans and Clarification of Sealed Sources

Dear Ms. Ullrich,

In response to your request to review a few examples of site specific plans that Perma-Fix creates for projects, please find attached three examples of said plans used on previous projects.

Additionally, Perma-Fix would like to clarify any sealed sources used on a given project will only be small quantity sources used for instrumentation quality and functionality tests. The quantities are below the threshold required for licensing and, as such do not need to be listed on the license. A revised "Table 1, Radioactive Material Quantity Limits" is attached.

Best Regards,

S. Eric Miller, CHP
Corporate RSO
Perma-Fix Environmental Services

Attachments

- Example Plan 1, Pennsylvania
- Example Plan 2, Ohio
- Example Plan 3, California
- Revised Table 1, Radioactive Material Quantity Limits

[redacted]

Project: Beaver Falls, Pennsylvania

March 24, 2016

Prepared by:
Perma-Fix Environmental Services, Inc.
2800 Solway Road
Knoxville, TN 37931

Prepared for:

[redacted]

Decontamination Work Plan

[redacted]

Contract Services Agreement 041515

Decontamination Work Plan Approvals

By their specific signature, the undersigned certify that they prepared, reviewed, or provided comments on this Decontamination Work Plan (DWP) for [redacted]ylvania facility.

Prepared by:	Stace Johnson, Manager of Projects	March 24, 2016 Date
Concurrence:	Eric Laning, Technical Services Manager	March 24, 2016 Date
Concurrence:	Andrew Williams, Deputy Project Manager/ES&H/Waste Manager	March 24, 2016 Date
Approval:	Andy Lombardo, Senior Vice President	March 24, 2016 Date
Approval:	Will Hansard, PSC Client Representative	March 24, 2016 Date
Approval:	David Allard, Director – Bureau of Radiation Protection Pennsylvania Department of Environmental Protection	Date

TABLE OF CONTENTS

APPENDICES

FIGURES

TABLES

ACRONYMS

ABHP	American Board of Health Physics
ACGIH	American Conference of Governmental Industrial Hygienists
ACP	Access Control Point
AHA	Activity Hazard Analysis
ALARA	As Low As Reasonably Achievable
ANSI	American National Standards Institute
ASR	Automotive Shredder Residue
Bi	Bismuth
BMP	Best Management Practice
BRA	Background Reference Area
C&D	Construction and Demolition
CEO	Chief Executive Officer
CFR	Code of Federal Regulations
CHP	Certified Health Physicist
cm^2	square centimeter
COC	Contaminant of Concern
cpm	counts per minute
CPR	Cardiopulmonary Resuscitation
dB (A)	decibels A-weighted
dpm	disintegrations per minute
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DQO	Data Quality Objective
DWP	Decontamination Work Plan
EEWP	Energized Electrical Work Permit
EPA	U.S. Environmental Protection Agency
ES	Energy*Solutions*
ES&H	Environmental Safety and Health
FSS	Final Status Survey
g	gram
GCMS	Gas Chromatography Mass Spectroscopy
GFCI	Ground Fault Circuit Interrupter
GPS	Global Positioning System
GWS	Gamma Walkover Survey
HDPE	High Density Polyethylene
HEPA	High Efficiency Particulate Air
HP	Health Physics, Health Physicist
HPGe	High-purity Germanium
HPT	Health Physics Technician
ICP-MS	Inductively Coupled Plasma Mass Spectrometry
IDLH	Immediately Dangerous to Life or Health
IMC	Intermodal Container
ISMS	Integrated Safety Management System
K	Potassium
keV	kilo-electron volt
m	meter
m^2	square meter
m^3	cubic meter
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDA	Minimum Detection Activity
MDC	Minimum Detectable Concentration
mg	milligram
mrem	millirem
MSHA	Mine Safety and Health Administration
NaI	Sodium Iodide

NELAC	National Environmental Laboratory Accreditation Conference
NFPA	National Fire Protection Association
NESHAP	National Emission Standards for Hazardous Air Pollutants
NIOSH	National Institute for Occupational Safety and Health
NRC	Nuclear Regulatory Commission
NRRPT	National Registry of Radiation Protection Technologists
OSHA	Occupational Safety and Health Administration
OTR	Over the Road
Pace	Pace Analytical Services, Inc.
PADEP	Pennsylvania Department of Environmental Protection
Pb	Lead
PCHP	Project Certified Health Physicist
pCi	picocurie
PEL	Permissible Exposure Limit
Perma-Fix	Perma-Fix Environmental Services, Inc.
POD	Plan of the Day
PPE	Personal Protective Equipment
PM	Project Manager
PSN	Proper Shipping Name
QA	Quality Assurance
QC	Quality Control
Ra	Radium
RAP	Radiological Assistance Program (DOE)
RCRA	Resource Conservation and Recovery Act
RCT	Radiological Control Technician
REL	Recommended Exposure Limit
Rn	Radon
RPP	Radiation Protection Plan
RQ	Reportable Quantity
RSO	Radiation Safety Officer
RWP	Radiological Work Permit
SCBA	Self-contained Breathing Apparatus
SDS	Safety Data Sheet
SEC	Safety and Ecology Corporation
SOR	Sum of Ratios
SOW	Scope of Work
SSHO	Site Safety and Health Officer
SU	Survey Unit
SVOC	Semivolatile Organic Compound
TBD	To Be Determined
TCLP	Toxicity Characteristic Leaching Procedure
TENORM	Technologically Enhanced Naturally Occurring Radioactive Material
TLV	Threshold Limit Value
TSCA	Toxic Substances Control Act
TWA	Time-weighted Average
USEI	US Ecology Idaho
VOC	Volatile Organic Compound
WAC	Waste Acceptance Criteria
WBGT	Wet Bulb Globe Temperature
WCS	Waste Control Specialists, LLC

1.0 INTRODUCTION

Perma-Fix Environmental Services, Inc. (Perma-Fix) is contracted by [redacted] radiological response actions including characterization, remediation, disposition of materials, and final status surveys (FSSs) for two impacted facilities in Ohio (Canton and Massillon) and one in Pennsylvania (Beaver Falls). Each of the facilities has been impacted as a result of accidentally processing and transporting radium (Ra)-226 source material on or about February 23, 2016. This plan will describe the Decontamination Work Plan (DWP) elements as related to the Beaver Falls site.

The Beaver Falls facility is a large-scale automotive and scrap metal shredding, sorting, and lay-down yard set on approximately 40 acres. The facility purchases scrap metal loads delivered by the public and routinely ships out automotive shredder residue (ASR) for downstream processing at the X[redacted]n, Ohio sorting facility. The DWP is developed in accordance with applicable Perma-Fix Corporate and site-specific health and safety requirements, the Perma-Fix Radiological License, and the reciprocity agreement.

The unrestricted release criteria of Pennsylvania Department of Environmental Protection (PADEP) Title 25 and U.S. Nuclear Regulatory Commission (NRC) 10 Code of Federal Regulations (CFR) 20 equal to 25 mrem/yr total effective dose equivalent will be the standard for the site. Final status release criteria for structural and fixed-equipment surfaces is based on the surface concentration equivalent to 25 mrem/yr for Ra-226 referenced in Table 5.19 of NUREG-5512, Volume 3 (1999). The selected release criteria reflect a risk tolerance (P_{crit}) of 0.90, and an assumption that residual removable activity will be limited to 10% of total surface activity.

The volumetric release criterion equal to 25 mrem/yr of 0.7 pCi/g, above natural background for soil and soil-like materials for total radium is based Table 6.91 of NUREG-5512, Volume 3 (1999).

Table 1. [redacted]nse Release Criteria

Decay Mode	Average	Maximum	Removable
Alpha (Ra-226)	1,120 dpm / 100 cm^2	N/A	112 dpm / 100 cm^2
Beta/Gamma (all other beta-gamma emitters including Ra-226 progeny)	5,000 dpm / 100 cm^2	N/A	1,000 dpm / 100 cm^2
Total Radium (volumetric concentration, e.g., soil, solid debris)	N/A	0.7 pCi/g above background	N/A

This DWP is developed in accordance with applical[redacted]e health and safety requirements, the Perma-Fix Radiological License, and the reciprocity agreement. Once decontamination activities are completed, the impacted areas of the site will be released in accordance with NUREG-1575, *Multi-Agency Radiation Site Survey and Investigation Manual* (MARSSIM), Revision 1.

1.1 Project Organization

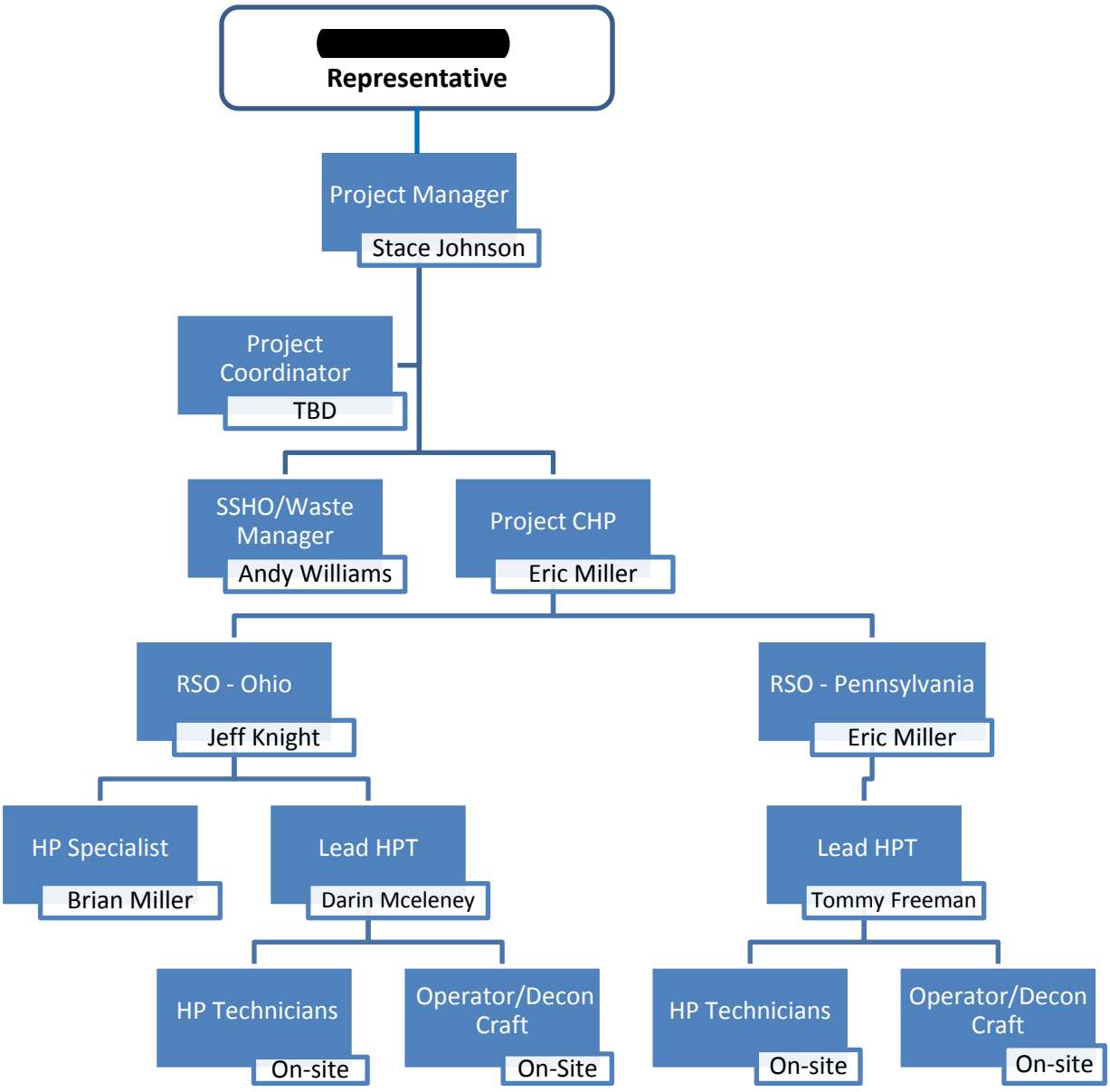
The project organization is presented in **Figure 1**. Key personnel for this project as noted on this figure are as follows:

- Project Manager (PM): Stace Johnson
- Project Certified Health Physicist (CHP): Eric Miller
- Radiation Safety Officer (Site Lead at Canton and Massillon, Ohio): Jeffrey Knight
- Radiation Safety Officer (Site Lead at Beaver Falls, Pennsylvania): Eric Miller
- Site Safety and Health Officer (SSHO)/Waste Manager: Andy Williams
- Health Physics Technicians (HPT): On-site
- Equipment Operators and Decontamination Technicians: On-site

Interfaces for key personnel are also included in **Figure 1**. No work shall be performed on-site unless the PM (or designee) and the SSHO (or Company approved designee) have approved the work activities.

The Perma-Fix PM, Stace Johnson, is the dedicated point of contact with the [redacted]Roles and responsibilities of the key project personnel are outlined in **Table 2**.

Figure 1. Project Organization



1.2 Project Schedule

The project baseline schedule (see **Appendix A**) contains necessary milestones included in the contract. A weekly schedule reflecting actual progress will be developed using input from the field team and the daily reports prepared each day by the PM or designee. The proposed schedule is based on preliminary assumptions based on available characterization data, site history, and site conditions. The schedule is built upon working 5 days per week at 10 hours per day and an 8-hour work day on Saturday. No Sundays are planned to be worked.

Table 2. Responsibilities and Required Qualifications of Key Personnel

Key Personnel	Required Radiological Qualification(s)	Responsibilities
Project Manager (PM)	• Radiation Worker II Training.	• Overall responsibility for meeting contract requirements. • Dedicated, single point of contact between Perma-Fix and the [redacted] communicate project status, upcoming schedule activities, resource needs, and other contract issues as necessary. • Authority to commit Perma-Fix resources to the project. • Responsible for ensuring quality assurance (QA) compliance. • Responsible for ensuring the SSHO and Radiation Safety Officer (RSO) have the necessary resources to safely and efficiently execute the project scope of work (SOW). • Responsible for execution of all work as specified in approved project work plans and Activity Hazard Analysis (AHA). • Provides direction to site personnel and coordinates activities among the various labor types. • Responsible for the effective utilization of the labor workforce and equipment. • Leads or designates a lead to perform plan of the day (POD) meetings and POD debriefing meetings with focus on safety, method of accomplishment for scheduled activities, and lessons learned. • Responsible for creating, embracing, and reinforcing a safe and productive work environment.
Project Certified Health Physicist (PCHP)	• American Board of Health Physics (ABHP) certification. • Minimum 10 years of experience. • Authorized user of Safety and Ecology (SEC) Corporation Radioactive Materials License Number 201-650-15.	• Overall responsibility for the implementation of site radiological work activities in accordance with the approved Radiation Protection Plan (RPP) and As Low as Reasonably Achievable (ALARA) principles. • Provides technical support and health physics (HP) direction to the RSO. • Supports preparation of project work plans, work instructions, and Final Report. • Responsible for creating, embracing, and reinforcing a safe and productive work environment. • May be designated as an RSO if working multiple sites.
Site Safety and Health Officer (SSHO)	• Radiation Worker II Training.	• Responsible for assuring all field activities are conducted in accordance with requirements of the project Health and Safety Plan (see Section 4.0) and AHA (see **Appendix B**). • Responsible for necessary revisions to project Health and Safety Plan (see Section 4.0) and AHA (**Appendix B**). • Participate in development of the POD/plan of the week meetings and POD debriefing meetings to discuss safety and health requirements for scheduled work activities and lessons learned, and reinforce importance of safe work practices and a safe work environment. • Interfaces with the client to assure all work is executed in a safe manner. • Continuously communicate Integrated Safety Management System (ISMS) and zero accident requirements and commitments to the work force. • Responsible for ensuring quality control (QC) compliance. • Verification of utility isolation with XXX personnel prior to intrusive field activities. • Responsible for creating, embracing, and reinforcing a safe and productive work environment.
Radiation Safety Officer (RSO)	• ABHP certification or National Registry of Radiation Protection Technologists (NRRPT) member. • Minimum 10 years of related field experience (i.e., decontamination and decommissioning support activities performed in accordance with the MARSSIM guidance). • Minimum 2 years working within the Perma-Fix Radiation Protection Program if not ABHP Certified (CHP).	• Implementing and ensuring compliance with RPP's policies and procedures. • Inspect work activities to ensure operations, including off-normal activities, are being conducted according to the facility or project requirements, applicable Federal regulations, and industry accepted ALARA principles. • Reviewing and approving work plans, radiological work permits (RWPs), and RPP procedures. • Trending radiation work performance of project personnel including contamination and radiation exposure control. • Identifying, reviewing, and documenting nonconformance and their causes and corrective actions for incidents associated with radiation protection. • Ensuring an effective ALARA program including conducting on-site radiation safety and health briefings. • Ensuring documentation of any RPP safety violation. • Reviewing survey data. • Conducting briefings concerning radiological work activities. • Ensuring that radiological records are complete, clear, and legible, meet the intended purpose, and are regularly transmitted to document control for archive. • Ensuring Restricted Areas are correctly identified, posted, and marked. • Responsible for creating, embracing, and reinforcing a safe and productive work environment.
Health Physicist	• NRRPT certification and/or Baccalaureate Degree in Applied Science (e.g., Chemistry, Geology, Physics, Environmental Studies). • Minimum 5 years' experience in decommissioning survey design and implementation.	• Support the PCHP and RSO with the design, implementation, and reporting of decontamination and FSSs. • Interface with the client regarding technical and engineering issues relating to the design and implementation of decontamination and FSSs.
Health Physics Technician (HPT)	• Minimum 36 months documented radiation protection experience [American National Standards Institute (ANSI) 3.1 or U.S. Department of Energy (DOE) Radiological Control Technician (RCT)]. • Minimum 2 years working within the SEC Radiation Protection Program.	• Perform daily QC checks of instrumentation used in support of site decontamination and decommissioning activities. • Perform decontamination support surveys; perform FSSs.
Waste Manager	• Radiation Worker II Training. • U.S. Department of Transportation (DOT) 49 CFR 173 Training Certification. • Minimum 5 years related field experience in handling, packaging, transporting, and disposal of radioactive waste.	• Preparing waste forms and other supporting documentation for transport and disposal of wastes. • Inspecting waste containers and verifying contents meet disposal facility waste acceptance criteria (WAC). • Inspecting trucks and trailers prior to transport. • Tracking shipments and containers through final disposition. • Maintaining an up-to-date inventory of containers.

2.0 SITE BACKGROUND AND INITIAL RESPONSE

2.1 Site Detail

The [redacted]ler facility in Beaver Falls, Pennsylvania, is located at the northern end of Westg[redacted]st of Route 1[redacted]cility features several concrete and metal buildings situated on a 40-acre property which supports a large-scale shredding operation. The shredder consists of an infeed steel track conveyor which drops collected materials into a rotary hammer mill which shatters the feedstock into football- to fist-sized objects. The shredder processes approximately 1–2 tons of material per minute. On-demand smart water dust suppression is used to minimize dust generated at the hammer mill. An up-conveyor then transports the material to a magnetic sorting platform to separate ferrous and non-ferrous materials. Here plant workers manually pick unwanted waste materials out of the non-ferrous stream. These product streams are then conveyed to a sorting cyclone, referred to as the "Z-box," using high velocity fans to separate the lightweight residue from heavier metallic objects. Out of the Z-box, the ASR stream passes through a covered eddy current stand, thence to a final "finder," or sensor deck, area. The shredding and sorting process creates two output piles: ferrous metals and ASR, which includes non-ferrous materials.

Aside from the shredder system footprint, on-site structures include the front two-story office housing the customer collection retail operation and storage area. Other structures support various maintenance, storage, and garage functions. There are several concrete open-top storage bins, or bunkers, located throughout the site. **Figure 2** presents a satellite view of the Beaver Falls site and an initial estimate of the limits of the radiologically impacted area.

Figure 2. [redacted]ler Facility (West Parcel) (impacted footprint in magenta rectangle)

2.2 Training

All required training for project personnel shall be performed before personnel are allowed to work on the site. Medical examinations, medical monitoring, and training shall be conducted in accordance with the Health and Safety Plan (see Section 4.0), while other project-specific training will be performed as outlined in the project Training Matrix. The Training Matrix is simply a specialized spreadsheet set up to document and track the status of all required training, certifications, and qualifications for Perma-Fix employees performing work activities described within this DWP. Controlled copies of the Health and Safety Plan and Training Matrix will be kept at the project site. Original

versions of the plans will be maintained at the Perma-Fix Corporate Office in Document Control. Personnel shall also be required to review this DWP and all attachments, including the AHA identifying field activities and associated hazards.

Training requirements for all project personnel are detailed in the Health and Safety Plan (see Section 4.0). Due to the scope of the decontamination activities, personnel engaged in these activities are required to have the following additional training (in addition to the training described in the Health and Safety Plan) as noted below:

- Respiratory Protection (for all personnel wearing respirators).
- Rad Worker (all personnel).
- Aerial Lift (for personnel working from aerial lifts).
- Fall Protection (for personnel working at heights greater than 5 feet).
- Equipment as required (e.g., fork lift, skid steer, loader, back hoe, excavator, etc.).
- Other project-specific plan and AHA training (all personnel).

Personnel will be trained to all work package documents and hold other required training as noted in the Training Matrix. Evidence of training records will be obtained and kept in the project files and reviewed on a periodic basis during the project to ensure all training is kept current and available to XXX personnel upon request.

2.3 Work Control Boundaries

Since the Beaver Falls facility is in a temporary state of operational shutdown and is physically located at the north end of Westgate Drive, no additional work control boundary fencing or postings are anticipated. Entrance gates to the facility remain locked and only authorized personnel have been assigned gate keys.

The SSHO or RSO will monitor the site boundaries to control visitor access. No one (other than trained crew) will be allowed access to the construction area unless they have received proper training, have appropriate safety equipment (hard hat, safety glasses, and footwear), and have signed the applicable RWP and POD for each day's entry. The construction fencing will have postings warning personnel of the jobsite hazards and any contact information in case site access is needed or in case of an emergency. Perma-Fix will ensure that the boundaries are located properly.

2.4 Access Control Measures

The Beaver Falls facility is currently closed to the public and shredder operations are suspended during the radiological response and recovery effort. Access gates to the facility remain locked at all times. Perma-Fix personnel assigned to the Beaver Falls facility have been given gate keys by XXX personnel.

XXX has requested limited public access to allow for receipt of scrap materials. Perma-Fix is working through steps to stabilize conditions on-site such that limited public access can be supported.

2.5 Security and Stabilization Activities

Perma-Fix personnel first arrived at the Beaver Falls facility for an initial conditions site walk-down with XXX on February 26, 2016. Additional Perma-Fix mobilized to the site on March 7, 2016. HPTs immediately set to installing radiological ropes and postings conservatively so as to include all potentially impacted areas of the site. Gamma walkover surveys (GWSs) were performed over haul roads and peripheral land areas and structural contamination surveys were performed in the front office building and other ancillary structures. Measurement results below applicable release criteria (< 2 times background over open land; < Reg Guide 1.86 for Ra-226 surface contamination) allowed the limits of the radiologically controlled area to be reduced to a rectangular area encompassing the shredding and sorting equipment footprint as well as adjacent product stockpiles and concrete loading bins.

Part of the initial recovery and stabilization effort also included the identification, removal, containerization, and securing of high-radioactivity infeed material. Between March 12 and March 16, 2016, a small but highly contaminated (up to ~ 2,000 mrem/hr near contact) amount of material was collected from the ground under the shredder and secured in a locked metal container. This container is currently cable-locked within a posted area in the Power House block building. PADEP will coordinate with the DOE Radiological Assistance Program (RAP) team to package and transport any materials for further investigative inquiry. Any items deemed to be important to the investigation will be retained and coordinated with PADEP.

During March 22-23, 2016, Perma-Fix personnel applied soil stabilization and a dust control agent onto contaminated open land areas around the shredder footprint. Also, the shredder hammer mill opening and box enclosure was covered with a sturdy synthetic liner and tightly secured to prevent rain from entering the machine and potentially spreading internal contamination beyond posted areas.

3.0 WORK SUMMARY

This section describes the work to be performed to complete the decontamination of the areas of elevated radioactive contamination identified in Section 3.1. Activity-specific personal protective equipment (PPE) and details regarding hazard controls are specified in the AHAs (see **Appendix B**), in the Health and Safety Plan (see Section 4.0), and in the RWP located at the Beaver Falls site office.

3.1 Decontamination Phase

The estimated extent of the impacted area surrounding the shredder equipment area is shown in **Figure 3** as a yellow rectangle. Not all structures, equipment, and land area within the impacted area may require decontamination and/or disposal as waste.

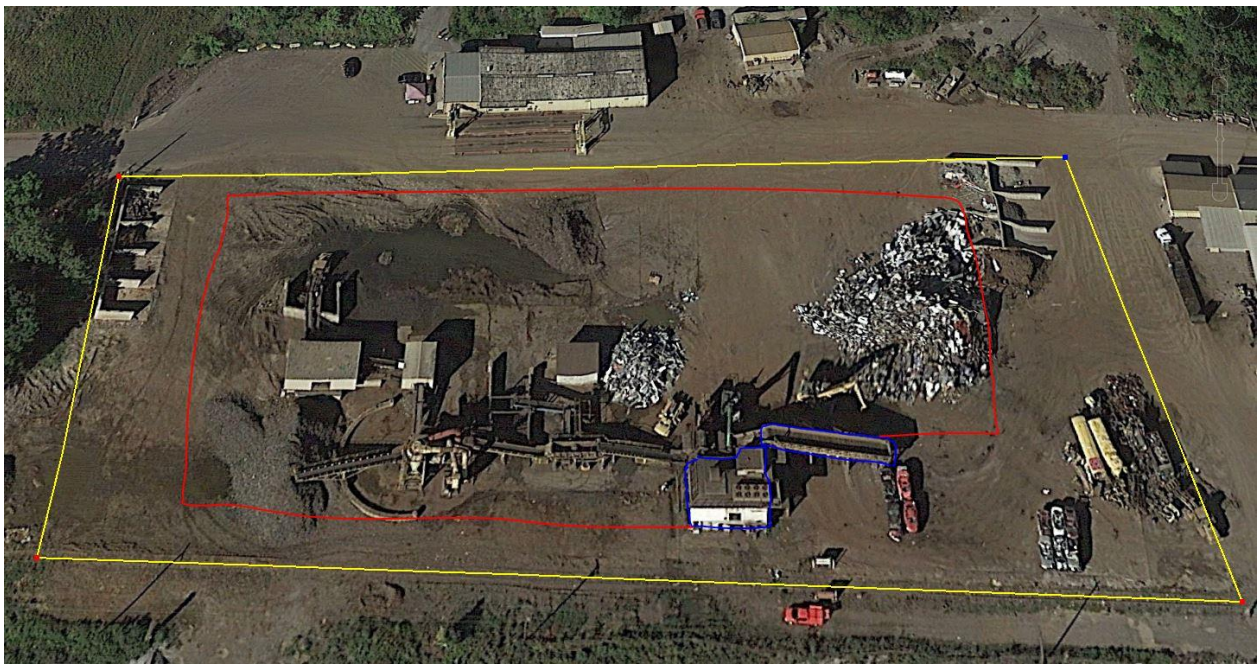


Figure 3. Satellite View of XXX – Beaver Falls Shredder Yard
(Yellow box indicates estimated Class 1 extent; Red indicates Decon Areas;
Blue Outline Components Potentially Clean)

3.1.1 Preparation

Waste Characterization: Additional sampling and characterization of contaminated soil, ASR fluff, and ferrous fragment piles at the Beaver Falls facility is necessary to quantify the radionuclide mixtures in impacted media. Sampling will consist of collection of representative samples of areas to be removed and submittal of these samples to an off-site laboratory for radiological and chemical [Toxicity Characteristic Leaching Procedure (TCLP) – Resource Conservation and Recovery Act (RCRA) metals] analyses. Radiological analyses will include gamma and/or alpha spectrometry. Waste planning and management as well as personnel protective strategies will be based on the results of the sampling. All direct-reading instrumentation and on-site analyses will be performed as directed in the Health and Safety Plan (see Section 4.0).

The Perma-Fix PM or designee will communicate daily with XXX personnel to plan the work so that personnel have access to areas needed, including those that have not yet been characterized for the FSS. Any personnel performing removal of rad-contaminated waste will work in proper PPE and respiratory protection under the RWP, the direction of the HPT, and the approved RPP (see **Appendix C**). Donning and doffing will take place in the designated access control point (ACP). Perma-Fix HPTs will establish and police the ACP to ensure that the required

PPE items are present and that ACP instrumentation and paperwork are on hand and in place. After doffing PPE items, trained personnel exiting radiologically controlled areas (e.g., Contamination Areas) must perform a whole-body personal survey, or "frisk," using the ACP instrument. Proper personal frisking technique is covered during Rad Worker training required for all employees performing radiological work in Controlled Areas.

3.1.2 Shredder Equipment

Initial surveys indicate that the highest levels of radioactive contamination currently reside within the shredder machinery between the hammer mill output down grates and the up-conveyor to the magnetic stand. Dose rate levels as high as 500 mrem/hr have been measured near this area. Through pre-job briefings, all HPTs and workers will understand their individual roles and responsibilities prior to commencing source removal and decontamination activities. Residual product ("hold-up") in other parts of the shredder, such as the eddy current sorting stand, Z-box components, and downstream conveyor belts, will require removal prior to scoping surveys and decontamination.

Next, shredder component surfaces (including ancillary downstream components) will be surveyed for total and removable surface contamination in order to determine the scope of the decontamination effort.

The first decontamination step of equipment surfaces will involve non-intrusive methods. Removal of residual "sticky" shredder residue will be accomplished using a combination of high efficiency particulate air (HEPA) vacuuming, wet wipe-downs using Simple Green cleaner or equivalent, pressure washing, or steam cleaning. If surface activity levels remain above release criteria after non-intrusive decontamination methods, more aggressive surface decontamination methods may be selected.

Intrusive surface decontamination of equipment surfaces may involve the use of sanding, grinding, or blasting tools in order to remove a thin surface layer of equipment metal. These "destructive" techniques require increasing levels of PPE and become more time intensive to the point that removal and disposal of shredder component as waste becomes a more probable outcome.

After interference removal, background levels will drop significantly, thereby improving the scanning minimum detectable concentrations (MDCs) of the survey instrumentation.

3.1.3 Process Pile Investigation

Potentially impacted piles of sorted ASR and ferrous output near the shredder will undergo radiological gamma scanning, sorting, and segregation. This process will be performed in a balanced manner commensurate with the benefit of minimizing waste volume while keeping doses to Perma-Fix personnel ALARA. In other words, piles with the highest dose rates should undergo a lesser amount of scanning and sorting time in order to maintain doses ALARA.

ASR Pile materials exceeding the 0.7 pCi/g above background release limit will be shipped as waste to an off-site disposal facility prior to characterization surveys.

3.1.4 Open Land Cleanup

Initial scoping GWSs at the Beaver Falls site indicate that areas of certain sections of unpaved land area surrounding the shredder operational footprint may require some removal of contaminated ASR fluff and some surface soil. Impacted soil areas undergo GWSs using 2-inch x 2-inch (and/or 3-inch x 3-inch) sodium iodide (NaI) scintillation detectors coupled to global positioning system (GPS) units to correlate positional data with radiological measurements. HPTs perform GWS by walking forward while moving the detector side-to-side at a rate of 0.5 m/sec and maintaining a distance of about 3 to 4 inches between the detector and the ground surface. Land areas where GWS measurements exceed twice the local background level will be demarcated for more intensive investigation and sampling. Surface soil found to exceed the volumetric criterion (0.7 pCi/g above background) will be segregated for off-site disposal as waste.

3.1.5 Contaminated Concrete/Asphalt Removal

Initial surveys at the Beaver Falls site indicate fixed and removable contamination over several sections of the concrete support slab for the shredder equipment footprint. There is also the potential for loose and/or fixed contamination to be found on exterior concrete block walls of the Power House/Control Room Building closest to the hammer mill and belly grates. First, Perma-Fix will attempt to decontaminate identified areas of elevated concrete wall activity on the Power House using HEPA vacuuming and wet wiping. Post-decon surveys will be performed to assess the effectiveness of the initial decontamination. If results indicate that more aggressive intrusive decontamination is required, the methodology for concrete removal will depend on the depth to which the concrete is

contaminated. For shallow depths (less than 1 inch), Perma-Fix may utilize scarification, scabbling, chipping, and/or roto-peen scalers to remove the affected concrete. Surface contamination on exposed concrete building blocks is not expected to be deeper than ⅛ inch. These equipment types and their intended uses follow in the succeeding paragraphs.

Scarification equipment used will be equipped with a shroud and port onto which a HEPA-filtered vacuum will be attached to capture and collect any fugitive dust. In cases where shrouds cannot be installed, localized negative ventilation will be provided at the point at which cutting, scabbling, or chipping is being performed. The ventilation will be provided via the use of a HEPA-filtered vacuum. The suction end of the hose will be held directly at the point at which the operation is being performed to capture any dust, debris, and/or contamination that is generated. The majority of equipment used to remove contaminated concrete (including the scabblers, scarifiers, and grinding wheels) generally feature shrouds. The use of chipping hammers is not anticipated. Finally, the Perma-Fix RSO will evaluate any operations where decontamination is being performed without shrouded equipment and determine the need to set up local containment around the area using poly sheeting or pre-fabricated tents featuring negative air inside. These engineering controls will be used as needed and as determined by the RSO to provide additional control of contamination.

Additionally, work area air sampling and personnel lapel air sampling will be performed when decontamination work is performed. The results of the initial surveys used to identify the areas to be decontaminated do not have activity concentrations high enough to warrant respiratory protection. Decontamination and re-survey will be conducted in an iterative process and will continue until release criteria are met or until otherwise directed by XXX.

The use of scarifiers, scabblers, and/or roto-peen scalers (see photographs on the following page) is described below:

- Prior to initiating decontamination, the HPT will clearly mark the boundaries of the area to be decontaminated. These boundary demarcations will be verified by XXX.
- The decontamination technician(s) and HPTs will verify with the PM that there are no utilities or other obstructions present in the area of concrete to be removed.
- The decontamination technician(s) will inspect the equipment (scarifier, scabbler, or roto-peen scaler) and will inspect the HEPA filter and vacuum hoses. If any defects are noted, he must stop work and notify his supervisor immediately.
- The Perma-Fix decontamination technician(s) will attach the vacuum hose to the shroud of the equipment and will ensure that a good, tight seal is achieved.
- The decontamination technician(s) will prepare the HEPA vacuum in accordance with manufacturer's instructions and will position the vacuum so that the exhaust is pointed away from the work area and any potential hazards.
- The decontamination technician(s) will don appropriate hearing protection and face protection as specified in the AHA and/or RWP.
- The decontamination technician(s) will turn on the HEPA vacuum and ensure that sufficient negative pressure is achieved at the vacuum hose end or within the shroud of the equipment.
- Being careful to stay within the boundaries of the contaminated area (already demarcated), the decontamination technician will begin scabbling the concrete to remove the top ¼ inch of material. The technician will operate the equipment in strict accordance with manufacturer's instruction manual(s). While scabbling the concrete, the vacuum operator should place the vacuum nozzle in the vicinity of the scabbling to capture the dust and small debris generated. The vacuum operator must maintain a safe distance from the scabbler tip while the tool is operating. An extension to the vacuum hose should be used so the operator can remain a safe distance from the nozzle.
- Once the contaminated concrete material has been removed, turn the scabbler off and place it aside. The vacuum operator should meticulously vacuum the area to remove the fine debris and dust.
- Once cleaning is complete, the HPT will survey the area to determine if additional scarification is needed. If contamination has not been fully removed, consult the supervisor before repeating the scabbling procedure listed above.

3.2 Other Survey and Decontamination

During decontamination and clearance activities, additional radiological surveys will be performed in the following areas:

- Routine contamination control surveys performed on a daily, weekly, or monthly basis depending on the area/item surveyed. Routine survey areas typically include access control points, haul roads, personnel office and break rooms, bathrooms, ancillary buildings, etc.

If contamination is found during performance of these surveys, Perma-Fix will perform decontamination of the areas, at the direction of XXX, using the techniques described in Section 3.1 of this plan. Decontamination and re-survey will be conducted in an iterative process and will continue until release criteria are met or until otherwise directed by XXX.

3.3 Post-Decontamination Clearance of Beaver Falls Facility

The remediation and clearance process will be divided into phases due to the many unknowns regarding the extent of site impact. The initial phase will be for site characterization and 'hot spot' segregation/identification.

3.3.1 Phase 1 – Decontamination Support Surveys

After decontamination of shredder equipment surfaces, surface contamination surveys will be performed to confirm the effectiveness of the decontamination and that the impacted machinery and equipment is ready for FSS. These survey results collected upon decontaminated shredder equipment surfaces will be used to determine the number of direct measurements required within the Class 1 equipment survey units (SUs) (expected to be between 11 and 20 measurements within each 100 m^2 Class 1 equipment SUs, and similar number within each Class 2 equipment SU, which may be up to 1,000 m^2 in area).

Following a successful shredder decontamination and removal of contaminated ASR fluff and surface soil surrounding the shredder equipment footprint, GWS will be performed to confirm the impacted footprint area is ready for FSS GWS. A series of systematic samples at least eight in number shall be collected over the remediated land area in order to determine an appropriate number of FSS soil samples in the Class 1 Land SU(s) surrounding the shredder footprint.

3.3.2 Phase 2 – Final Status Survey

Open Land

Prior to performing FSS over open land in the impacted area, a background reference area (BRA) will be identified within a non-impacted section of the facility. Selection of the BRA within the facility boundaries is desirable since there is little to no native soil remaining. The former land use of the property was a strip mining operation which removed much of the native soil and backfilled excavations with clean structural fill. MARSSIM recommends that the soil type in the BRA be similar to that within the impacted area undergoing FSS. It is estimated that the Beaver Falls BRA will be approximately 2,000 m^2 in area and include a GWS and a minimum of 15 systematically collected samples based on a random-start triangular grid pattern.

Within the ~13,400 square meter (m^2) rectangle including the shredder process footprint and surrounding yard, a new GWS will be performed for FSS. GWS instrumentation may include NaI gamma scintillation detectors (e.g., 2-inch x 2-inch or 3-inch x 3-inch) and/or FIDLERs ("Field Instruments for the Detection of Low Energy Radiation") coupled to Trimble GPS units which correlate positional coordinates to gross gamma measurements at the rate of 1 measurement per second. One hundred percent coverage of all accessible and exposed land area within the impacted area should undergo GWS. Outside the impacted area, a minimum of 10% coverage of accessible land areas within

the property will be performed. Assuming no "shine" interference from nearby contaminated stockpiles and a natural background level of 1 pCi/g Ra-226 in soil, GWS measurements exceeding two times the local background level will be demarcated for further investigation, including surface soil sampling. This should be a conservative gross gamma measurement action level correlating to the 0.7 pCi/g above background soil cleanup level.

Instrumentation used for FSS of Open Land areas will have sensitivity(ies) sufficient to detect radium concentrations in soil or soil-like material at a level less than the selected soil release criteria.

Structures

Prior to structural FSS, building surfaces such as floors and walls must be clean, dry, and free of loose debris. Instrumentation used for FSS of structural surfaces (e.g., buildings) will have sensitivity(ies) sufficient to detect alpha activity at a level less than the total surface activity limit of 1,120 disintegrations per minute (dpm)/100 square centimeters (cm^2) for both scanning surveys and static measurements. Initial screening of structural floors for FSS suitability should be performed with 3-inch x 3-inch NaI detectors, such as a Ludlum 44-20, prior to scanning with gas-proportional detectors.

Floor scanning instrumentation, such as the large area gas-proportional Ludlum 43-37 scintillation detector, will be set to detect radiation in alpha+beta mode. Prior to starting a characterization floor survey, the HPT will determine background (alpha only and alpha+beta) level measurements upon an uncontaminated sample of concrete floor or other representative material within a non-impacted area of the Beaver Falls facility. This value will be subtracted from the gross activity measurements encountered during the scanning survey. Using the background level and using the calculated instrument efficiency, the HPT will determine an action level [the instrument reading in gross counts per minute (cpm)] which correlates to the 1,120 dpm/100 cm^2 surface contamination limit. If during the scan the combined instrument reading exceeds the total alpha limit, the detector will be switched to alpha only mode in order to quantify the alpha contribution for comparison to the 1,120 dpm/100 cm^2 limit.

The HPT will move the floor monitor systematically across the floor surface at a speed between 1 and 2 inches per second. He will ensure the probe set screws maintain a close, even distance (nominally ¼ inch, but not to exceed ½ inch) to the floor surface. A scanning survey of any tight, or cramped, floor areas the floor monitor cannot reach will be performed using a handheld Ludlum 43-93 alpha-beta scintillation detector. Move the handheld survey probe systematically across any floor areas the large area detector cannot access at a speed between 1 and 2 inches per second while holding the probe as close (nominally ¼ inch, but not to exceed ½ inch) to the surface as conditions allow. The scanning surveys will cover the percentage of the accessible surface areas within the area of interest as indicated in **Table 3**.

During the floor scan, the HPT should pause at certain high potential surface features such as floor seams, cracks, or penetrations, and at floor/wall interfaces. These features have the potential for accumulating residual radioactivity and may be suitable candidates for static biased measurements.

Walls in impacted areas below 2 meters (m) in height will be scanned by moving the handheld survey probe (Ludlum 43-93) systematically across the wall surface at a speed between 1 and 2 inches per second while holding the probe as close (nominally ¼ inch, but not to exceed ½ inch) to the surface as conditions allow. The scanning surveys will cover the percentage of the accessible surface areas within the area of interest as indicated in **Table 3**.

For the purposes of bounding the survey area in which the scanning measurements will be collected, structural surfaces designated as Class 1 will be limited to a maximum size of 100 m^2. Class 2 structural surface SUs will be limited to a maximum size of 1,000 m^2. Class 3 structural surface SUs will be limited to a maximum size of 10,000 m^2.

Upon completion of floor and wall scanning within a given structural SU, a series of static direct measurements will be performed commensurate with the potential for residual radioactivity as given in **Table 3**. The direct measurements will be collected using the 100 cm^2 Ludlum 43-93 handheld probe for a period of one minute.

For the purposes of bounding the survey area in which the direct measurements will be collected, structural surfaces designated as Class 1 will be limited to a maximum size of 100 m^2. Class 2 structural surface SUs will be limited to a maximum size of 1,000 m^2. Class 3 structural surface SUs will be limited to a maximum size of 10,000 m^2.

Once structural and engineering design drawings (electronic .dwg format, preferably) for the impacted XXX facilities are received from XXX and have been evaluated to determine surface areas, more detailed SU Layout Drawings will be prepared to support the FSS design process. Alternatively, Perma-Fix field technicians may measure and collect structural dimension information needed to design FSS SUs.

Table 3. Structural Units (Initial FSS Classification, Scanning, and Measurement Requirements)

Building / Room	Surface	Preliminary Classification	Scan Coverage	Direct Measurements
Power House / All	Decontaminated Surfaces	Class 1 (random start systematic measurement grid)	100%	≥ 15
Power House / All (multiple SUs)	Remainder (not requiring decontamination)	Class 2 (random start systematic measurement grid)	≥10%	≥ 15
Compressor Building (block)	Decontaminated Surfaces	Class 1	100%	≥ 15
Compressor Building	Remainder (not requiring decontamination)	Class 2	≥10%	≥ 15
Picker Hut	Decontaminated Surfaces	Class 1	100%	≥ 15
Picker Hut	Remainder (not requiring decontamination)	Class 2	≥10%	≥ 15
Eddy and Finder Sheds	Decontaminated Surfaces	Class 1	100%	≥ 15
Eddy and Finder Sheds	Remainder (not requiring decontamination)	Class 2	≥10%	≥ 15
Concrete Bunker Bins	Decontaminated Surfaces	Class 1	100%	≥ 15
Concrete Bunker Bins	Remainder (not requiring decontamination)	Class 2	≥10%	≥ 15
All (Scales, Front Office, Maintenance, Storage Garages) / All	Outside Shredder Impacted Area Footprint	Non-impacted	N/A	N/A

Upon completion of scanning and collection of direct measurements within a given structural survey area, swipe samples will be collected in order to assess removable activity levels. After each static measurement, within the same area as the static measurement, cloth smears will be swiped with moderate pressure over an area of 100 cm^2 (a 4-inch by 4-inch square) in an S-shaped pattern in order to assess removable activity.

Machinery and Equipment

Prior to survey scanning, residual feedstock material must be removed from the interior compartments of sorting equipment to the extent practicable. Also, equipment surfaces must be dry and cleaned of all extraneous dirt, dust, grease, oil, and debris to the extent practicable prior to scanning. Instrumentation used for FSS of equipment surfaces (e.g., shredder components) will have sensitivity(ies) sufficient to detect alpha activity at a level less than the total surface activity limit of 1,120 dpm/100 cm^2 for both scanning surveys and static measurements.

Machinery and equipment scanning instrumentation, such as the Ludlum 43-93, will be set to collect measurements in both alpha and alpha+beta mode. Prior to equipment scanning, the HPT will determine a background (alpha and alpha+beta) level measurement upon an uncontaminated sample of steel-framed machinery or equipment within the non-impacted area of the Beaver Falls facility. This value will be subtracted from the gross activity measurements encountered during the scanning survey. Using the background level and using the calculated instrument efficiency, the HPT will determine an action level (the instrument reading in gross cpm) which correlates to the 1,120 dpm/100 cm^2 surface contamination limit.

The HPT will move the handheld survey probe systematically across equipment surfaces at a speed between 1 and 2 inches per second while holding the probe as close (nominally ¼ inch, but not to exceed ½ inch) to the surface as conditions allow. The scanning surveys will cover the percentage of the accessible equipment surface areas within the area of interest as indicated in **Table 4**.

During the equipment scan, the HPT should pause at certain high potential surface features such as lower horizontal ledges, grease/lube joints, exhaust ports, conveyor belt surfaces (if not disposed of as waste), diversion frame rails, etc. These features have the potential for accumulating residual radioactivity and may be suitable candidates for static biased measurements.

Table 4. Shredder Equipment (Initial FSS Classification, Scanning, and Measurement Requirements)

Equipment Item	Surface	Preliminary Classification	Scan Coverage	Direct Measurements
Infeed Conveyor	Interior	Class 1	100%	≥ 15
Infeed Conveyor	Exterior	Class 2	≥10%	≥ 15
Downhill In-Chute	Interior	Class 1	100%	≥ 15
Downhill In-Chute	Exterior	Class 2	≥10%	≥ 15
Shredder Mill (multiple SUs)	Interior (magnesium liners disposal likely)	Class 1	100%	≥ 15
Shredder Mill (multiple SUs)	Exterior	Class 2	≥10%	≥ 15
Shredder Underbelly Table	All	Class 1	100%	≥ 15
Magnet Stand Infeed Conveyor	All (belt disposal likely)	Class 1	100%	≥ 15
Magnet Vibrators	Contact Surfaces	Class 1	100%	≥ 15
Stearns Magnets	All (conveyors, equipment)	Class 1	100%	≥ 15
Non-ferrous Conveyor	All (belt disposal likely)	Class 1	100%	≥ 15
Z-Box Infeed Conveyor	All (belt disposal likely)	Class 1	100%	≥ 15
Z-box (multiple SUs)	Interior	TBD	TBD	≥ 15
Z-box (multiple SUs)	Exterior	TBD	TBD	≥ 15
Ferrous Conveyor Lines	All (belt disposal likely)	TBD	TBD	≥ 15
ASR Conveyors	All (belt disposal likely)	TBD	TBD	≥ 15
Radial Stacking Conveyor	All (belt disposal likely)	TBD	TBD	≥ 15

For the purposes of bounding the survey area in which the scanning measurements will be collected, equipment and machinery surfaces designated as Class 1 will be limited to a maximum size of 100 m^2. "Class 2" equipment and machinery surface SUs will be limited to a maximum size of 1,000 m^2. "Class 3" equipment and machinery surface SUs will be limited to a maximum size of 10,000 m^2.

Upon completion of equipment surface scanning within a given SU, a series of static direct measurements will be performed commensurate with the potential for residual radioactivity as given in **Table 4**. The direct measurements will be collected using the 100 cm^2 Ludlum 43-93 handheld probe for a period of one minute.

For the purposes of bounding the survey area in which the direct measurements will be collected, equipment and machinery surfaces designated as Class 1 will be limited to a maximum size of 100 m^2. Equipment and machinery surfaces designated as Class 2 SUs will be limited to a maximum size of 1,000 m^2. Class 3 equipment and machinery surface SUs will be limited to a maximum size of 10,000 m^2.

Once structural and engineering design drawings (electronic .dwg format, preferably) for the impacted XXX facilities are received from XXX and have been evaluated to determine surface areas, more detailed SU Layout Drawings for the various equipment and machinery types will be prepared to support the FSS design process.

Upon completion of scanning and collection of direct measurements within a given machinery and equipment survey area, swipe samples will be collected in order to assess removable activity levels. After each static measurement, within the same area as the static measurement, cloth smears will be swiped with moderate pressure over an area of 100 cm^2 (a 4-inch by 4-inch square) in an S-shaped pattern in order to assess removable activity.

4.0 HEALTH AND SAFETY PLAN

4.1 Environmental Health and Safety Policy

Perma-Fix is dedicated to the health and safety of project workers, the community, and the protection of the environment during work conducted at all XXX facilities. Perma-Fix will take all responsible precautions in the work performed during the decontamination and survey project to protect the health and safety of employees and the public, to minimize danger from hazards to life and property.

NOTE: Perma-Fix employees are expected to accept personal responsibility and concern for the protection of the environment, the health and safety of themselves, fellow workers, subcontractors, and visitors through compliance with company programs and policies, training programs, and abiding by established rules and procedures.

In order to ensure continued commitment to environmental safety and health (ES&H) policies, Perma-Fix has established subcontractor ES&H goals, objectives, and performance indicators. Perma-Fix maintains, as its primary goal: zero injuries, zero environmental impacts, and zero defects through the course of the project.

4.1.1 Safety and Health Goals and Objectives

Perma-Fix is dedicated to the concept that all accidents are preventable. Accordingly, Perma-Fix is committed to achieving and sustaining "Zero Accident Performance" through continuous improvement practices. Zero Accident Performance includes zero non-permitted discharges or releases with respect to protection of the environment. Perma-Fix views the success of the Zero Accident Performance Policy as being based upon three very fundamental goals. First, management supports the zero accident policy from the Chief Executive Officer (CEO)/President down through the Corporate and project management staff. This daily demonstration of commitment to Zero Accidents is essential to inculcate this philosophy to all levels of the company and its projects. Second, our employees are encouraged and directly involved in all elements of the work process. It has been proven that worker involvement is the most important element to ensure safe practices. Third, management, supervisors, and workers must be trained on case management regarding response, worker down time management, medical treatment options, and reporting requirements. This promotes responsiveness and compliance with applicable rules and regulations.

4.1.2 Integrated Safety Management System

ISMS objectives are in continual use for the planning and execution of all Perma-Fix project plans. Perma-Fix establishes and maintains a systematic approach to incorporate ES&H requirements effectively into all work performed. Protection of the public, the workers, and the environment shall be integrated into the project. For the purpose of ISMS, the term "Safety" encompasses environmental protection, safety and health, and includes pollution prevention, waste minimization, and resource conservation. Safety management activities shall include the five core functions:

- Define the Summary of Work.
- Analyze the Hazards.
- Develop and Implement Controls.
- Perform Work Within the Controls.
- Provide Feedback and Continuous Improvement.

These five, core safety-management functions are applied as a continuous cycle with a degree of rigor appropriate to the work activity and hazard involved. The order of priority for hazard controls is:

1) Engineering Controls.
2) Administrative Controls.
3) PPE.

Controls shall be tailored to the work's complexity and associated hazards as defined in the work plan(s)/AHA.

Perma-Fix is firmly committed to the ISMS concept to enhance worker safety. We have adopted this concept and embraced the process by incorporating it into all projects. The following steps are part of the Perma-Fix incorporation process:

- Require safety and ISMS training at all management and project execution levels, including solicitation of lessons learned from workers' past experience.
- Promulgation of safety policies, programs, procedures, and acknowledgement from workers of their acceptance.
- Requiring subcontractor commitment to ZERO ACCIDENT PERFORMANCE and to the core functions of ISMS from the contractual, training, and practical standpoints.
- Initial review for identification of potential environmental hazards and development/implementation of controls.
- Subcontractors and craft workers' integration into the Perma-Fix safety culture.
- Reiteration, reinforcement, and feedback through daily safety meetings.
- Active solicitation of worker input to address safety concerns or suggestions for improvement.
- Safety policies, programs, and procedures enforcement.

4.1.3 Safety Inspection Program

Perma-Fix utilizes a safety inspection process to ensure that a systematic approach is used to review each safety and health component and project activity. In addition, instructions are provided to site employees regarding employee

rights, protection, and employer obligations regarding nondiscrimination, filing complaints, availability of standards, and inspector accompaniment rights as it pertains to safety and health standards and enforcement. The safety inspection is performed by the SSHO or designated person at a frequency based on the hazards of the project, which is provided by the PM. After the inspection(s) are conducted, the results are documented and provided to the PM and maintained in the project files. Any identified issues are discussed with the crew during the following day's POD meeting.

4.2 Project Hazard Analysis Program

General and site-specific hazards that have been identified for the project are included in **Table 5**. Additional hazards that are identified during the project will be addressed and mitigations determined. Personnel will be trained in the daily PODs or as the hazards are identified on mitigation and hazard awareness.

Table 5. Potential Hazards at XXX, Inc.

General Hazards and Mitigations	
Temperature Extremes (Cold Stress and Heat Stress)	The Perma-Fix SSHO shall determine by performing environmental and/or physiological monitoring when workers need rest breaks to prevent heat stress or need warm-up exercises to prevent cold stress. Personnel shall be trained on the hazards associated with working in temperature extremes and on the identification of temperature induced stress signs and symptoms. Worker physiological indicators that point to potential cold or heat stress shall be observed. A work-rest schedule shall be implemented when required by environmental conditions, and workers shall be provided with climate-controlled break areas and plenty of drinking water.
Work in Potential Mercury Contaminated Areas	Before concrete scabbling or coring activities, Perma-Fix shall clearly monitor areas that may contain mercury, as indicated by historical analyses and other hazards. Perma-Fix shall ensure that workers are fully trained to the hazards present and the proper mitigation of those hazards and don the appropriate PPE.
Slips, Trips, and Falls	The risk of fall-type accidents will be encountered throughout the project site. To mitigate these risks, Perma-Fix will ensure all people are properly trained and will implement a rigorous program of marking potential fall hazard areas as well as fall avoidance training and reminders during the daily tailgate meetings.
Elevated Work	All elevated work shall be in accordance with the approved fall protection training and applicable AHA. Each employee performing elevated work shall wear the required fall protection equipment. The work area shall be posted and roped off to prevent unauthorized personnel entry.
Electrical/Work in Low Light Conditions	During work in low light conditions, task lighting will be used to illuminate the work areas until enough daylight is present to allow for safe working conditions. Any temporary lighting units will be on a dedicated separate circuit and will be hard wired by a qualified electrician. Task/activity lighting will be tied into a ground fault circuit interrupter (GFCI) protected regular circuit.
Work near energized utilities and lines	All work performed in utility isolation zones will be performed under the direct supervision of a subject matter expert and/or the SSHO. Perma-Fix will utilize additional spotters and will perform extensive pre-demolition training of the work crew so that they know the exact location of the lines and the methods of demolition to ensure the lines are not disturbed.
Fire	In the event that a fire is discovered, contact XXX representative or Fire Department and inform them of location of the fire. The fire watch will remain at the site until the Fire Department arrives. If the fire watch determines that they can contain or control the fire safely by use of a fire extinguisher, they may do so.
Radiological Abatement Activities	Prior to performing radiological abatement activities, all employees entering a radiological area shall be briefed on the RWP which will specify appropriate controls. All radiological abatement activities will be performed in accordance with AHA-02, Radiological Abatement. All workers who perform work within a Radiological Area shall have current Radiation Worker II training certificates, or equivalent.
Operation of Chipping Hammers, Scarifiers, and Scabblers	All mechanical concrete decontamination activities will be performed in compliance with AHA-02, Radiological Abatement.
Working Around or Near the Trench	Prior to beginning any activities, the area around the trench will be roped off and the floor will be marked with caution tape. Any work on the suspended concrete floor area shall not exceed the load limitation.

4.2.1 Hazard Analysis/AHA

Perma-Fix will develop a general AHA to support mobilization activities. Touring the facility and obtaining information regarding initial site conditions and activities will be considered. XXX personnel will lead the Perma-Fix team on the tour. During the tour, the specific work tasks and their associated hazards will be identified to

ensure that adequate controls are implemented. The SSHO will brief the site personnel accordingly during the pre-job and daily safety meetings. These job tasks and controls will be incorporated into Perma-Fix's existing AHA to address project-specific challenges and incorporate continuous worker feedback. Once the SSHO determines the job-specific controls needed to mitigate work activity hazards, the Lead HPT will review the controls to determine if they can be implemented in the field. Once an existing AHA has been revised to ensure that controls are adequate for the hazards and appropriate to be implemented in the field, Perma-Fix will submit the AHA to XXX for review and approval. Once approved, the AHA will be presented to the workers who will train to and sign the document, indicating their willingness and commitment to comply with the AHA and their understanding of the AHA objectives.

The AHA anticipated for the Decontamination project include:

- Mobilization/General Activities,
- Radiological Decontamination and Abatement,
- Concrete Decontamination, and
- Waste Loading/Transport.

AHAs will be prepared as necessary to address other hazards identified as the work activities progress. In addition to these deliverables, the training records, health and safety records, medical information, and any equipment testing results will be provided for XXX to review for verification of completeness when requested.

Employee feedback throughout this process is integral to the work plan/AHA process and the ISMS. The DWP and AHA shall be designed based on considerations given to the following criteria:

- Define the job to be conducted as individual tasks to be performed.
- Identify each work step in the process to be performed.
- Identify and define the specific hazards associated with each task (i.e., hazardous chemicals slips/trips/falls, burns, etc.) performed in that work phase.
- Identify and define the necessary action(s) to ensure risk minimization and safe task performance (i.e., written procedure, training, ventilation, PPE, etc.).
- Work plan/AHA shall include, where applicable:
  - Permit requirements,
  - Training requirements,
  - Emergency assembly points,
  - Alarming dosimeter (chirper),
  - Emergency contacts,
  - Engineering controls with referral to RWP where applicable,
  - Emergency telephone numbers,
  - Administrative controls with referral to RWP where applicable, and
  - PPE requirements for any and all conditions.
- The work plan/AHA shall be revised when work activities, work practices, or site conditions change to the extent that different or additional hazards may be present.

The work plan/AHA shall be developed and reviewed with the employees who will be performing the defined task. The work plan/AHA shall be readily available on-site for personnel review. All modifications shall be developed as the project progresses to ensure all hazards are appropriately addressed.

The work plan/AHA and all revisions shall be signed by the SSHO and PM and all applicable workers and subcontractor personnel prior to commencing the work activity, certifying that the work plan/AHA has been reviewed and approved.

4.3 Medical Surveillance

4.3.1 Baseline and Annual Health Assessment

A baseline physical examination may be provided for personnel working on the project site as required by their work assignment and applicable standards/regulations. The extent of the physical examination will be determined by the performing or consulting physician based on the task to be performed and the established standards requirements (i.e., 29 CFR 1910.120).

4.3.2 Post-Employment Examination

Upon employment termination or post project activities, site personnel who have been on-site for six months or greater will be requested to undergo an examination equivalent to the baseline health assessment. Dependent upon the specific work the employee performed on-site, each employee receiving the examination will have the opportunity to undergo a post-employment physical.

4.3.3 Supplemental Examination

If, during the course of the project, there is an identified risk for any worker to be potentially overexposed to contaminants identified in any of the structures, personnel may undergo a supplemental examination, if deemed appropriate by the examining or consulting physician.

4.3.4 On-site and Site-Specific Record Keeping

The SSHO shall maintain a record of Perma-Fix on-site personnel who are under medical surveillance. For each employee these records shall include, at a minimum, the following:

- The employee's name and social security number (last four digits only).
- A physician's written statement releasing the employee to perform work on a hazardous waste site without restrictions, or
- A physician's written statement recommending limitations for an employee to perform activities on a hazardous waste site.
- Other required task-specific (e.g., radiation and/or asbestos worker) training records as needed.

Personal medical and exposures shall be available only with written permission from the employee. Records will be kept in accordance to the Occupational Safety and Health Administration (OSHA) Log 300 policies and procedures.

The safety records/reports and training/qualification certifications, work plans, visitor's logs, daily pre-job briefings, permits etc., if applicable, will be kept on-site at all times.

4.4 Training Requirements

All project personnel that will be working full time on the site shall receive training and be thoroughly familiar with programs and procedures contained in this DWP, other project plans, and other written programs or job description. Employees shall receive a full site orientation and briefing before commencing work. Any additional training required shall be verified before work commences or be provided before beginning any tasks requiring the training. In addition to reading and understanding the required plans, the following subsection provides an overview of other training that may be required for site personnel. Only appropriately trained and qualified personnel shall be used to perform work on this project.

4.4.1 First Aid/Cardiopulmonary Resuscitation Training

At least one individual at each worksite shall have and maintain current certification from the American Red Cross or equivalent in basic first aid and cardiopulmonary resuscitation (CPR). These training records shall be maintained on-site.

4.4.2 Personal Protective Equipment Training

All personnel will have received training in PPE use, inspection, and maintenance as required by 29 CFR 1926, Subpart E. The PPE training shall have addressed at a minimum the following:

- Allowing the user to become familiar with the equipment in a non-hazardous situation.
- Making the user aware of the equipment's limitations and capabilities.
- Increasing the efficiency of operations performed by workers wearing PPE.
- Reducing PPE maintenance expense.

Before site activities commence, Perma-Fix shall compile copies of project employees' training certificates to be maintained in the project training files, if necessary.

4.5 Restricted Work Area/Site Control

The purpose of restricted work areas and site control for XXX facilities is to control site access and to minimize or prevent the migration of site-specific contamination from affecting the environment. Emergency

communications will be performed using cellular phones. Emergency numbers will be posted on-site and readily available to all personnel.

Site control shall be maintained by erecting physical barriers such as construction tape, stanchions, and signs. Fire extinguishers shall be present at all times on the site per OSHA 1926. Site control will be maintained at all times and with all activities. The project activities will take place in the general order listed below:

- Mobilization to the site and establishment of waste characterization, hazardous work area boundaries, and controls.
- Surveys and decontamination.
- Waste transportation and disposal.
- Performance of FSSs.
- Demobilization.

4.5.1 Pedestrian Control

Personnel accountability will be performed using the project's visitors log and sign in sheet from the daily safety meeting. In the event of any site emergency, the sign in sheets will act as the first line of personnel notification and accountability.

4.6 Personal Protective Equipment

This section defines the project guidelines for PPE applications during work activities to protect Perma-Fix and subcontractor workers from the physical and health hazards that may be present. All planned activities on the project shall be assessed for any prolonged, direct contact with physical and health hazards that project employees could come into contact with. Based on this assessment, the Perma-Fix PM, RSO, and SSHO shall evaluate the need to add or reduce PPE requirements. PPE guidelines, which may be applicable for forecasted major activities, have been formulated and provided in this section. In situations where PPE is required by an AHA or work plan, the specified requirements shall be followed. If a situation arises where the requirements of an AHA and work plan conflict, stop and notify supervision for resolution. The following sections define the levels and required PPE for each task.

4.6.1 Protective Ensemble

All personnel shall wear PPE appropriate for the task and the anticipated known contaminants contact when engineering or administrative controls cannot eliminate potential exposure. The subsections below outline the different OSHA protection levels that may be used.

4.6.1.1 Level A

Level A is used when the greatest respiratory, skin, and eye protection level is required:

- Positive pressure, full face piece, self-contained breathing apparatus (SCBA), or
- Positive pressure supplied air respirator with escape SCBA, approved by the National Institute for Occupational Safety and Health (NIOSH).
- Totally-encapsulating chemical protective suit.
- Inner chemical resistant gloves.
- Outer chemical resistant gloves.
- Chemical resistant boots – steel toe and shank.
- Hard hat.
- Optional as applicable to the job are:
  - Boots,
  - Leather gloves,
  - Coveralls,
  - Long underwear, and
  - Disposal protective suit.

4.6.1.2 Level B

Level B is used when the highest respiratory protection level is required, but a lesser skin protection level is needed.

- Positive pressure, full face piece, SCBA or
- Positive pressure, supplied air respirator with escape SCBA, approved by NIOSH.

- Hooded chemical resistant clothing (disposable chemical resistant overalls).
- Outer chemical resistant gloves.
- Inner chemical resistant gloves.
- Boots, outer, chemical resistant steel toe and shank.
- Hard hat.
- Optional as applicable to job are:
  - Coveralls,
  - Long underwear,
  - Disposal protective suit,
  - Leather gloves, and
  - Boots.

4.6.1.3 Level C

Level C is used when the airborne contaminants' concentration and types are known and the air purifying respirators criteria are met.

- Full face air purifying respirator, NIOSH-approved.
- Outer chemical resistant gloves.
- Inner chemical resistant gloves,
- Hooded chemical resistant clothing (disposable chemical resistant overalls).
- Hardhat.
- Boots, outer, chemical resistant steel toe and shank.

4.6.1.4 Level D

Level D is a work uniform affording minimal protection, used for nuisance contamination only.

- Long pants and shirts with 4-inch sleeves or coveralls.
- Hard hat (ANSI).
- Safety glasses with side shields.
- ANSI protective toe footwear.
- Optional as applicable to job are:
  - Gloves,
  - Leather gloves,
  - Face shields, and
  - Disposal boot covers.

It should be noted each of these ensembles may be modified to fit the work situation and specific hazards. If applicable, PPE specified by a RWP shall be integrated into PPE ensembles described.

4.6.1.5 Eye Protection

All work conducted inside the demolition zone that poses a potential hazard from flying debris or objects shall require appropriate eye protection use. When safety glasses are required, they shall meet the current ANSI Z87.1 Standard. Safety glasses used to protect eyes against particles and projectiles do not provide adequate protection against dusts, vapors, or mists. Where such material forms could be encountered, chemical safety goggles or full-face respirators shall be worn.

4.6.1.6 Hearing Protection

Personnel who are required to perform tasks around equipment producing noise levels at or above 85 decibels A-weighted [dB (A)] on an 8-hour time-weighted average (TWA) shall wear earplugs or muffs. The SSHO shall provide a noise level survey for undefined areas as necessary. OSHA 29 CFR 1926.52 noise standard requirements shall be used as reference. Good hygiene in ear protection use shall be carefully considered due to the increased potential of chemical constituents being introduced into the ear because of their use.

4.6.1.7 Hand Protection

Glove selection for the project is contingent upon requirements for dermal protection based on site activities and associated hazards.

4.6.1.8 Head Protection

Hard hats shall be worn in designated areas or as defined in the AHA based on the hazards and task to be performed. Hard hats shall meet ANSI Z89.1-1986 and OSHA 29 CFR 1926.100 specifications.

4.7 Respiratory Protection

If respiratory protection is required, project personnel will be subject to respirator training.

4.7.1 Medical Requirements

The medical surveillance program as specified in this DWP applies to all Perma-Fix and subcontractor personnel required to wear respiratory protection during specific remedial action activities such as asbestos abatement.

As determined by the examining physician, any failed test during the medical examination may disqualify a worker from employment or may require restrictions on work assignments for that worker as determined by the examining physician. No employee shall be assigned to work tasks that require respirator use unless s/he is medically qualified.

4.7.2 Respirator Selection

Perma-Fix shall provide respirators as needed. The Perma-Fix SSHO shall determine the respiratory protection levels and types required based on the types of activities being performed. The AHA for each specific task shall provide some guidance in the respiratory protection selection process.

The SSHO shall ensure appropriate selection consider the following information:

- The estimated contaminant concentration is in the range requiring respiratory protection, as determined by industrial hygiene monitoring information.
- Limits exceeded for the contaminant may be:
  - Permissible Exposure Limit (PEL),
  - Threshold Limit Value (TLV),
  - Short-term exposure limit,
  - Action levels, or
  - Ceiling value.
- The contaminant is:
  - Gas,
  - Vapor,
  - Mist,
  - Dust, and
  - Fumes.
- The contaminant concentration could be termed immediately dangerous to life or health (IDLH).
- The contaminant is flammable and the estimated concentrations may approach the lower explosive limit.
- The contaminant has poor warning properties (i.e., odor, irritation, or taste).

Respirator approval is granted by NIOSH via test certification numbers. Only NIOSH approved equipment shall be accepted. All component and replacement parts shall also have NIOSH approval. In addition, respirators are approved as a system. Parts of the system, which cannot be interchanged among different brands of equipment or even among the equipment of a given manufacturer unless specifically approved, include:

- Cartridges,
- Canisters,
- Filters,
- Airlines, and
- Regulators.

4.7.3 Respirator Fit Testing

All personnel that will be working on the project are required to be enrolled in a current medical surveillance program which includes a current physical and chest x-ray, and will have passed a respiratory fit test. The Perma-Fix Project Coordinator will be responsible for obtaining certificates from all personnel to verify their training is current. Copies of this information will be provided to the XXX PM upon request.

Each individual required to wear a respirator is required to be clean-shaven in the areas corresponding to the respirator face piece sealing areas. Each respirator user shall be respirator fit tested using quantitative testing at least annually. Testing is generally completed during the individual's yearly medical. A qualified technician shall perform the quantitative fit testing. Upon donning the respirator device or before entering any restricted work area, each respirator wearer is required to perform a negative and positive pressure fit test.

4.7.4 Respirator Cleaning, Inspection, Maintenance, Sanitization, and Storage

Respirators shall be sanitized and stored in a sanitary container. Parts that require inspection include the:

- Valves,
- Nosepiece,
- Straps, and
- Eyepiece.

Each worker is responsible for the inspection and correct storage of her/his respirator and supplied-air equipment and shall be trained in the correct methods and procedures. Equipment inspection sheets shall be maintained with each respirator.

4.7.5 Respirator Use General Considerations and Limitations

The following criteria shall be followed:

- Oxygen Deficient Atmosphere (containing less than 19.5% oxygen) atmosphere-supplying (Supplied Air) respirators shall be used in environments IDLH.
- Eye irritation – when working in contaminated environments or where there is a potential for eye irritation, a full face piece unit shall be used.
- Nuisance dust – any approved filter respirator may be used for nuisance dusts.

4.7.6 Air Purifying Respirators

All air purifying respirators and filter cartridges used by employees shall meet NIOSH/Mine Safety and Health Administration (MSHA) approval, and conform to OSHA standards/regulations.

4.7.7 Cartridge Changes

Respirator cartridges will be changed based on the type of cartridge being used and the environment. Particulate cartridges will be changed weekly at a minimum. Chemical cartridges have a color indicator which turns colors to indicate the need to change. If working in a radiological environment with respiratory protection, new respirators and cartridges will be used each time new PPE is donned. Water saturation of filters or dusty conditions may necessitate changes that are more frequent. Changes are to occur when the wearer begins to experience increased inhalation resistance, or a chemical warning property breakthrough.

4.7.8 Corrective Lenses

Normal eyeglasses cannot be worn under full-face respirators because the temple bars interfere with the respirators sealing surfaces. For workers requiring corrective lenses, special optical inserts designed for use with respirators shall be provided.

4.8 Engineering Controls

The use of engineering controls in conjunction with administrative controls to mitigate or reduce the potential for exposure in the workplace is always preferable to the use of PPE. In some conditions where the hazards can vary in type, location, intensity, or form, implementing engineering controls is not always possible. Engineering controls for potentially hazardous chemical or waste usually provide two functions: (1) to reduce the potential or actual exposure and (2) to reduce the potential for off-site migration of contaminate constituents.

4.9 Inspection and Maintenance Program

Various equipment use is planned for the XXX project. When the equipment is delivered to the site, the SSHO and operators will perform an initial inspection to ensure the equipment meets the necessary requirements for which it was procured. During the project, lift equipment operators shall inspect all heavy equipment before performing assigned tasks daily. The inspection shall include:

- Fluids,

- Belts,
- Lights,
- Attachments,
- Safety equipment,
- Safety systems,
- Warning devices, and
- Hoses and lines.

Evidence of the equipment inspections shall be recorded on designated Equipment Inspection Forms and maintained on-site. Any deficiency that cannot be readily repaired is to be reported to the PM and or SSHO for appropriate action. Equipment may not run over hoses, grating covers, debris, or other similar material. Caution is to be used in operating lift equipment around scaffolding and other elevated platforms.

Operator/owner's manuals shall be on-site readily available for reference. Strict adherence to the owner's manual is required including manufacturer's operation, inspection, and maintenance recommendations. All operators shall review and understand the operator/owner's manual for the equipment that person operates. Objective evidence from personnel of the operator manual training understanding and comprehension shall be obtained by the responsible management and kept in the project training records. Documentation of the operator's qualifications shall be kept in the project training files.

Perma-Fix shall obtain certification from the supplier prior to delivery to the site that each piece of equipment has been inspected for the presence of suspect and/or counterfeit items by a qualified inspector. Evidence of this inspection shall be maintained within the equipment inspection records.

Equipment operators are responsible for ensuring upon completion of the task each day that the equipment is secured observing a zero gravity policy for the bucket, boom, etc.

Equipment operators shall utilize all safety equipment and warning devices when the equipment is in operation. The SSHO shall ensure the use of such devices or equipment.

The SSHO shall randomly inspect equipment and tools used during the project to ensure they have appropriate safety devices, are environmentally acceptable, and adequate for the task. Pre-notification is required before moving tools and equipment on or off the work site. Tools and equipment shall be gathered and secured at the end of each work shift.

Personnel shall ensure tools and equipment are inspected prior to use. Items to be inspected include lifting devices, hand tools, etc. Defective or otherwise unsafe equipment is to be tagged "Do Not Use." After repairs are made, the SSHO shall re-inspect the equipment before use.

Prior to an operator using equipment on-site, the SSHO shall ensure that all operators of motor vehicles have a current, valid state driver's license as well as verifiable documentation validating that the operator(s) have been certified and/or qualified to operate each piece of heavy equipment.

Perma-Fix shall be responsible for the safe operation of all vehicles and heavy equipment operated by Perma-Fix personnel, and the oversight of subcontracted personnel operating equipment for safe operation. Vehicle and equipment drivers and/or operators shall use caution when operating in close proximity to other equipment and tools (e.g., vehicles, heavy equipment, scaffolding, hoses, cords, etc.).

Drivers shall be responsible for the all passengers' safety and the stability of materials being hauled. Personnel shall not mount or dismount moving vehicles. Personnel shall not ride in the bed of any vehicle. Vehicles used to transport employees shall have seats firmly secured and adequate for the number of employees to be carried. The use of seat belts shall be mandatory when operating or riding in vehicles.

All heavy equipment shall be equipped with functioning back-up alarm systems that are clearly audible above surrounding noise. Motion alarms shall be used as applicable. See **Appendix D** for daily inspection forms for equipment, etc.

4.10 Environmental Protection

Perma-Fix demonstrates a strong commitment to protect the welfare of the environment during every project. Potential hazards to the environment that may be present on a project are identified prior to mobilization and addressed during training. These include air pollution, water quality, managing storm water runoff, dust suppression,

and spill prevention and countermeasure controls. Additional potential environmental impacts identified during the duration of a project are addressed during the morning POD with workers so that environmental awareness is in place. Spill prevention will be addressed by inspections and constant monitoring. In the event a spill occurs, the spill kit on-site will be utilized. The spill will be controlled and contained using environmentally friendly materials.

4.10.1 Air Pollution Prevention

If required during the project to avoid fugitive emissions from project activities, Perma-Fix shall provide dust suppression measures as discussed in Section 4.12.2 of this plan. Pursuant to American Congress of Governmental Industrial Hygienists (ACGIH) TLV for particulates, total airborne dust concentrations as measured in the work areas shall at no time exceed a limit of 10 milligrams (mg)/cubic meter (m^3). The limit for areas outside of the project area is 5 mg/m^3.

Perma-Fix shall manage all work activities in a manner that prevents pollution and minimizes the generation of waste and that promotes energy conservation and practice pollution prevention and waste minimization techniques including proper storage of chemicals to prevent spills, separation of waste streams to expedite material management and to prevent cross-contamination, prompt clean-up and reporting of spills, and use of non-hazardous substitutes in the place of hazardous chemicals.

Perma-Fix will make every effort to minimize waste generated during construction and demolition (C&D) and track and report the weight and volume of materials that were removed from the site as waste and shall indicate the method of disposition (e.g., reused, recycled, or disposed). The purchase and use of materials and products that provide for pollution prevention shall take advantage of reuse and recycling programs to the extent practical.

4.10.2 Dust Suppression

During any dust producing activities, Perma-Fix may use soil-tac, tarps, water spraying, or other methods as necessary to suppress dust emissions to the lowest practicable level. Excessive visible particulate emissions shall not be permitted. Total airborne dust concentrations, as measured in the work areas, shall at no time exceed a limit of 10 mg/m^3 and a respirable TLV of 3 mg/m^3. The limit for areas outside of the construction area is 5 mg/m^3.

If total airborne particulate concentration measurement is not feasible or practical, the airborne particulate levels shall be evaluated by visual inspection. If visible, Perma-Fix shall implement additional particulate control measures and, if determined necessary by the SSHO, personnel/environmental monitoring. Under this plan, Perma-Fix shall ensure that all operations are conducted in a manner that prevents airborne contaminants and total airborne particulates from exceeding established limits.

4.10.3 Spill Prevention, Control, and Countermeasures

This section prescribes that if a spill were to occur, the PM shall immediately notify the appropriate Emergency Response personnel, the PM, and the SSHO. As a result, Perma-Fix shall comply with applicable Federal, State, and local regulations pursuant to waste handling and spill response.

4.10.3.1 Contain, Control, and Collect Cleanup

Perma-Fix and its subcontractor's shall follow standard spill response and clean up techniques used for various material types. Perma-Fix shall maintain the appropriate spill response materials compatible with those materials that would present a spill hazard. These materials' location shall be made known to the project employees and posted with appropriate signage.

- Reporting Leaks and Spills:
  a) All spills and leaks shall be immediately reported to the PM.
  b) The PM shall notify the XXX Representative.
- Methods and Procedures:
  a) When alerted to a possible oil or chemical spill during the project, the PM shall direct the crew to begin containment using a cleanup kit kept on-site. In the event that the spill is large and not containable or that there is danger to human health or the environment, then emergency off-site support is to be sought.
  b) Once the spill has been contained, it shall be cleaned up per the instructions from the PM.
  c) All equipment contaminated during the spill response shall be temporarily packaged and brought to a controlled area for decontamination.
  d) All disposable spill control materials shall be discarded through the normal designated waste disposal methods.

- Handling Procedures:
  a) Any spilled materials shall be managed and disposed in a timely manner.
  b) The spill area shall remain controlled by the placement of caution/hazard tape.
  c) Erosion control barriers or absorbent sock/booms placement may be necessary to prevent any contaminated materials migration into uncontrolled area.

4.10.3.2 Secondary Containment

Perma-Fix may establish secondary containment utilizing plastic and/or earth beams for all material staging and storage areas that contain items with hazardous free liquids. Perma-Fix shall provide a secondary containment capable of containing at least the maximum quantity of the container's volume of all freestanding liquids.

4.11 Hearing Conservation

Anticipated work activities are extensive and most likely involve the use of noise-producing equipment, which may present a noise hazard exposure to workers. The SSHO shall implement safeguarding personnel from potential injury due to noise exposure in the following manner:

- Personnel subjected to excessive noise shall be trained in the hazards associated with acute and chronic noise exposures.
- Suitable hearing protection devices shall be used by personnel when exposed to excessive noise.
- Work areas with noise levels greater than 85 dBA shall be posted as a high noise area, requiring hearing protection use.
- Workers whose exposure to noise exceeds an 8-hour TWA of 85 dBA shall be placed in a medical surveillance program which includes receiving audiograms.
- Specific noise exposure precautions taken shall be in compliance with OSHA 29 CFR 1910.95.
- Whenever possible, noise hazards removal or reduction shall be accomplished through administrative and engineering controls implementation.

4.12 Temperature Extremes

Perma-Fix shall ensure that the appropriate heat/cold stress monitoring is performed during hot and cold weather. When necessary, weather data web sites will be used, or, in extreme cases, a Wet Bulb Globe Temperature (WBGT) station shall be set-up to monitor weather temperatures. This information shall be used by the SSHO to determine appropriate work/rest regimens for approved, specified implementation details. All workers shall be trained by the SSHO on temperature extremes recognition and preventive measures. This training could be met by providing this information during a POD meeting.

Perma-Fix shall ensure that employees have access to an adequate sanitary potable water supply during all periods of the day and have available electrolyte replacement drinks during seasons of the year when heat stress may occur.

4.13 Fall Protection

All project personnel who perform elevated work shall use fall prevention practices and a definition of elevated surface as anything above 6 feet. In reaching and working at elevated heights, elevated work, fall prevention requirements apply to the use of:

- Ladders,
- Scaffolds,
- Vehicle-mounted elevating and rotating work platforms,
- Harnesses,
- Roofs,
- Lifelines,
- Safety belts,
- Telescoping scaffolds,
- Warning lines,
- Stationary work platforms, and
- Other miscellaneous equipment.

Perma-Fix will inspect fall protection equipment as required by the manufacturer prior to each use and adopt a 100% fall protection policy that makes provision for secondary fall protection (full-body harness) for all employees who are working or traveling more than 6 feet (for construction) and 4 feet (for general industry) above ground.

Where personnel are required to work on unprotected roofs or other structures, Perma-Fix shall review the SOW to identify the methods to achieve 100% fall protection or prevention. A Roof Access/Fall Protection Plan will be developed for acceptance prior to start of such work.

Where lifeline systems are used, anchor points shall be capable of supporting at least 5,000 pounds. Lifelines shall be installed and maintained by qualified persons who possess the rigging knowledge necessary to ensure the integrity and safety factors necessary for lifeline system installation. Lanyards shall be secured to vertical lifelines by rope grabs only. Knots, painters-hitches, or loops are not acceptable Perma-Fix practices. Horizontal lifelines shall have tie-off points at least waist high.

Perma-Fix will assure that all supervisors and users of fall protection equipment have documented training in the care, use, and inspection of all fall protection used. A designate competent and qualified person(s) as required by 29 CFR 1926.501 will be provided for fall protection scope**.**

4.14 Electrical

Permanent or portable GFCI protection is required for electrical circuits in accordance with 29 CFR 1910 and 29 CFR 1926.

GFCI shall be used and connected at the power source. All lights are to be equipped with protective, nonconductive covers, and all light bulbs in any light stringers are to be shatterproof. Exposed, empty light sockets or broken bulbs are not permitted. If any light sockets are found in an unsatisfactory condition, the light socket shall be placed back to a working condition in accordance with the appropriate AHA. Burned-out bulbs shall be replaced as identified. Portable lighting used in wet or in other conductive locations shall be operated at 12 volts or less. However, 120 volt lighting may be used if it is hooked up to GFCI.

Electrical cords and equipment shall not be hung or tied to steel or hung with wire unless a nonconductive material is used to insulate the cord from the metal. Plastic-coated wire shall not be used to hang electrical cords. Cords that pass through doorways or holes, or are exposed to vehicle or equipment traffic, shall be protected from damage. Flexible electrical cords shall not be spliced or have insulation repaired with tape. Replacement cord ends used for flexible electrical cord repair shall be constructed of plastic or rubber and shall encapsulate all connections. Extension cords shall be made of No. 12 (or better) conductor S.O. cord or larger. Portable electrical equipment and extension cords used in highly conductive work locations (e.g., areas inundated with water or other conductive liquids) or in locations where employees are likely to have contact with water or conductive liquids, shall be approved by the SSHO for use in those locations. Employees shall not plug or unplug flexible electrical cords while their hands are wet or when standing in accumulated water or other conductive liquids.

Portable electric tools (except battery powered) shall either be double insulated, case grounded, or low voltage.

Perma-Fix will assure that all workers who may be exposed to facility electrical hazards meet the training requirements outlined in OSHA, National Fire Protection Association (NFPA) 70, and NFPA 70E for "qualified person(s)" and will assure that electrical workers have adequate training in electrical safety.

For work on or near exposed electrical hazards, which includes activities such as zero energy checks, adjustments, troubleshooting, and maintaining and/or repairing electrical equipment, Perma-Fix will develop and follow an Energized Electrical Work Permit (EEWP) that meets the requirements of NFPA 70E.

4.15 Illumination

The Perma-Fix SSHO shall ensure that adequate illumination intensity is provided in all active work areas. A minimum of 5 foot candles shall be met; however, 1926.56 requires more in some areas. Therefore, the SSHO will ascertain the lighting conditions and establish a level suitable to worker safety.

4.16 Housekeeping

Housekeeping shall strictly be enforced during project duration. All material, scrap, tools and toolboxes, and other equipment shall be stored in a neat and orderly fashion. Trash and scrap should be removed from the work area on a regular basis (i.e., as needed or at a minimum of every three days) and shall never be allowed to accumulate, especially in walkways, under stairs, at the bases and landings of stairs and ladders, and near flammable substances.

Perma-Fix will provide the necessary resources to ensure all work areas are kept neat and orderly at all times by implementing the following housekeeping practices:

- Keep tools and materials properly stored when not in use and remove all materials that are no longer needed.
- Keep floors clear of trip and slip hazards, including hoses, electric cords, liquids, and other obstacles. Keep cords, hoses, and leads clear of walkways, roadways, and other locations where possible exposure to damage exists.
- Ensure protruding nails, screws, staples, and other sharp objects are protected or removed and do not present a hazard.
- Provide and keep eating and sanitary facilities maintained in a clean and sanitary condition at all times, including adequate washing facilities with soap and disposable towels.

4.17 Radiological Hazards

Radiological contamination will be managed with instructions developed within RWPs and in the RPP.

4.18 Industrial Hygiene Monitoring

Instantaneous monitoring equipment used by the SSHO shall be operated in accordance with manufacturer specifications and operation procedures. A copy of the manufacturers' procedure or specification shall be maintained at the project site for review, as necessary.

The SSHO shall maintain industrial hygiene sampling data on-site. Monitoring results from direct-reading instruments shall be documented in the project log. Personal monitoring results shall be presented and explained to the employee within 48 hours of receipt of the results.

4.19 Injury/Illness Occurrence Reporting (OSHA 300 Log)

The PM and/or any worker has the responsibility to immediately notify the PM of all injuries, illness, potentially serious hazards to personnel, or unusual occurrence at the site. The PM, with assistance from the SSHO, shall jointly investigate all injuries, illness, incidents, or occurrences. The SSHO shall administer the investigation and supervision. Workers involved shall be required to participate. Perma-Fix will notify the XXX Representative of any accident, injury, or incident immediately and provide all applicable information.

The PM shall follow Perma-Fix incident report procedures and notify the Corporate Health and Safety Manager and the XXX Representative within two hours of the event. Supporting documentation shall be provided to the PM as soon as available.

Events to be reported and investigated include, but are not limited to:

- Events involving OSHA recordable injuries or illnesses.
- Potentially serious hazards to personnel.
- Other abnormal events.
- Near miss events.
- Equipment failures.
- PPE issues.

Each injury, illnesses, incident, or occurrence shall be investigated by Perma-Fix health and safety personnel to determine the root cause. Feedback shall be developed and integrated back into affected plans and AHA. A "Lessons Learned" shall be developed and distributed to all project employees.

4.20 Emergency Procedures

4.20.1 Emergency Notification

In the event of an emergency (i.e., medical, fire, chemical spill, etc.) during this project, the PM shall, immediately upon learning of the emergency, notify the SSHO. If notification is made, the following information, at a minimum, should be provided:

- Name of the person calling.
- The emergency's nature and type.
- The emergency's exact location.
- Location and number from which the call is made.

Perma-Fix shall ensure all personnel are accounted for during work activities. Specific details of personnel accountability will be established through coordination between the Perma-Fix PM and SSHO prior to start of work activities. At the start of the project, the SSHO shall identify the nearest Assembly Point for site emergencies and shall instruct personnel on the need for evacuating to the designated Assembly Station.

4.20.2 Fire Protection/Prevention

Fire prevention and protection measures shall be in place to address specific fire/explosive hazards if required or identified by the AHA and OSHA 1926.150 (a) (1). All combustible debris and/or material shall be put away or safely stored at the work shift's end. If any plastic sheeting or tarpaulins are to be used, Perma-Fix shall obtain sheeting or tarpaulins that meet the NFPA 701 fire retardant standards.

4.20.3 First Aid/Cardiopulmonary Resuscitation

The SSHO shall be trained and certified in both first aid and CPR. Upon notification of a medical illness or injury, the appropriate basic life support will be provided until additional aid arrives. Available first aid supplies and equipment shall be readily available on-site to provide basic life support. The SSHO shall inspect and maintain first aid supplies and equipment weekly. A weekly inspection log shall be kept with first aid supplies and shall be maintained by the SSHO.

4.20.4 Hospital Route

The project SSHO will establish the hospital routes from each of the XXX sites to the nearest medical facility. The routes should be utilized when necessary to take personnel for non-emergency medical treatment.

4.21 Scaffolding and Portable Ladders

NOTE: Under no circumstances will any work be performed backwards from a ladder (regardless of fall protection).

Scaffold platforms shall be fully planked or decked out, capable of supporting four times the maximum intended load to be imposed upon them, and all sides protected by standard guardrail system. The top rail shall be approximately 42 inches from the platform. A mid-rail and 4-inch toe board shall be installed.

Erected scaffolds, where employees are working/passing below, shall have planking/siding or netting installed from the platform to the top rail. A scaffold tagging system that uses a red tag to indicate scaffolds under construction or demolition, yellow to indicate scaffolds that are complete but have hazards associated with them, and green to indicate scaffolds erected to a complete, safe standard will be used.

Scaffolds shall be erected or modified under the direction of a trained, competent scaffold builder. For usage of portable ladders, Perma-Fix shall visually inspect ladders before each use for damage and/or defects, and remove defective equipment from service immediately. Ladders are for climbing only and shall not be used for any other purpose.

Manufactured ladders shall be rated for industrial or heavy-duty work and used only as allowed by the manufacturer. Job-made ladders shall be constructed to conform to OSHA standards.

Metal ladders shall not be used during electrical work activities or near any electric lines or services. Stepladders shall be open, leveled on all 4 feet, and spreaders locked in place before use. The base of straight or extension ladders must be equipped with non-skid safety feet and shall be positioned out one fourth of the ladder's length from its upper point of support. The top shall extend at least 3 feet beyond the supporting object or a grab rail must be provided. On extension ladders, ensure safety dogs or latches are engaged, the extension rope is secured to a rung on the base section, and a minimum of three rungs of overlap exist. Straight or extension ladders and all type ladders over 8 feet tall must be tied off or held by another person. Ladders fitting this category shall be held in place by another person when being tied or untied.

Standing on the platform or top step of a stepladder or the step immediately under it is prohibited. Only one person at a time is permitted to work from a ladder unless a two-man designed ladder is in use. Tools, materials, or other items may not be carried while ascending or descending a ladder. Hand lines must be used to raise and lower items to and from the work area. Both feet must be kept in contact with the rungs at all times while working. Ladders must be positioned to maintain proper access to the work area so that the worker faces the ladder during work operations.

The areas around the base and top of a ladder must be kept free of tripping hazards. Perma-Fix will erect ladders so that access/egress areas are unobstructed. When used in the proximity of a doorway, the doorway must be barricaded and "Overhead Work" warning signs must be posted.

Perma-Fix shall only use ladders for access/egress and/or to conduct low level work of short duration. Ladders may not be used in lieu of scaffolds as a primary means of conducting work of longer duration.

4.22 Aerial Lifts and Equipment Handling Equipment

4.22.1 Critical Lifts

Lifts must be classified as either ordinary or critical lifts. Any lift meeting one or more of the following criteria shall be considered a Critical Lift (otherwise, it is an ordinary lift):

- Any lift exceeding 75% of the manufacturer's rated capacity for the crane, hoist, or mechanized equipment to be used in the lift.
- Any item that requires special care in handling because of weight, size, asymmetrical shape, undetermined center of gravity, installation tolerances, or other unusual factors.
- Any lift using two or more cranes, hoists, pieces of mechanized equipment, or a combination of such equipment.
- An otherwise non-critical lift that must be made in close proximity to critical or expensive items which could be damaged as a result of contact with a hoisted load.
- Any lift where the mechanized equipment could at any time come in contact with an energized high voltage power line.
- Any lift that requires personnel to be hoisted.

Critical Lifts must have a lift plan approved by the SSHO before such lifts are performed. All critical lift plans shall contain, at a minimum, the following:

- Identify the Person In Charge.
- Identify the item(s) to be lifted, weight, dimensions, center of gravity, flight path, and any hazardous or toxic materials that are present.
- Identify equipment to be used by type and rated capacity.
- If rigging is used, sketches that include:
  - Identification and rated capacity of slings, lifting bars, rigging accessories, and below the hook lifting devices;
  - Load indicating devices;
  - Lifting point(s);
  - Sling angle(s);
  - Boom and swing angle(s);
  - Method of attachment;
  - Crane orientation(s);
  - Any other factors affecting equipment capacity; and
  - Operating requirements, special instructions, rigging precautions, and safety measures to be implemented.
- Identify an experienced operator that has been trained and is qualified for the specific equipment.
- Designate a qualified signaler.
- Directions to the operator to obey all STOP signals no matter who gives the signal.
- Current daily, monthly, annual inspections, and/or certifications.
- Load charts.
- An expiration date.

Perma-Fix shall ensure that the counter weight and housing swing radius of all cranes is properly barricaded whenever it is possible for personnel to come into contact with or be struck by them and ensure that equipment operators do not leave their positions at the equipment controls whenever loads are suspended or raised.

All equipment must be operated in a safe manner per manufacturers' instructions.

4.23 Hazard Communication Plan

The following will apply to all commercial products containing hazardous substances brought on-site during the project, in accordance with the OSHA Hazard Communication Standard, 29 CFR 1910.1200, as follows:

- Perma-Fix Hazard Communication procedure (PF-IH-08) will be followed for hazardous materials brought on-site. This procedure will be made available to all site personnel.
- The SSHO will maintain a safety data sheet (SDS) for each hazardous material brought to or used on-site.

- The SSHO will affix a hazard communication label providing information on health and physical hazards information to each container of hazardous material for those containers of hazardous materials not supplied with an adequate hazard label.
- The SSHO will train site personnel working with hazardous materials in accordance with the requirements of hazard communications training per 29 CFR 1910.1200.
- The SSHO will maintain an inventory of hazardous materials used on-site.
- The SSHO will inform personnel, including those employed by subcontractors, of the hazards of hazardous materials on-site and the location of appropriate SDSs.
- Subcontractors are required to provide SDSs to Perma-Fix and obtain approval of the SSHO prior to bringing hazardous materials on-site.

5.0 RADIATION PROTECTION PLAN

The RPP is included as **Appendix C**. Perma-Fix will adapt and tailor the Corporate Radiation Protection Program requirements as necessary to the site-specific radiological hazard associated with the XXX facility in Beaver Falls, specifically discrete and dispersed Ra-226 source contamination. For example, air sampling performed for personnel inhalation and environmental airborne radioactivity will be compared to the established occupational and environmental effluent limits given in 10 CFR Appendix B to Part 20.

6.0 FIELD SAMPLING PLAN

Radiological surveys and sampling performed for this characterization may consist of: (a) field gamma screening, (b) direct alpha and beta total contamination surveys, (c) smear or removable contamination surveys, and (d) sampling for off-site radiological and laboratory analyses. This section summarizes the scope and objectives of these survey activities; a detailed description of field screening and sampling are presented in Sections 6.3 and 6.4, respectively.

6.1 Scope of Field Screening Activities

Field screening activities will consist of using field instruments and detectors to identify the possible presence of Ra 226 contamination within the XXX facilities. Screening of solid and aqueous samples will also be performed. Field screening activities will include gamma walkover data collection (ground surfaces) across exterior areas of the facility. Contamination surveys will be conducted within facility buildings and equipment. Both total and removable contamination will be evaluated throughout the facility including the shredder operation, process machinery, buildings, trucks, and mobile site equipment.

Direct-reading radiological instruments and detectors will be used throughout the field operations of the project for scanning and surveying of personnel, sample equipment, and areas. The instruments and detectors will be operated and maintained by trained Perma-Fix personnel and will undergo routine QC checks as required by Perma-Fix operating procedure RP-108. Proposed types of instruments, detectors, and equipment (or their equivalents) to be used on-site during field screening are listed in **Table 6**.

Table 6. Field Screening Equipment

Instrument	Detector	Parameters/Usage
Ludlum Model 2221, or Equivalent	Ludlum Model 44-10, 2x2 NaI Scintillator	Portable scaler/ratemeter (high energy gamma)
Bicron Microrem , or Equivalent	—	Portable low-level dose rate meter (gamma)
Thermo XXXXX Model RO20	—	Portable high-level dose rate meter (gamma)
Ludlum Model 3, or Equivalent	Ludlum Model 44-9 Pancake Frisker	General purpose survey meter (beta/gamma)
Ludlum Model 19 Micro-R Meter	1x1 NaI Scintillator	Exposure rate survey meter (high energy gamma)
Ludlum Model 2929 or Equivalent	43-10-1	Portable removable smear counter
Ludlum Model 2360	43-93 or Equivalent, Plastic Scintillator	Portable scaler/ratemeter (alpha-beta)
Ludlum Model 2350	43-37 or Equivalent, Gas Proportional	Large area (alpha-beta)

6.2 Scope of Field Sampling Activities

Field sampling will be conducted to support a variety of activities. Activities include characterization and scoping surveys, waste characterization surveys, and FSSs. Sampling will include the collection of smears for removable contamination, water samples to characterize surface water, and soil/solid samples to characterize site soils and waste.

The following types of field samples will be collected for the purposes identified:

- Removable surface contamination will be evaluated by collecting smears at elevated surface measurements. Smears will also be collected as contamination control.
- Direct Alpha and Beta measurements will be collected to determine total contamination levels.
- Gamma surface scans with direct read radiological equipment paired with a GPS that simultaneously records soil gamma intensities in cpm and locations.
- Exposure Rate Measurements will be collected for the purpose of determining radiological postings and ALARA.
- Air samples will be collected for personnel and general work area to monitor for potential airborne activity.

Off-site analyses of solid and aqueous samples may include the following parameters:

- Gamma spectroscopy to identify Ra-226 and daughter radionuclides.
- Inductively coupled plasma mass spectrometry (ICP-MS) for metals.
- Gas chromatography mass spectroscopy (GCMS) for semivolatile organic compounds (SVOCs) and volatile organic compounds (VOCs).

6.3 Field Screening and Testing Activities

Procedures and activities for radiological field surveys (screening) surfaces, soils, solid and aqueous samples, and sampling areas are described below.

6.3.1 Gross Gamma Screening ("Walkovers")

Gross Gamma Radiological Surveys will be performed utilizing a Ludlum Model 2221 survey instrument with a Ludlum Model 44-10 NaI Detector. The radiological instrumentation will be paired with a GPS to collect data at a rate of about 1 measurement per second. Measurements will be collected by traversing areas on foot or, for large open land areas, data may be collected by mounting a series of detectors to the back of a vehicle.

6.3.2 Exposure Rate Screening

Exposure rate measurements will be conducted prior to entering uncharacterized areas and to maintain gamma exposures ALARA.

6.3.3 Total Contamination Screening

Total contamination screening will be performed on solid surfaces throughout the facilities. A combination of both hand held instrumentation (Ludlum 43-93 plastic scintillation) and floor carts with larger detectors (Ludlum 43-37 gas proportional). A combination of scanning and static measurements will be utilized to locate contamination throughout the facility.

6.3.4 Removable Contamination Screening

Forty-four millimeter cloth smears/wipes will be used to collect information about removable contamination. A wipe will be firmly rubbed against a surface over an area of approximately 100 cm^2. Smears will be counted on a low background smear counter (Ludlum model 2929). Additional large area removable contamination screening may be performed using Masslinn® or other cloth. The purpose of large area screening is to determine if tools or other items have removable contamination present.

6.3.5 Soil and Solid Sampling

Soils and solids may be sampled primarily for waste characterization. The data will be used to determine the concentration of Ra-226 as well as other constituents such as metals, VOCs, and SVOCs to ensure the materials meet the WAC of the facility where they will be dispositioned.

Biased soil samples may also be collected to determine the activity concentration of Ra-226 in the soils. This may be determined by elevated measurements collected during the gamma survey.

6.3.6 Water Sample Collection

In limited cases, surface water may be collected from areas where water ponds or pools on the site. The purpose of water samples will be to provide further characterization to determine additional waste streams. Water will be collected by dipping the water from the pond or puddle with a high density polyethylene (HDPE) dipper.

6.4 Field Sampling Activities

This section describes sampling and analyses to be performed by off-site laboratories. The quantitative analytical data that are generated as a result of these activities will be sufficient in type, quantity, and quality such that data quality objectives (DQOs) discussed in this field sampling plan are met.

Specific sampling parameters, laboratory analytical methods, and numbers of samples are discussed further within Section 6.7 and are summarized in **Table 7** on page 32.

6.4.1 Objectives

There are two primary objectives for sending materials to an off-site laboratory. The first objective is to determine the waste characterization information necessary to facilitate disposal. As discussed previously, this would include both the radiological constituents as well as non-radiological constituents.

Additionally samples will be collected to determine if site clean-up goals have been met.

6.4.2 Sampling Methods

Solid samples will be collected using decontaminated reusable or disposable sampling tools (e.g., stainless steel trowels or auger). Other methods may be employed based on the solid to be sampled. Sampling tools may be decontaminated prior to first use on-site, between sampling locations, and following last use on-site (i.e., before demobilizing that equipment) as appropriate based on survey data. The samples selected for analysis will be placed into laboratory approved containers immediately following collection and labels promptly affixed to the sample containers. The samples will be transported via delivery service under chain-of-custody control to the off-site subcontract laboratory for analysis.

6.4.3 Laboratory Analysis

Solid samples will be analyzed for radiological contaminants of concern (COCs) in the off-site laboratory, including Ra-226, bismuth (Bi)-214, lead (Pb)-214, and potassium (K)-40. Additional non-radiological parameters may be evaluated to ensure the disposal facility WAC is met. This may include, but is not limited to metals, SVOCs, and VOCs.

Aqueous samples will be analyzed primarily for radiological COCs to determine if surface water has been contaminated. Aqueous sample analysis will also include Ra-226, Bi-214, Pb-214,, and K-40.

6.4.4 Equipment Decontamination Procedures

Reusable sample equipment will be used. Such equipment will be decontaminated both prior to sampling in the field and between uses, as appropriate. The following decontamination steps will be performed for reusable equipment, in the following order as necessary:

1. Remove any bulk soil from the equipment with a disposable towel.
2. If necessary, spray with potable water and use scrub brush to remove any additional materials.
3. Rinse again with potable water.
4. Survey with a Geiger Mueller detector (Ludlum 44-9) to ensure no contamination is present on the sample equipment.
5. Repeat if contamination is found.

6.4.5 Field Documentation

6.4.5.1 Log Books and Field Data Sheets

Information pertinent to field activities will be recorded on field logbooks. The logbooks will be bound and the pages will be consecutively numbered. Sufficient information will be recorded in the logbooks to permit reconstruction of site sampling activities. Information recorded on official project documents (e.g., survey forms, chains-of-custody, etc.) will not be repeated in the log books except in summary form or cross reference notation where determined necessary. Field log books will be kept in the possession of the appropriate field personnel, or in a secure place when

not being utilized during field work. Entries recorded in log books will be made in blue or black waterproof ink and may include, but not be limited to the following information:

- Surveyor/sampler, date, and times of arrival at and departure from the site;
- Description of the field activity and summary of daily tasks;
- Names and responsibilities of field crew members;
- Sample collection method and number/volume of sample(s) collected;
- Information regarding activity changes and scheduling modifications;
- Field observations and weather conditions;
- Types of field instruments used and results;
- Field measurements made and quantities/volumes of material sampled;
- Scanning/surveying of equipment and materials; and
- GPS coordinates as appropriate.

Field data sheets and Radiological Survey forms may be used to record field information in addition to the use of log books.

6.4.5.2 Sample Numbering System

A unique sample numbering scheme will be used to identify each sample collected and designated for on-site and off-site laboratory analysis. The purpose of this numbering scheme is to provide a tracking system for the retrieval of analytical and field data on each sample. Sample identification numbers will be recorded on sample labels or tags, field data sheets and/or logbooks, chain-of-custody records, and all other applicable documentation used during the project.

6.4.5.3 Sample Labels

Labels will be affixed to all sample containers during sampling activities. Information will be recorded on each sample container label at the time of sample collection. The information to be recorded on the labels will be as follows:

- Sample identification number,
- Sample type (discrete or composite),
- Analysis to be performed,
- Type of chemical preservative present in container,
- Date and time of sample collection, and
- Sample collector's name and initials.

6.4.5.4 Chain-of-Custody Records

Chain-of-custody procedures implemented for the project will provide documentation of the handling of each sample from the time of collection until completion of laboratory analysis. The chain-of-custody form serves as a legal record of possession of the sample. A sample is considered to be under custody if one or more of the following criteria are met:

- The sample is in the sampler's possession,
- The sample is in the sampler's view after being in possession,
- The sample was in the sampler's possession and then was placed into a locked area to prevent tampering, and/or
- The sample is in a designated secure area.

Custody will be documented throughout the project field sampling activities by a chain-of-custody form initiated each day during which samples are collected. The chain-of-custody will accompany the samples from the site to the laboratory and will be returned to the laboratory coordinator with the final analytical report. Personnel with sample custody responsibilities will be required to sign, date, and note the time on a chain-of-custody form when relinquishing samples from their immediate custody (except in the case where samples are placed into designated secure areas for temporary storage prior to shipment). Bills of lading or air bills will be used as custody documentation during times when the samples are being shipped from the site to the laboratory, and will be retained as part of the permanent sample custody documentation.

Chain-of-custody forms will be used to document the integrity of all samples collected. To maintain a record of sample collection, transfer between personnel, shipment, and receipt by the laboratory, chain-of-custody forms will be filled out for sample sets as determined appropriate during the course of fieldwork.

The individual responsible for shipping of the samples from the field to the laboratory will be responsible for completing the chain-of-custody form and noting the date and time of shipment. This individual will also inspect the form for completeness and accuracy. After the form has been inspected and determined to be satisfactorily completed, the responsible individual will sign, date, and note the time of transfer on the form. The chain-of-custody form will be placed in a sealable plastic bag and placed inside the cooler used for sample transport after the field copy of the form has been detached. The field copy of the form will be appropriately filed and kept at the site for the duration of the site decontamination activities.

Chain-of-custody seals may also be placed on each cooler used for sample transport. These seals will consist of a tamper-proof adhesive material placed across the lid and body of the coolers. The chain-of-custody seals will be used to ensure that no sample tampering occurs between the time the samples are placed into the coolers and the time the coolers are opened for analysis at the laboratory. Cooler custody seals will be signed and dated by the individual responsible for completing the chain-of-custody form contained within the cooler.

6.4.5.5 Documentation Procedures

The tracking procedure to be utilized for documentation of all samples collected during the project will involve the following steps:

- Collect and place samples into laboratory sample containers;
- Complete sample container label information;
- Complete sample documentation information in the field logbook;
- Complete project and sampling information sections of the chain-of-custody form(s);
- Complete the air bill for the cooler to be shipped to off-site laboratory, if applicable;
- Perform a completeness and accuracy check of the chain-of-custody form(s);
- Complete sample relinquishment section of form(s) and place the form(s) into cooler;
- Place chain-of-custody seals on the exterior of the cooler; and
- Package and ship the cooler to the laboratory.

The following steps will be made upon receipt of the cooler at the subcontract laboratory:

- Inspection of contents,
- Complete requested analyses, and
- Transmit original chain-of-custody form(s) with final analytical results from laboratory.

6.4.5.6 Corrections to Documentation

Original information and data in field logbooks, on sample labels, on chain-of-custody forms, and on any other project-related documentation will be recorded in blue or black waterproof ink and in a completely legible manner. Errors made on any accountable document will be corrected by crossing out the error and entering the correct information or data. An error discovered on a document will be corrected by the individual responsible for the entry, as possible. Erroneous information or data will be corrected in a manner that will not obliterate the original entry, and corrections will be initialed and dated by the individual responsible for the entry.

6.5 Sample Packaging and Shipping

Sample containers destined for off-site laboratory analysis will be packaged in thermally insulated rigid-body coolers and will be stored in a secure area during the time period between collection and shipment to the off-site subcontract laboratory. These samples will be packaged, classified, labeled, stored, shipped, and tracked in accordance with current DOT regulations (e.g., 49 CFR 173 et. seq.).

6.6 Management and Retention of Records

Original copies of field data, field records, analytical data, training records, and other project-specific documentation will be retained by Perma-Fix.

6.7 Laboratory Analysis

Pace Analytical Services, Inc. (Pace) shall perform radiological analysis of solid and aqueous samples for characterization. The Pace Radiochemistry Laboratory has prior experience and is capable of providing the analytical services required to meet the project objectives. Pace is accredited by both Pennsylvania and Ohio and the National Environmental Laboratory Accreditation Conference (NELAC) for all of the project required analyses.

Solid and aqueous samples will be transported to off-site laboratories for analyses in accordance with documented laboratory-specific standard methods listed in the Analysis Methods column of **Table 7**.

Table 7. Summary of Sampling/Laboratory Analysis

Sample Type	Media/ Sample Type	Analytical Parameters	Analysis Methods	Frequency
Soil and Sediment Samples	Soil/soil-like	Gamma spectroscopy to identify TENORM radionuclides	USEPA 901.1 Modified	As necessary
Water	Aqueous (Grab)	Gamma spectroscopy to identify TENORM radionuclides	USEPA 901.1 Modified	As necessary

6.7.1 Spectroscopic Energy Lines

Radiological COCs for these samples may be quantified for activity concentrations directly via gamma decays, or inferred via gamma-emitting progeny, assuming a secular equilibrium state. **Table 8** lists gamma and x-ray emissions from site radiological COCs that may be used for determining soil activity concentrations. The list is broken down into direct emissions from the radiological COC itself or from its decay progeny, which can be used to infer the parent's activity.

Table 8. Spectroscopic Gamma Energy Lines for Site Radiological COCs

Radiological COC	Direct / Inferred	Inferred Nuclide	Photon Emission (keV), *Primary	Yield (%)	Sample HPGe MDA (pCi/g)[(a)]
Ra-226	Direct	Not Applicable	*186.2	3.59	0.5 – 2.5
	Inferred	Bi-214	609.3	46.3,	0.05
		Pb-214	1,764.5	15.8	0.04
			295.2, 351.9	19.2, 37.2	

Note: (a) The nuclide minimum detection activity (MDA) values stated in the table are from pre-remediation samples analyzed by the High-purity Germanium (HPGe) in a 1 liter Marinelli beaker counted for 15 minutes inside a lead shield.

Radium-226 may be measured directly by detection of its 186.2 kilo-electron volt (keV) energy line for high activity waste-sludge samples. However, the presence of U-235 can cause interference with direct Ra-226 detection since it has a gamma line of similar energy (185.7 keV). The short-lived equilibrium daughters of radium may be used to determine Ra-226 concentrations in the soil when a background level of Ra-226 is encountered, for example 1 pCi/g. However once the soil is disturbed, these short-lived daughters must be allowed to grow back in. The parent of these daughters, radon-222 (Rn-222), has a moderate half-life of 3.8 days, therefore requiring at least 21 days of progeny in growth to reestablish equilibrium. Gamma spectroscopy will also identify other gamma emitting radionuclides that may be present in samples.

6.7.2 Laboratory Quality Control

Since Pace is a Pennsylvania and Ohio State- and NELAC-accredited laboratory, they will utilize their own QC program including instrument source checks, matrix spikes, and counting duplicates.

6.8 Quality Assurance Program

The Perma-Fix Quality Management System (QMS) is attached as **Appendix E**.

7.0 WASTE MANAGEMENT PLAN

Perma-Fix will manage all waste in accordance with the latest Federal and State requirements, rules, regulations, ordinances, and laws and comply with the applicable requirements of XXX management will be contacted for coordination of waste transportation and disposal activities.

The Waste Manager will prepare the transportation and disposal documents including waste profiles and manifests as required for the transportation and disposal of the wastes. All truck drivers will have proper certification in place and be signatory to the daily POD and waste-related project documents. They will don proper PPE as specified by the approved plans and the SSHO. All trucks will bear proper placarding and signage, follow all posted speed limits and drivers will utilize seat belts at all times.

Should an incident, spill or release occur during shipment of waste, the PM or Waste Manager will notify XXX management within one hour. In addition, Perma-Fix will make any required notification to the appropriate local, State, and Federal regulatory agencies and remedy any situation arising from an incident, spill or release in accordance with applicable local, State, and Federal laws. Waste management tasks associated with the XXX response project will include sorting and segregation, packaging, transportation and disposal for the following identified waste streams:

Waste shall be segregated into the following categories:

- Radiologically contaminated waste,
- General C&D debris and waste, and
- Mixed waste with RCRA metals.

Radiological Material: The radiological material will be downsized as required and placed into the designated appropriate container. Waste containers and conveyances will be surveyed by an HPT, accounted for, and labeled as necessary, to meet the WAC. Perma-Fix will manage the container of radiological waste for ultimate disposition.

Mixed Waste with RCRA Metals: Any mixed waste radiological debris will be segregated from the non-RCRA debris and placed in separate containers. RCRA metals-contaminated radiological debris will be segregated, characterized, and placed into the designated container. All containers will have been surveyed by an HPT, accounted for, and labeled as necessary, to meet the WAC. Perma-Fix will manage the container of RCRA Metals-contaminated radiological waste for ultimate disposition.

General C&D Debris: The non-contaminated general debris resulting from the decontamination and preparation activities at XXX will be disposed of at a local landfill. A table of various disposition pathways is included in **Table 9** on page 36. A flow chart describing proper shipping name (PSN) determination for DOT compliance is shown in **Figure 4** on page 37.

7.1 Title 49 CFR Compliance for Low Level Radioactive Wastes, Low Level Mixed Wastes, and Hazardous Wastes

The Perma-Fix team will evaluate the waste generated during the XXX project by consistently implementing the following methodology for determining the regulatory requirements for managing the waste:

1. Review characterization data for both the radiological and chemical constituents that may be present.
2. If chemicals are present and they are "Pure Technical Chemicals," 49 CFR 172.101 will be reviewed to determine if the chemical is specifically listed. If not, the appropriate SDS will be used to determine the chemistry make-up and review the appropriate Hazard Class Definition beginning in 49 CFR 171.8.
3. If the waste is a mixture, mixture properties and components will be evaluated to determine the Primary Hazard Class in accordance with 49 CFR 173.2a. This evaluation will determine if the waste will be regulated under RCRA, Toxic Substances Control Act (TSCA) and or National Emission Standards for Hazardous Air Pollutants (NESHAP), and any applicable State regulations.
4. A determination will be made on whether or not the waste is Class 7 Radioactive Material.
5. When both the chemical and radiological properties are properly assessed, the Hazard Class will be determined.
6. Next, the constituents, both chemical and radiological, will be evaluated to determine if they meet the definition of a Hazardous Substance as provided in 49 CFR 172.101 Appendix A and/or Appendix B.
7. If the material meets the definition of a Reportable Quantity (RQ) for a Chemical Hazardous Substance, the appropriate shipping paper and marking requirements will be implemented for each package/shipment. If waste meets the definition of a hazardous substance, but does not meet the definition of radioactive material per 49

CFR 173.403, or any other hazard class, the hazardous substance will be given the appropriate DOT PSN in the Hazard Class 9 Category. The Class 9 PSN will determine packaging and transportation requirements.

8. Hazardous substances found at XXX will typically be transported as Class 9 shipments with a PSN of "RQ, UN3077, Environmentally Hazardous Substances, Solid, N.O.S, (Hazardous Constituent)."

8.0 DEMOBILIZATION

Once all decontamination and survey activities are complete, Perma-Fix will begin demobilization activities in a phased approach as various site activities are concluded. Equipment and materials shall be surveyed and removed from the site once they are no longer needed. Demobilization shall be considered complete when Perma-Fix has:

- Removed equipment and material from the site.
- Performed a final walk down of the site with XXX and closed out all punch list items to the client's satisfaction.
- Provided the required project records, including waste shipments, to the PM.

Perma-Fix shall implement good housekeeping measures throughout the project. The job site shall be kept clean and free of debris to the extent possible. This "clean as you go" technique will not only minimize the risk for potential injury, but should also decrease the time necessary to perform site cleanup at job completion.

9.0 REPORTING

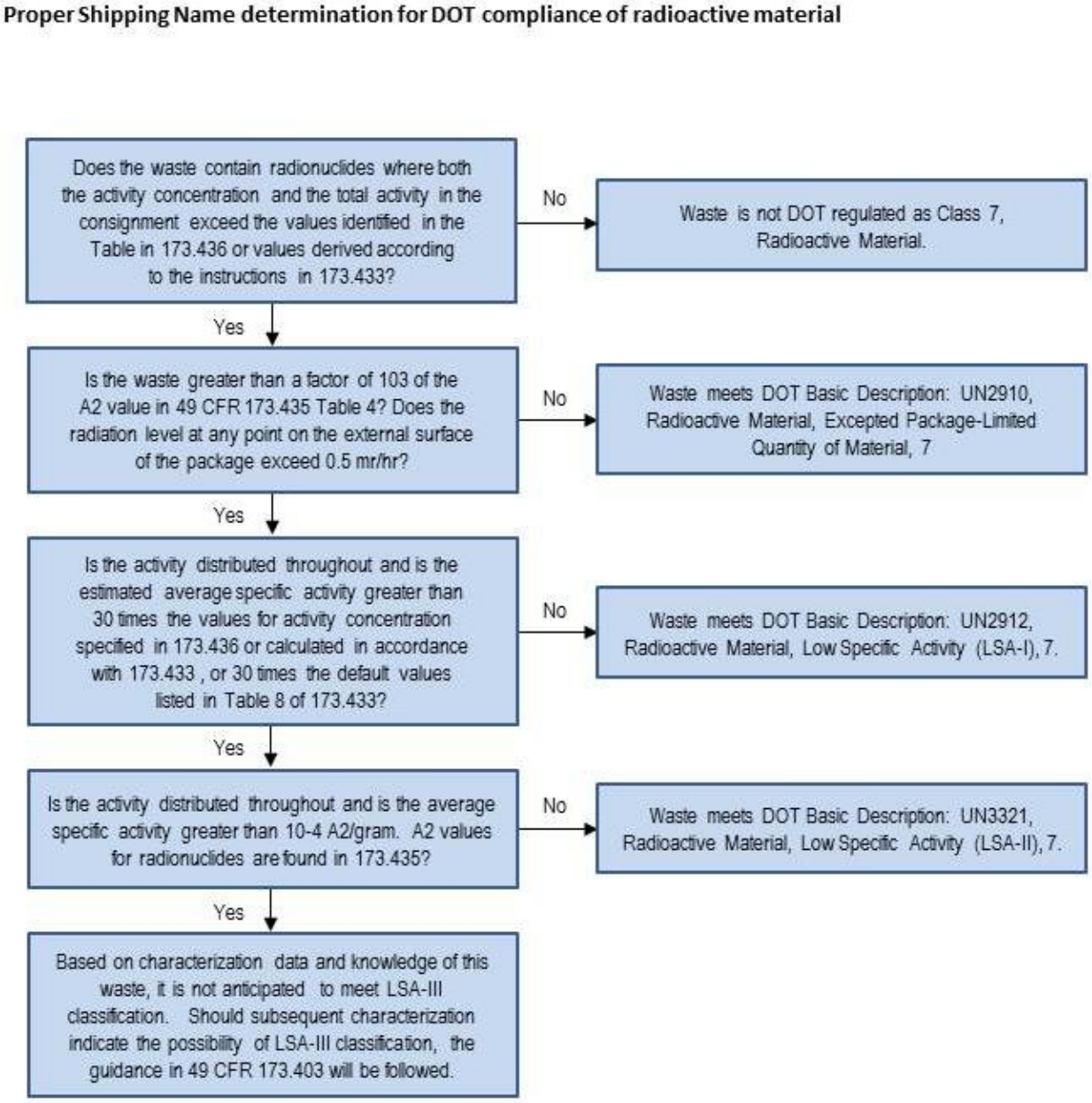
Upon completion of individual FSS units, FSS documentation will be submitted to PADEP to support the unconditional release decision of structural or land areas. These reports will be submitted either individually or in groups of SUs as expeditiously as possible after completion.

The FSS Reports will include a summary of the survey activities performed, presentation of all survey and sampling results, a data evaluation, and conclusion.

Table 9. Disposition Pathway Options

Waste Disposition Facility	Site	Waste Acceptance Criteria	Transportation	Rationale/Cost Savings over next best option
US Ecology Idaho (USEI) Subtitle C Landfill	US Ecology Idaho, 20400 Lemley Rd., Grand View, ID 83624	Can dispose of Ra-226 up to 1,500 pCi/gm and average waste total activity concentration of 3,000 pCi/gm	Lined dump trucks transloaded nearby into lined and lidded gondolas appropriately manifested (Class 7, Class 9 as applicable). Waste can also be loaded into intermodal containers and transloaded to ABC rail cars.	Lowest cost option using railcars. Gondola rail cars can either be loaded on-site or transported to Shale Mountain Resources licensed trans load facility in NE Ohio.
Waste Control Specialists, LLC (WCS) Subtitle C Landfill	Exempt Cell Waste Control Specialists, 9998 West State Hwy 176, Andrews, TX 79714	Established limits table provides quick determination of sum of ratios (SOR) comparison of candidate waste with site WAC criteria	Must receive as packaged waste for facility's material handling for sampling and in situ cross-characterization methods, unlike the above option. Can still trans as eight 9-yd^3 lift liners in lidded rail gondola car, or two per over the road (OTR) flat-bed, and can always take in more robust intermodal containers (IMCs). Requires 540/541 manifest.	Lower cost option than ES and WAC is open to Class A waste limits; less transport distance than USEI and ES, but higher disposal and packaging costs than US Ecology. Debris is required to have undergone a volume reduction factor of 3 prior to disposal at WCS, and they now offer shredding at the site as an option.
Energy*Solutions* (ES) Licensed Radioactive Waste and Permitted Hazardous Waste Disposal Facility	Energy*Solutions*, Interstate 80, Exit 49, Grantsville, UT 84029	Can dispose of Ra-226 up to 10,000 pCi/gm	Lined dump trucks or packaged material transloaded nearby into lined lidded gondolas appropriately manifested with NRC form 540 and 541 (Class 7, Class 9 as applicable). Waste can also be loaded into IMCs and transloaded to ABC rail cars. Smaller quantities of material can be sent in drums or B-25 Boxes via truck.	Direct rail served and has landfill-owned ICMs and ABC rail cars, as well as high-sided rail gondola cars. Fully licensed commercially operated low-level radioactive waste disposal landfill. Lower than the Class A waste limits and cost is significantly higher than WCS or US Ecology. Less sampling frequency than required by WCS.

Figure 4. DOT Flow Chart for Radioactive Material Shipment

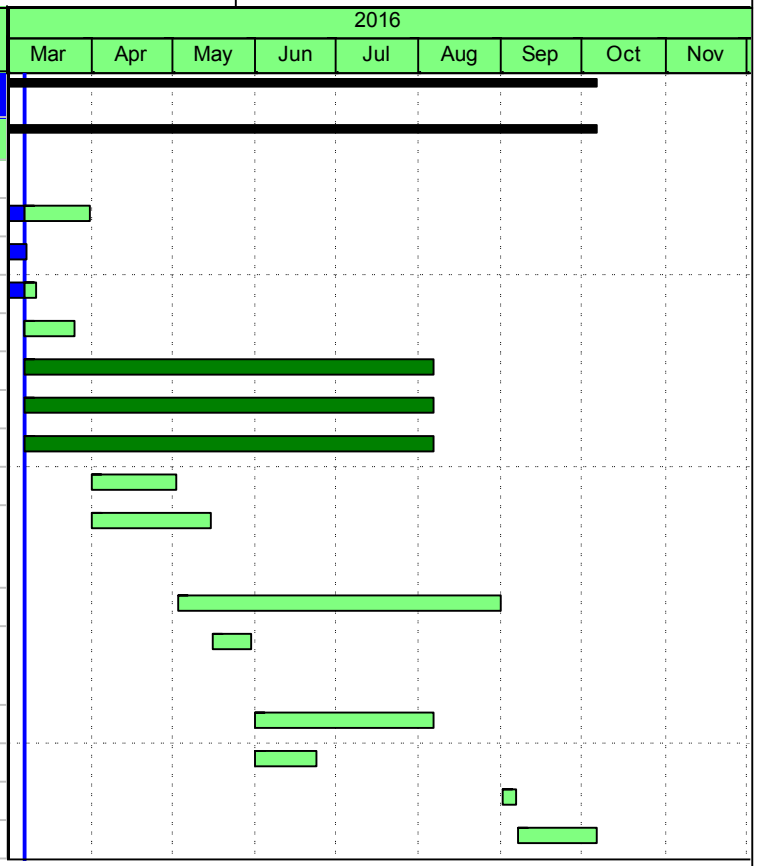


APPENDIX A
Schedule

PSC Response - Beaver Falls

Data Date: 3-7-16

Activity ID	Activity Name	Dur	Start	Finish
PSC Response - Beaver Falls		208	2-24-16 A	10-6-16
Beaver Falls, PA		208	2-24-16 A	10-6-16
A1290	NTP	1	2-24-16 A	2-24-16 A
A1340	Develop DWP	25	2-24-16 A	3-31-16
A1300	Mobilization	12	2-25-16 A	3-7-16 A
A1310	Site Walk & Site Setup	16	2-25-16 A	3-11-16
A1320	Initial Survey and Security	19	3-7-16 A	3-25-16
A1330	Support Hazard Controls/Mitigation	140	3-7-16	8-6-16
A1410	Waste Packaging	140	3-7-16	8-6-16
A1420	Shipping and Disposal	140	3-7-16	8-6-16
A1350	Sorting and Segregation of outside debris piles	30	4-1-16	5-2-16
A1370	Intrusive Sampling and Characterization (process E&M)	42	4-1-16	5-15-16
A1430	Final Survey	110	5-3-16	8-31-16
A1380	Develop Remediation Strategy (Decontamination vs. Removal)	14	5-16-16	5-30-16
A1390	Decontaminate E&M	61	6-1-16	8-6-16
A1400	Remove/Strip-Out E&M	21	6-1-16	6-23-16
A1440	Demobilize	5	9-1-16	9-6-16
A1450	Prepare & Submit Final Report	28	9-7-16	10-6-16



Remaining Level of Effort
Actual Work
Actual Level of Effort
Remaining ...

APPENDIX B
Activity Hazard Analysis

Activity Hazard Analysis (AHA) - 01 – Mobilization and General Work Activities	**Hazard Analysis (HA)**
	Originating Organization: Perma-Fix Environmental Services, Inc.
	Subcontract No:
Job Description/Title: XXX Response	**Date of Analysis:** 2/28/16
KEY PERSONNEL: **Project Manager** : Stace Johnson **Site Radiation Safety Officer:** Jeff Knight **Site Safety & Health Officer**: Andy Williams	**Training Requirements:** Fall Protection, Hearing Protection, Radworker II. In addition, First Aid and CPR for Project SSHO. **Medical Monitoring and Surveillance Requirements:** Annual Medical Surveillance for Employees.
Emergency Communication	Radio and cell phone.
Facilities Covered	Massillon, OH; Canton, OH; Beaver Falls, PA
Emergency Assembly Points	Per drawing.
Shelter-In-Place Locations	Per drawing.
Permits Required	Radiological Work Permit.
Special Instructions	**Preventive Measure:** Prior to implementation, Perma-Fix will evaluate controls specified in all permits to ensure that there are no conflicts and will STOP WORK if conflicts are found until the affected permits are revised.
	Radiological contamination: A characterization survey will be performed at each site to determine rad conditions.
	Alarming dosimeter: N/A
	Fire patrols: N/A

HA Preface:

**** ALL EMPLOYEES HAVE SUSPEND/STOP WORK AUTHORITY –** All employees, are reminded that they have both the authority and responsibility to stop work when they perceive that an unsafe condition exists that threatens themselves, their coworkers, or the environment. Every employee has the right to a safe workplace, safe working conditions, and to understand the hazards of the workplace.

ALL INJURIES, ILLNESSES, AND INCIDENTS MUST BE REPORTED TO THE SITE ENVIRONMENT, SAFETY, AND HEALTH REPRESENTATIVE IMMEDIATELY. See the Emergency Response Plan included in the Site Environment, Safety, and Health Plan.

ALL PERSONNEL ARE ENCOURAGED TO ASK QUESTIONS AND OFFER SUGGESTIONS. Feedback on work methods, procedures, hazard controls, and preventative measures during all phases of work is essential to continuous improvement of work processes and is a part of the Integrated Safety Management System. Help us make your job easier and safer!

Signature of Site Safety and Health Manager: **Date:**

Task/Activity	Hazards	Preventive Measures and Responses
General Activities	Unauthorized Personnel / Visitor Control	• Access to regulated areas is limited to personnel meeting the requirements for protective clothing and equipment, medical surveillance, training and respirator fitting as required. Site boundaries shall be established that outline the appropriate training and personal protection required to enter different areas of the project, i.e. Rad Worker Training for Rad Workers. • Site boundaries will be enforced and controlled so that unauthorized personnel do not enter the controlled work areas. • All site visitors will be required to sign and visitor's log, which will be maintained and the site access/entry point. • The SSHO will verify visitor's training and PPE prior to allowing them entry to the site. • Visitors with inadequate training may be allowed entry to the site – however, they will require a full-time escort, and entry into active work areas may be restricted (even with escort). • All visitors will be required to follow the PPE and posted instructions with regards to the work being performed in the area.
	Radiological Contamination	• Radiological contamination is present on the project. • Entry into radiologically contaminated areas will be controlled through a Radiation Work Permit (RWP). The RWP will prescribe the necessary PPE, controls and work steps to mitigate the contamination hazard – workers must be trained to and sign off on the RWP prior to entry into contaminated areas. • Mitigation and/or decontamination may include wet-wipe, HEPA vacuum, minor removal, and other methods approved by RSO. • Visitors will not be allowed entry into radiologically controlled areas without verified training, signature on the active RWP and/or proper PPE. • Radiologically contaminated areas will be cordoned off from the remainder of the work areas using barricades, warning tape, signs and postings. • Entry into radiologically contaminated areas will be controlled by the RCTs using the RWP process.
	Radiological Emergency	• In the event of a radiological emergency, all personnel shall follow the instructions of the SSHO and RSO as given over communication devices.
	Exposure to Radiation and Radioactive Material	• All workers who must perform work within a Radiological Area shall have at least a current Radiation Worker II training certificate or be under escort of a trained Radiation Worker. • Smoking, chewing tobacco or gum, eating, drinking, or use of cosmetics is prohibited in radiological areas. • **HOLD POINT**: If work is to be conducted in radiological areas, contamination areas, systems with internal contamination, or as determined by RADCON, request an RWP from RADCON. • Personal protective equipment shall be specified in the Radiation Work Permit (RWP). • Radiation exposure shall be monitored by TLD or ED. • A Radiation Work Permit is required for operations as determined by RADCON and area posting. All personnel shall follow requirements outlined in the RWP and the directions given by RADCON personnel. • Personnel shall sign the RWP prior to each entry. • Personnel shall record their entry and exit times on the RWP. • Personnel shall review the RWP prior to each entry to check for any changes to the RWP, check its expiration date, and obey all area postings.

Task/Activity	Hazards	Preventive Measures and Responses
General Activities (cont'd)	Exposure to Chemicals	• All chemical products used in the performance of project completion shall have an SDS on file, the appropriate PPE available, and Industrial Hygiene Monitoring based on the SSHO recommendations. • An MSDS file shall be kept onsite so that personnel can review the SDS at any time. • During the AHA briefing, personnel shall be informed of the location of the SDS files.
	Events Causing Injury/Illness and Near Miss Events	• Any event that results in an Injury/Illness shall be reported to the SSHO and Project Manager who in response shall perform an investigation and evaluation using ISMS principles and fundamentals to determine the cause and implement corrective measures, if needed, to prevent reoccurrence. • Any small injury, even a First Aid, shall be reported to the SSHO and PM immediately.
	Slips, Trips, and Falls	• Determine the best access route before transporting equipment. • Basic housekeeping requirements shall apply to the job site. • Continually inspect the work area for slip, trip and fall hazards and be aware of the changes in surfaces and conditions that may occur during demolition.
	Eye/Head/Foot Injuries from Work Activities	• Safety glasses meeting ANSI Z87.1 standards are required at all times in work areas. • Dark safety glasses are not to be worn inside a building. • Post flagging and signs around the area that say "Danger Overhead Hazard." • Hard hats with the brim facing forward are to be worn at all times. (Iron workers can wear hard hats with rim facing backward only while in Hoisting/Rigging operations or while welding/cutting with a welding hood). • Safety shoes are required in all work areas with the exception of the office and break trailers. • Break areas and designated smoking areas may be exempt from PPE requirements. These areas will be clearly marked as break/smoking areas and workers will be trained as to their locations. All areas will be considered non-exempt from the PPE requirements unless specifically posted as such.
	Injury Due to Stepping, Lifting, and Carrying	• Do not step over barriers and boundary control tapes or ropes. Use a gate or make one. Stepping over is a trip hazard. • Keep walkways clear of materials, scrap, and debris. • Wear safety shoes with toe protection that are high enough to protect ankles. • Do not wear worn-out shoes that need sole or heel replacement. • Look, before you step to be sure you have a solid place to step. • Do not step on materials, debris, or scrap. • Do not jump over objects or obstructions. Go around. • Do not jump off docks, other raised places, or steps. • Do not carry over 50 pounds without assistance. • Do not carry items that block your view. • Use proper lifting techniques to prevent back injuries. Lift using the power of the legs and not the back. Squat down, pull the load close to the trunk, and get up slowly.

Task/Activity	Hazards	Preventive Measures and Responses
General Activities (cont'd)	Injuries Caused by Improper Manual Material Handling	• Consider size, shape, and weight of the object. Lifts greater than 50 pounds require assistance or the aid of mechanical equipment. • Use safe lifting techniques such as keeping back straight, feet planted for balance, bend at the knees, keep the load close and low to your body, lift smoothly, and do not twist. • Do not lift a load that cannot be seen over. • Gloves and the object should be free of dirt or grease that could prevent a firm grip. • Always evaluate pinch hazards prior to handling material or any other activity that involves possible pinch point hazards.
	Hand Injuries (abrasions, cuts, lacerations, etc.)	• Leather work gloves are to be worn at all times while handling rough material or equipment and tools that present hazards to hands. • Be aware of the presence of protruding nails, jagged edges that are typically exposed on materials during demolition.
	Injury from Falls	• All work that is 6-feet above the floor, deck, or platform, requires 100% fall protection requirements implementation and compliance. • Personnel working in scissor lifts will be required to follow manufacturer's instructions when operating the lift. • Keep fall protection equipment free of dirt, grease and chemicals that can reduce integrity. • Personnel shall have fall protection training prior to use of fall protection devices. • Do not do any work while sitting or standing on any surface that is six or more feet above the floor, deck, or landing below, without fall protection, unless the surface is an approved work surface protected by hand rails and kick boards. • Inspect all fall protection equipment before each use. • Do not leave fall protection equipment on the ground. • Store fall protection equipment in a dry storage area, hanging up.
	Fire	• In case of fire, the fire department shall be notified immediately. • In case of fire, evacuate the work area. All personnel will report to the rally point designated by the SSHO. • Fire extinguishers of the appropriate size and type shall be located at the project site. (20 lbs, multi-purpose ABC at points of fuel and flammable storage points). Perma-Fix shall provide and maintain these extinguishers. • When an employee finds damaged or broken fire extinguishers he/she shall mark it in some way so it is not used again until it can be disposed for repair or disposed from the work site. • No hot-cutting or welding will be allowed on the project. • Fuel not in a vehicle or motorized device, shall be in an approved metal fuel can with safety cap and flash arrestor. • Fire retardant poly shall be used for all abatement enclosures. • Flammables are to be stored at least 50 feet away from a source of ignition or in a fireproof cabinet. • Smoking is allowed only in designated areas. • Personnel shall have "Hands On" training in the use of fire extinguishers as necessary.

Task/Activity	Hazards	Preventive Measures and Responses
General Activities (cont'd)	Fall from Ladder	• All ladders shall be inspected prior to each use. • When an employee finds damaged or broken ladder, he/she shall mark in some way so the ladder is not used again until it can be disposed for repair or from the work site. • Damaged or broken ladders shall not be used and they are to be marked by tape or tag and removed from service. • Marked damaged and broken ladders are to be reported to the SSHO. • Secure, by tying off, extension ladders so that they do not slip during use. • Use fall protection when above six feet off the deck and on an extension ladder, unless the task only requires one hand and the other hand can be used to hold onto the ladder. If fall protection is not used, maintain three points contact with ladder. • Be sure that an extension ladder is properly placed, one foot out at the base for every four feet of height. • Be sure that the ladder extends three feet above any point of transfer on and off at the top of the ladder. • Do not lean out to the side while working from an extension or step ladder. • Have an assistant hold any extension ladder that is not tied off until the ladder is tied off. • Have an assistant while working from a step ladder if the task is not a short up and down. • Do not stand on the last step and the top of a step ladder. • Do not place any ladder in a door or walkway without posting warnings in any direction required to warn oncoming traffic. • Take all ladders down at the end of the shift unless the ladder is an extension ladder that is tied off and is to be used during the next shift. • Store all ladders were they will not be damaged and will not cause a trip hazard.
	Electric Shock	• A Ground Fault Circuit Interrupter (GFCI) shall precede all connected extension cords and electric tools. • No work shall occur on existing wiring without verification of deactivation. • Personnel shall obtain an excavation permit when necessary. • Abandoned and active utilities (above and underground) shall be marked and identified with colors identifying status. • Any excavation in soil by air-hammer or excavator shall not be done until the equipment has been connected to an approved electrical ground.
	Noise	• Potential high noise sources (e.g., generators, heavy equipment, etc., shall be identified). • Hearing protection shall be required where noise levels exceed 85 dBA. Employees are to follow the Perma-Fix Hearing Conservation Program which considers the ACGIH guidelines of noise exposure/sampling. • Should noise levels (w/o quantitative data) be in question, employees shall use hearing protection at all times unless specified otherwise by the SSHO – use good judgments!

Task/Activity	Hazards	Preventive Measures and Responses
General Activities (cont'd)	Unsafe Equipment, Tools, Ladders, and Electric Cords	• Employees shall inspect all equipment tools, ladders, and electric cords prior to each use. • When an employee finds a defective and/or damaged item, he/she shall "Tag Out" the item for repair/removal from the site. • Small tools shall not be carried by hand up ladders accessing the roof. Implement the use of tool belts, rope-bucket tie-offs. • Extension cords, which have faulty plugs, damaged insulation or are unsafe in any way, shall be removed from service. • Electric cords shall be free of breaks, splices, or taped repairs or otherwise disposed for disposal. • NO equipment is allowed to run over electrical cords.
	Inadequate Illumination	• Illumination shall meet the General Construction Lighting requirements of five-foot candles. • Additional lighting (i.e. portable lighting) shall be added as needed.
	Ergonomics – Repetitive Motion and Vibration Injury	• To reduce and/or eliminate cumulative trauma disorders personnel will be encouraged to find alternative methods for performing repetitive motion tasks such as change of position, using different hand positions, use of PPE, and using a support and good posture. • The use of job/task rotation may also be used to eliminate these hazards.
	Inadequate Housekeeping Causing Hazards	• Keeping all areas and walking/working surfaces neat and clear of unnecessary materials, tools, debris, etc. • Placing materials, tools, etc. in areas that will not cause tripping hazards. • Picking up nails and any other objects that cause injury to personnel or damage to vehicles. • Placing trash in provided and marked trash receptacles. • Trash receptacles shall be emptied before becoming over full. • Placing debris in proper refuge containers, daily. • Not allowing combustible materials to accumulate, daily cleanup is required.
	Temperature Extremes	• Symptoms of heat/cold stress shall be stressed in toolbox meetings, pre-job activities, and work planning and personnel will be briefed in recognizing the signs and symptoms of temperature extremes.
	Weather	• All personnel shall observe weather conditions and warnings. • The SSHO and/or Project Manager shall determine when workers need to take shelter away from the work site by being alert to changing and threatening weather conditions such as heavy rain, strong winds, and lightning.
	Pest Hazards	• Special precautions shall be taken for animals (i.e., checking areas prior to start up to ensure area is clear of skunks, snakes, etc.). • SSHO shall inform all personnel regarding the potential of pest hazards so that all personnel are aware of potential exposure to insect pests such as chiggers, ticks, mosquitoes, spiders, and bees/wasps. • Information shall be provided to personnel on identification of poisonous snakes, plants, and insects that may be encountered. • Insect repellant shall be available for all employees as needed. • If bird or rodent droppings are present within a work area, personnel donning respiratory protection will remove the droppings by sweeping and place in a covered container. The area will be sanitized using a 10% bleach solution prior to lifting the need for respiratory protection.

Task/Activity	Hazards	Preventive Measures and Responses
General Activities (cont'd)	Hazards Associated with Motorized Wheeled Equipment On-site – Combustion Engines	• All equipment is subject to radiological surveys prior to exit from the facility as determined by the appropriate radiological personnel. • All motorized-wheeled equipment is subject to safety inspections prior to entry into the site. • All motorized shall be in good repair without cooling, hydraulic, lubricant, and fuel leaks. • Only a qualified operator shall operate any motorized-wheeled equipment. • All mobile equipment (i.e. excavators, forklifts, etc.) shall have fire extinguishers mounted where they are readily accessible to the operator. • Extreme caution shall be taken when refueling vehicles and equipment. Equipment shall be cool prior to refueling. • All motorized, wheeled work equipment shall have the required and properly inspected fire extinguishers. • Prior to initial operation for the day, all motorized-wheeled equipment and trucks over one ton capacity, shall be inspected daily using the Daily Equipment Operator Checklist that is signed by the operator. • When an employee finds damaged or broken motorized vehicle, he/she shall mark it in some way so the motorized vehicle is not used again until it can be disposed for repair or disposed from the work site. • In the event, the operator finds any damage or problem, he/she shall inform the Project Manager or SSHO. • Seat belts and other applicable operator restraints shall be worn at all times of operation. • A spotter will be used as needed when moving motorized equipment. • No motorized equipment is allowed to enter a street that is not a part of the controlled work site unless a spotter is there to control traffic. • Where there is frequent utilization of a street adjacent to a work site, appropriate signs shall be used to warn traffic that normally uses the street. • Employees needing to use motorized equipment inside a building shall inform the Project Manager and SSHO. • The SSHO shall ensure that gas or propane engines are not operated inside buildings unless there is monitoring for carbon monoxide or adequate ventilation. • All stationary or small engine devices will have fire extinguishers located adjacent to the work area (within 20 feet). • No stationary or small engine device shall be fueled until it is turned off and allowed to cool. • No equipment is allowed to run over any electric or ground wire.
	Untrained Operators	• Only qualified operators shall operate heavy equipment. • Proof of qualifications shall be documented and available for review.
	Actives Involving Work with or Near Electrical Tools or Equipment	• No work (such as changing blades) is allowed on any device, tool, conduit, or electrical cabinet, unless the device, tool, conduit, or cabinet, has been totally unplugged, been locked out under approved "Lock-Out-Tag-Out" procedure, or has been marked for removal after it has been completely isolated from any electrical power source.

Task/Activity	Hazards	Preventive Measures and Responses
General Activities (cont'd)	Electrical Shock from Unsafe or Damaged Electric Tools, Extension Cords, and Other Electric Items Used on the Work Site	• Portable electric tools and all cord and plug connected equipment shall be protected by a Ground Fault Circuit Interrupter (GFCI) device. • The Site S&H Officer shall visually inspect ALL electrical tools, portable hand tools, extension cords, and GFCI devices, for defects prior to their initial use on the work site. • Any electrical item found with a defect shall be tagged with a DO NOT USE tag and the item shall be placed in a holding area until the item is removed from the work site. • Portable electric tools, which are unsafe due to faulty plugs, damaged cords, or other reasons, shall be removed from service. • Tools shall be unplugged while servicing or changing blades/attachments. • Safety devices shall be functioning properly and cannot be modified. • The user prior to each use shall inspect electrical tools, portable hand tools and extension cords. • Electrical installation, repairs and maintenance shall be performed only by qualified individuals.
	Hazards from Using and/or Refueling Generators	• All generators shall be operated in accordance with manufacturer's instructions. • Generators shall be inspected and accepted by the SSHO prior to use. • No smoking or spark sources shall be allowed near generator refueling operations. • Personnel shall ensure that the dispenser nozzle stays in contact with the fuel tank fill tube during refueling. • Personnel will at no time lock the nozzle trigger in the open position. • Engines shall be turned off during refueling – engines will be provided enough time to cool down prior to refueling. • Smoking shall be prohibited within 50 feet of refueling operations. • Refueling will only be conducted in designated locations. • Check equipment for leaks and repair if necessary prior to use. • Avoid positioning equipment over or near unprotected storm drains, streams, etc.
	Electric Shock from Unsafe Extension Cords	• All extension cords shall be protected by GFCI device. • No extension cords shall put into service until it has an initial inspection. • Prior to each use employees are to inspect any extension cord for defects. • Extension cords, which have faulty plugs, damaged insulation, or are unsafe in any way, shall be removed from service; the employee finding a defective and/or damaged item shall identify it by taping or tagging as to why it is defective so the item is not used again until it can be disposed for repair or disposed from the work site. • Extension cords shall be protected from damage from sharp edges, projections, pinch points (doorways and walkways) and vehicular traffic. • Any electric cord that goes through a door or wall shall be protected by a nonconductive sleeve. • Extension cord connectors shall be kept out of water. • Extension cords shall be suspended only with a non-conducive support (rope, plastic ties, etc.). No wire shall be used to hang electrical cords. • No equipment is allowed to run over extension cords. • Any electric cord in place more than one shift shall be hung above the floor traffic if in motorized vehicle traffic area.

Task/Activity	Hazards	Preventive Measures and Responses
General Activities (cont'd)	Electric Shock Due to Use of Unsafe Temporary Lighting	• Temporary lighting shall be used with a GFCI device. • Temporary lighting drops shall be inspected frequently for defects. • All bulbs on temporary lighting systems shall have a protective cage. • All light sockets shall be occupied. • All temporary lighting with than one lamp shall be hung above floor traffic. • Any one lamp drop cord that is to remain after the end of one shift shall be hung above floor traffic.
	Fire Caused by High Temperature Bulbs	• Portable/temporary quartz and halogen lighting fixtures can become extremely hot and should be secured and positioned so that contact with ordinary combustibles is prevented. • Lamps and light bulbs shall be covered by a protective shield or shroud. • Temporary light drops shall be kept up above floor traffic.
	Injury Using Hand Tools and Equipment	• Before each use, any hand tool or equipment shall be inspected for defects. When an employee finds damaged or broken hand tools or equipment he/she shall mark in some way so the item is not used again until it can be disposed for repair or disposed from the work site. • Marked damaged and broken tools are to be reported to the SSHO. • Any instructions, manuals, or tags that come with specialized and unfamiliar tools or equipment shall be given to the SSHO for placement in the onsite equipment tool record. • Specialized and unfamiliar equipment shall only be operated by a user that has reviewed and signed-off that they have read the equipment's operation manual. • No hand tool or equipment is to be used unless the operator has been trained in its operation. • Hand tools and equipment are to be used only for the use they were made to do. • Hand tools and equipment shall be used in a safe manner and with all manufacturers' supplied guards in place. • Ear protection shall be used with any hand tool or equipment that makes a noise at or greater than 85dBA. • All operators are required to use the required ear protection without being reminded. • All hand tools and equipment are to be picked up and stored in their proper storage places at the end of the shift. • Do not leave hand tools and equipment in walkways or where they are a snag or trip hazard. • Use leather work gloves as required – gloves should be puncture and cut resistant. • Do not cut remove any conduit or pipe unless it has been marked and approved for removal. • Report any injury that occurs while using hand tools or equipment, even a small injury, to the SSHO.

Task/Activity	Hazards	Preventive Measures and Responses
General Activities (cont'd)	Bodily Injuries While Erecting Site Boundary and Control Barriers	• Utilize the above stated preventive measures to prevent and control bodily injury. • Establish gates in barriers to prevent trip hazards. • Utilize proper lifting techniques as stated above.
	Damage to Equipment During Erection of Boundary Controls	• Utilize the above stated preventive measures to prevent and control damage to equipment.
	Injury to the Public and Unauthorized Individuals	• Post on site control barriers signs that warn and restrict unauthorized entry. • Utilize gates and keep them closed. • Replace any barrier that has been taken down for equipment entry or exit after the equipment has entered or exited. • Utilize ground personnel to control entry any time barriers are taken down unless otherwise authorized.
	Drainage, Runoff, or Spills Damage the Environment.	• Erect silt fencing as necessary. • Place straw bales to filter silt and control runoff. • Cover drains with silt clout and anchor in place with straw bales. • Place spill kit on site. • Maintain environmental controls during the duration of the project. • Inspect all equipment for leaks prior to start of work and at the end of the day.

Print your name, badge number, signature, and date to indicate you have read and understand the AHA.

Name	Badge Number or Last Four Digits of SSN	Signature	Date

APPENDIX C

Radiation Protection Plan

(The RPP is an approved Corporate document.)

	SAFETY AND ECOLOGY CORPORATION		
TITLE:	**Radiation Protection Program Procedure**	**NO.:**	RP-100
		PAGE:	1 of 6
		DATE:	May 2013

APPROVED:

5/31/13
Technical Services Manager Date

5/31/13
Corporate Certified Health Physicist Date

1.0 PURPOSE

This administrative procedure describes the major elements of the Radiation Protection Program for Safety and Ecology Corporation (SEC). As applicable, this administrative procedure references sections in the Radiation Protection Plan and project procedures which describe the program in more detail.

2.0 APPLICABILITY

These program descriptions apply to personnel who plan, review, supervise, or perform work involving radiation protection activities during remediation.

3.0 REFERENCES

References are listed in the specific Project Procedures that comprise this Radiation Protection Program.

4.0 DEFINITIONS

Radiation Work Permit (RWP): A document or series of documents prepared by Radiation Protection to inform workers of the radiological and industrial hygiene conditions that exist in the work area and the radiological requirements for the job.

Radioactive Material: Material activated or contaminated by the operation or remediation of the site and byproduct material procured and used to support the operation or remediation.

Radiological Area: Any area within a Restricted Area which require posting as a Radiation Area, Contamination Area, Airborne Radioactivity Area, High Contamination Area, or High Radiation Area.

Restricted Area: An area to which access is limited to protect individuals against undue risks from exposure to radiation, radioactive materials, and chemical contaminants. All posted radiological or chemical areas are Restricted Areas.

5.0 RESPONSIBILITIES

5.1 Radiation Safety Officer (RSO)

The RSO advises project management on all aspects of Radiation Protection and Operational Health Physics. The RSO directs all radiological safety activities on the project. The RSO has the authority to suspend operations and / or restrict personnel access at the project as a result of nonconformance to this SSHP, or other applicable regulations, and when radiological conditions change beyond the scope of an HWP. The RSO is responsible for:

- Implementing and ensuring compliance with RPP's policies and procedures.
- Inspect work activities to ensure operations, including off-normal activities, are being conducted according to the facility or project requirements, applicable federal regulations, and industry accepted As-Low-As-Reasonably-Achievable (ALARA) principles.
- Reviewing and approving work plans, Radiation Work Permits, and RPP procedures.
- Trending radiation work performance of project personnel including contamination and radiation exposure control.
- Identifying, reviewing, and documenting nonconformance, their causes and corrective actions for incidents associated with radiation protection.
- Ensuring an effective ALARA Program including conducting onsite radiation safety and health briefings.
- Ensuring documentation of any RPP safety violation.
- Reviewing survey data.
- Conducting briefings concerning radiological work activities.
- Ensuring that radiological records are complete, clear and legible, meet the intended purpose, and are regularly transmitted to document control for archive.
- Ensuring Restricted Areas are correctly identified, posted and marked.
- Performing or coordinating regular internal audits of the RPP.

5.4 Radiation Protection Technicians (RPTs)

RPTs report directly to the RSO. RPTs are assigned by the RSO to provide support to each major field activity for implementation of RPP requirements. RPTs provide guidance in RPP matters to field personnel. RPTs have stop-work authority for radiological safety matters and activities that could result in an unsafe condition being present. RPTs are responsible for the following:

- Conducting routine and job-specific radiological surveys (i.e., radiation, contamination, and airborne radioactivity).
- Establishing radiological postings.
- Implementing the personal protective equipment (PPE) and respiratory protection programs for the purpose of keeping radiation exposures ALARA.

- Maintaining and operating portable Health Physics survey instrumentation used in the performance of Radiation Protection (RP) activities.
- Performing unconditional release surveys of material from the restricted area.
- Performing transportation radiological surveys according to applicable U.S. Department of Transportation (DOT) regulations.
- Assisting the SSHO with IH&S monitoring and inspections to a level commensurate with training and experience.

5.5 Project Supervisors

All Project Supervisors are responsible for:

- Ensuring personnel under their direction comply with RPP requirements.
- Providing information on projected work activities to the RPP organization.
- Notifying RP personnel of any radiological problems encountered.
- Ensuring workers are prepared for tasks with tools, equipment and training to minimize time spent in radiological areas.

5.6 Project Radiation Workers

All Project Radiation Workers and individuals entering radiologically controlled areas are responsible for:

- Obeying promptly “stop-work” and “evacuate” orders from RP personnel and the SSHO.
- Obeying posted, oral and written radiological control instructions and procedures, including instructions on Radiation Work Permits and those in the SSHP.
- Immediately reporting lost dosimetry devices to RP personnel.
- Reporting medical radiation treatments to the RSO and supervisor.
- Keeping tack of personal radiation exposure status to ensure that administrative dose limits are not exceeded.
- Notifying RP personnel of faulty or alarming radiation protection equipment, and unsafe radiological conditions.

6.0 PREREQUISITES

None

7.0 PRECAUTIONS AND LIMITATIONS

None

8.0 APPARATUS

None

9.0 RECORDS

None

10.0 PROCEDURE

10.1 Radiation Protection Organization

1. The RPP Organization will provide appropriate personnel and resources to verify and maintain a radiologically safe working environment.
2. RPP staffing levels will be periodically reviewed to ensure that adequate staffing levels are maintained consistent with current and planned remediation activities.
3. The Project RPP Organization will have access to engineering and other personnel needed to support the Radiation Protection Program.
4. The development and control of RPP Project Procedures will be in accordance with the following guidelines:
    - Clearly defined scope, tasks, applicability, limiting conditions, precautions, consideration of special controls, reference to acceptance criteria and quality requirements.
    - Clearly understood text, using standard grammar, nomenclature and punctuation, concise instruction steps in a logical sequence, and references.
    - Review, approval, issuance, and control of changes and permanent revisions.

10.2 ALARA Program

All activities involving radiation and radioactive materials shall be conducted in such a manner that radiation exposure to workers and the general public are maintained As-Low-As-Reasonably-Achievable (ALARA), taking into account current technology and the economics of radiation exposure reduction in relationship to the benefits of health and safety. ALARA concepts are implemented throughout the entire RPP. ALARA-program requirements include:.

1. Administrative controls and procedures endeavor to reduce individual and collective radiation exposures ALARA. Minimizing radiation exposure is accomplished by preliminary planning and scheduling, using proven and innovative engineering techniques and performing engineering reviews of proposed work plan changes.
2. Worker involvement and acceptance in minimizing radiation exposure is a key component of the ALARA Program. Workers are responsible to incorporate ALARA principles into work performance.
3. Work shall be planned in accordance with ALARA principles, involving input from discipline engineers, the project RPP staff and implementing supervisors.
4. An Embryo-Fetus Protection Program has been established for the Project and is specified in RPP-113, “Embryo-Fetus Protection”

10.3 Radiation Protection Audit Program

1. Internal / External Audits of the Radiation Protection Program should be performed, documented, and be of sufficient scope, depth, and frequency to identify and resolve actual or potential performance deficiencies before

significant quality problems are encountered. Audit frequency and criteria is determined by the RSO and / or SSHO .

2. The RSO and / or SSHO shall perform an annual review of RPP content and implementation as specified in 10 CFR 20.1101(c).

10.4 External and Internal Dosimetry Program

Internal and external dosimetry and exposure control requirements are defined in the SEC Radiation Protection Plan and includes:

- A discussion of applicable regulatory limits for occupational workers and members of the public.
- ALARA goals.
- Monitoring requirements.
- Recordkeeping requirements.
- Reporting requirements for both normal operations and incidents.

10.5 Radiation Protection Instrumentation Program

All instrumentation used to measure radiation and radioactive material will be maintained in accordance with their respective technical manuals and operating procedures This includes establishing criteria and requirements for the operation, calibration, response testing, maintenance, inventory and control of radiation protection instrumentation and equipment to comply with applicable regulations and conform with applicable ANSI standards. The Instrumentation Program is detailed by specific procedures including RP-108, RP-109, and RP-110.

10.6 Access Control Program

Access controls to radiological areas will be maintained at all times at the SEC. The administrative and physical measures used to control access to Restricted and/or Radiological Areas are established procedures RP-101, RP-102, and RP-103

10.7 Radiation Protection Surveillance Program

The Radiation Protection Surveillance Program provides for the conduct of radiological surveys in all areas controlled for the purpose of radiation and/or radioactivity. The Program encompasses both routine and non-routine surveys to be performed within the SEC. The specific requirements for conducting and documenting radiological surveys at the SEC are detailed in procedures RP-104, RP-105, RP-106, and RP-107

10.8 Radioactive Material Control Program

This Program provides guidance and requirements for control of radioactive materials. The Radioactive Material Control Program includes receipt, inventory, handling, and release of materials. It also provides for radioactive sealed source control, control of materials entering Restricted Areas and control of contaminated tools and equipment. The requirements of this program are established in RP-111

10.9 Respiratory Protection Program

It is not expected that respirators will be widely used by SEC staff for radiation protection purposes at SEC. As such the Respiratory Protection Program will be administered by the SSHO in accordance with the SEC Site Safety and Health Plan. The

SSHO will consult with the RSO when respiratory protection is required for radiological purposes.

10.10 Radiological Training

The Radiological Training is required for SEC employees and/or subcontractors who perform work near, or in areas controlled for the purpose of radiation and/or radioactive materials as defined in Section 8.1 of the SEC Radiation Protection Plan. There are two basic levels of training: General Employee Radiation Training for visitors and non-radiation workers, Radiation Worker Training for workers who access Restricted Areas.

10.11 Radiation Protection Records

Radiation Protection Records are routinely developed to document all aspects of the Radiation Protection Program. Records are generated using clear concise text using standard grammar and punctuation. Records are reviewed for adequacy and completeness and transmitted to the Document Control organization for long-term retention.

APPENDIX D
Project Forms

PermaFix environmental services A Nuclear Services and Waste Management Company	**Project Plan of the Day**	**PF-OPS-001-F5** **Rev.5**

Project Number: 144099	Project Name: XXX	Date:
Project Manager: Stace Johnson	SSHO: Andy Williams	
RSO: Jeff Knight		
Weather/Site Conditions:		
Safety Topic:	Supporting document attached: Yes No N/A	
Notes:		
Primary Activity or Feature of Work:		Reference Work Plan:

Specific Tasks/Activities (Planned)

1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	

Notes:

Required AHA: ☐ Yes ☐ No	If required, AHA #	
Permit Required? ☐ Yes ☐ No	If required, type of Permit:	Expiration Date:
RWP Required: ☐ Yes ☐ No	If required, RWP Number:	Expiration Date:
Hot Work Permit Required: ☐Yes ☐No	If required, HWP #:	Expiration Date:
Penetration/Dig Permit: ☐ Yes ☐ No	If required, Permit #:	Expiration Date:
Subcontractor work: ☐ Yes ☐No	Work performed:	Complete: ☐ Yes ☐ No

Specific Tasks/Activities (Performed)

1	See Daily Activity Report

Notes:

STOP WORK AUTHORITY:
All employees have the authority and responsibility to stop work when they perceive that an unsafe condition exists that threatens themselves, their coworkers, or the environment. Every worker has the right to a safe workplace; safe working conditions; and understands the hazards of the workplace.

Use PF-OPS-001-F5A (Project Attendance Roster) for POD

Project Manager or Designee

ES&H or Designee

PermaFix environmental services A Nuclear Services and Waste Management Company	**Project Attendance Roster**	**PF-OPS-001-F5** **Rev.4**

Project Number: 144099	Project Name: XXX Response
Project Manager: Stace Johnson	Date:

Topic: _____

Name	Signature	Last 4 of SSN	Date	Time
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
19.				
20.				

Project Manager or Designee (Name)

H&S Representative or Designee (Name)

Project Manager or Designee (Signature)

H&S Representative or Designee (Signature)

PermaFix® environmental services
A Nuclear Services and Waste Management Company

PROJECT WEEKLY SAFETY INSPECTION

PROJECT NAME: XXX Response-Massillon Project # 144099 DATE:

NUMBER OF ON-SITE PROJECT EMPLOYEES: Safety and Ecology Corporation H&S

INSPECTION PERFORMED BY:

	YES	NO	N/A	Action Taken
First Aid Kit available				
Spill Kit(s) available				
Communications device(s)				
Housekeeping:				
Walkways clear of obstacles				
Slip, trip and fall hazards				
Work area adequately lighted				
Overhead hazards				
Work area generally clean				
Biohazards				
Combustible Storage				
Holes and openings barricaded/guarded				
Waste piles covered, protected and secured				
Radiologically controlled areas are posted and demarcated				
Trash, garbage and designated smoking areas				
Electric Equipment:				
Tools & equipment are properly stored				
GFCI's are used and no daisy-chains				
Tools properly grounded				
Cords in good condition (no tape or breaks in insulation)				
Plugs & receptacles in good condition				
Fall Protection:				
Work Platform inspected (e.g., scaffold, aerial lift, etc.)				
Fall Protection equipment has been inspected prior to use				
Fall Protection equipment is properly stored				
All personnel required to tie off are adequately protected				
Personnel are trained and qualified				
Miscellaneous:				
Fire extinguisher monthly inspections are current				
All protective equipment/hard hats, safety glasses, proper clothing, safety belts, lanyards, in good condition and being worn.				
Compressed gas cylinders secured properly				
Concurrent evolutions & potential impacts				
Traffic control and transportation considerations				
Adverse weather conditions				
Storm Water Protection				
Site Security (e.g., fencing, walls, etc.)				
Discussion / Comments from Inspection :				
Signature: Date:				

APPENDIX E

Quality Management System

(The QMS is an approved Corporate document.)

Quality Management System

Applicability: Perma-Fix (PF) Nuclear Services (NS)* Revision 3

Prepared by:	Signature on File	16Nov15
	Darrell Srdoc, PF Corporate QA Manager	Date
Concurrence:	Signature on File	16Nov15
	Stace Johnson, NS Manager of Projects	Date
Concurrence:	Signature on File	16Nov15
	Eric Laning, NS Technical Services Manager	Date
Concurrence:	Signature on File	16Nov15
	Jeff Bowers, NS Vice President of Performance Assurance	Date
Concurrence:	Signature on File	16Nov15
	Andy Lombardo, NS Senior Vice President	Date
Approval:	Signature on File	16Nov15
	John Lash, PF Chief Operating Officer	Date
		20Nov15
		Effective Date

Type of Change:

- ☒ Document Revision
- ☒ Non-intent Change
- ☐ Document Rewrite
- ☐ Adequacy Review

Recommended Training:

- ☐ Classroom Training
- ☐ Management Brief
- ☒ Required Read
- ☐ Other

* Nuclear Services is a division of Perma-Fix.

Table of Contents

1. INTRODUCTION

This document, PF-Q-01, *Quality Management System* (QMS), describes the Perma-Fix Environmental Services, Inc. Nuclear Services (PFNS) quality management system. The structure of the QMS is derived from and compliant with the American Society Mechanical Engineers (ASME) Nuclear Quality Assurance (NQA) 1-2008, *Quality Assurance (QA) Program Requirements for Nuclear Facilities Applications*. This structure also allows compliance with the International Organization for Standardization (ISO) 9001, *Quality Management Systems*, and addresses government and commercial based customer quality requirements. The QMS includes a general description of the Perma-Fix business structure, primary services, Quality Policy, and the organizational and operational framework for identifying and ensuring continued compliance to NQA-1, ISO 9001, and customer quality requirements.

2. PERMA-FIX SERVICES AND BUSINESS STRUCTURE

Perma-Fix provides nuclear and waste treatment services to both government and commercial customers. The PFNS division provides project management services in the areas of waste management, environmental remediation/restoration, decontamination, decommissioning, new build construction, demolition, and radiological protection. The PFNS division also provides technical services in the areas of radiological safety and protection, health physics support, site characterization, and instrument calibration. The company's waste treatment service group operates four fixed based waste treatment facilities that treat hazardous, low-level, and mixed waste streams.

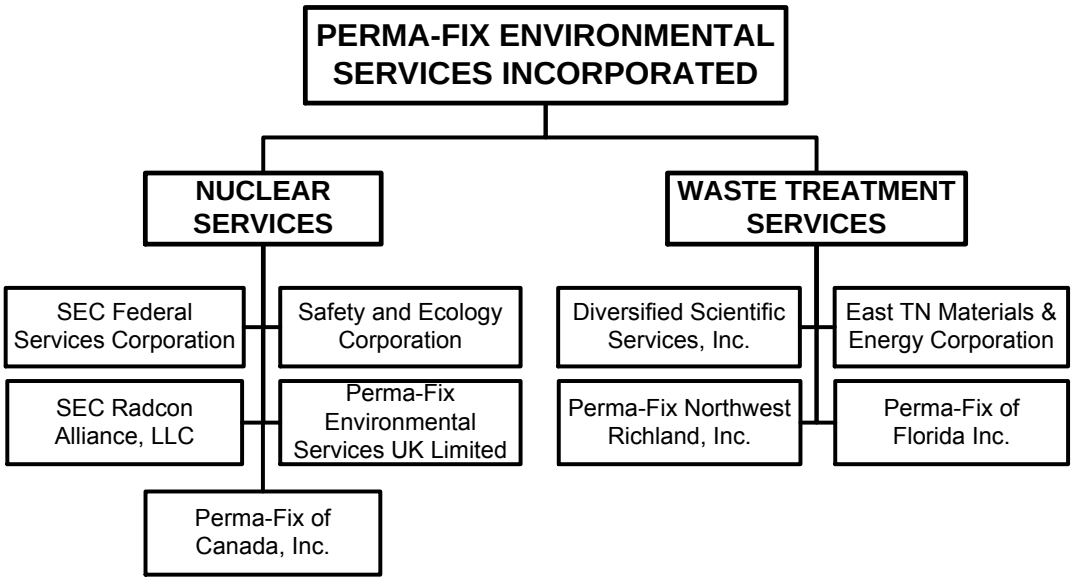


Figure 1 - Perma-Fix Services and Business Structure

Perma-Fix's headquarters is located in Atlanta, GA, with its primary business center located in Knoxville, TN. Perma-Fix corporate Human Resources, Financial, and Information Services maintain their central offices in Atlanta while PFNS functional support groups maintain their offices at the Perma-Fix Business Center (PFBC).

The PFBC provides the primary infrastructure for proposal development, contract management, procurement, human resources, project controls, project management, quality assurance (QA), health and safety (H&S), finance, and customer communication. This infrastructure provides the support necessary to ensure PFNS projects are managed effectively and compliantly from project initiation to project closure. The QMS provides the framework for assuring support groups document, implement, and monitor work processes to the extent necessary to achieve project success.

3. QUALITY POLICY

PFNS is committed to maintaining a QMS that ensures work is performed safely, meets our customer's requirements, and exceeds our customer's expectations. This is accomplished through good planning, process ownership by line management, compliant execution of daily tasks, and periodic self-assessment to assure continued improvement through preventive actions.

Each individual employed or subcontracted by PFNS is empowered to stop work if conditions present a danger to themselves, other personnel, the public, or the environment. In addition, each employee or subcontractor is responsible for identifying and reporting conditions adverse to safety or quality to their immediate supervisor.

4. QUALITY MANAGEMENT SYSTEM

4.1. Organization

As described in Section 2.0, PFNS maintains two primary service entities that consist of project based nuclear and technical services. These business entities have adopted the QMS as their program for compliance to the NQA-1 and ISO 9001 standards. Effective implementation of the QMS is sustained through an organization structure that allows sufficient independency while ensuring efficient operations. The QA organizational structure, lines of reporting, and lines of communication of key personnel are depicted in Figure 2.

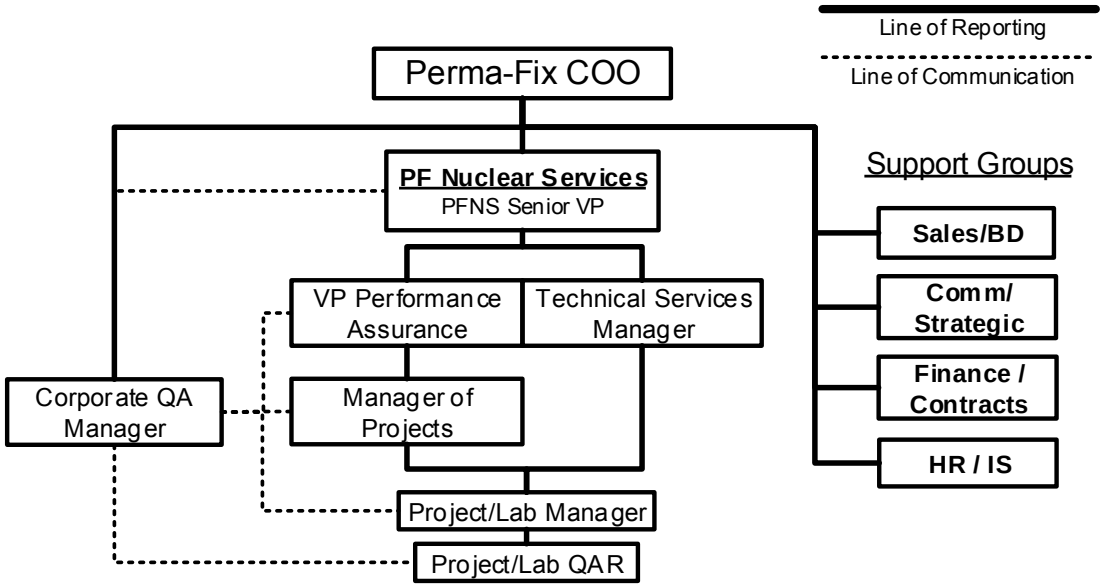


Figure 2 - PFNS Lines of Reporting and Communication

4.1.1. Chief Operating Officer

The Chief Operating Officer (COO) has complete authority for the execution of the QMS. The COO is responsible for:

- Approving the QMS,
- Ensuring internal assessments are conducted,
- Ensuring adequate resources are maintained for effective QMS execution,
- Reviewing results of completed assessments, and
- Authorizing long term preventative actions for continued improvement.

4.1.2. PFNS Senior Vice President

- The PFNS Senior Vice President (SVP) reports directly to the COO and is accountable for the effective implementation and execution of the QMS for NS. The SVP is also responsible for:
- Ensuring QSM compliance,
- Ensuring adequate resources are provided to conduct management assessments,
- Ensuring adequate resources are provided to support independent assessments,
- Ensuring observed or identified issues and concerns are resolved in a timely manner,
- Evaluating reported quality and safety issues, and
- Authorizing short or long term preventative actions for continued improvement.

4.1.3. NS Vice President of Performance Assurance

The Vice President of Performance Assurance (VPPA) manage all aspects of NS business development, oversees the NS proposal process and performs post award reviews to ensure stated objectives are met or exceeded. Other responsibilities include:

- Coordinates monthly project reviews and closures
- Supports updates and changes to the operation manual
- Provides support and oversight to the Manager of Projects
- Coordinates resources and support between remote project managers, manager of projects and home-office support

4.1.4. Manager of Projects and Technical Services Manager

The Manager of Projects (MP) reports directly to VPPA and the Technical Services Manager (TSM) reports directly to the SVP. They are primarily responsible for ensuring field implementation of the QMS. They are also responsible for:

- Ensuring quality and safety provisions are established for each project,
- Ensuring PMs comply with all quality and safety requirements,
- Ensuring PMs provide resources to conduct management assessments,
- Ensuring PMs provide resources to support independent assessments,
- Evaluating reported issues and concerns as reported, and
- Ensuring PMs provide timely closure of identified issues and concerns.

4.1.5. Support Groups

Support Groups ensure PMs are supported with proposal development, contract administration, personnel acquisition, scheduling, information technology, procurement, work execution, customer feedback and contract closure.

4.1.6. Corporate Quality Assurance Manager

The Corporate Quality Assurance Manager (CQAM) reports directly to the COO and is the senior subject matter expert (SME) on QMS development, implementation, and compliance. The CQAM is primarily responsible for assessing QMS field execution and facilitating system improvements. The CQAM is also responsible for:

- Assisting each PM to ensure effective implementation of the QMS,
- Assessing field activities to ensure conformance to the project work plans,

- Ensuring flow down QA and/or quality control (QC) plans are developed and implemented when required,
- Assisting each PM in the investigation and resolution of documented issues,
- Reviewing quality and safety issues with the COO on an annual basis,
- Identifying any trends as a result of independent and management assessments,
- Recommending preventive actions to preclude potential non-conformances or adverse conditions,
- Assisting the PM in timely closure of issues and concerns, and
- Leading root cause analysis investigations as requested by the COO.

4.1.7. Project Manager

The PM reports directly to the MP or TSM and is responsible for ensuring day-to-day activities conform to project specific QA/QC or H&S plans and procedures. The PM is also responsible for:

- Executing the project in accordance with the Project Management Operations Manual;
- Performing management assessments of project field activities;
- Ensuring independent assessments are adequately supported;
- Identifying and documenting issues that lead to conditions adverse to quality and safety;
- Investigating issues and developing corrective actions to ensure conformance and developing preventive actions to prevent recurrence; and
- Ensuring timely closure of actions that address issues, concerns, and deficiencies.

4.1.8. Project QA Representative

The Project QA Representative (QAR) reports directly to the PM with an independent communication line to the CQAM. The QAR is responsible for ensuring QA/QC provisions are met during day-to-day execution of project activities. They are also responsible for:

- Supporting implementation of project QA Plans and procedures;
- Performing oversight of day-to-day project activities;
- Performing receipt inspection of items identified as important to safety or quality;
- Identifying and documenting issues that represent conditions adverse to safety or quality;
- Investigating issues and developing corrective actions on behalf of line management;

- Screening adverse conditions for reportable occurrences or nuclear safety violations; and
- Assisting line management in the timely closure of issues, findings, and deficiencies.

4.2. Quality Management System Structure

The QMS is an "umbrella" document under which all PFNS project work is conducted and assessed. The QMS is implemented through QA standard operating procedures (SOPs) compliant with the eighteen basic requirements specified in the NQA-1 and the six basic requirements for ISO 9001. The QMS and SOPs allow PFNS to meet requirements listed in the U.S. Department of Energy (DOE) Order (O) 414.1D, *Quality Assurance* and 10 Code of Federal Regulations (CFR) Part 830.122, *Quality Assurance Criteria*, as demonstrated in Figure 3.

PF-Q-01 QMS vs ISO 9001:2008; 10 CFR 830.122; and DOE O 414.1D	Perma-Fix NQA-1 Quality Standard Operating Procedures																			
	PF-Q-01 Quality Management System	PF-Q-02 Training & Qualifications	PF-Q-03 Design Control	PF-Q-04 Procurement Control	PF-Q-05 Instructions, Procedures, & Dwgs	PF-Q-06 Document Control	PF-Q-07 Control of Purchased Items/Services	PF-Q-08 Identification and Control of Items	PF-Q-09 Control of Special Processes	PF-Q-10 Inspection	PF-Q-11 Test Control	PF-Q-12 Control of Measuring & Test Equip.	PF-Q-13 Handling, Storage, and Shipping	PF-Q-14 Inspection, Test, and Oper. Status	PF-Q-15 Issues Management	PF-Q-17 Quality Records Management	PF-Q-18 Assessments	PF-Q-19 Suspect & Counterfeit Items	PF-Q-20 Safety Software
ISO 9001:2008																				
4.0 QUALITY MANAGEMENT SYSTEM	●																			
4.1 General Requirements	●	●																		
4.2 Documentation Requirements	●				●	●										●				
5.0 MANAGEMENT RESPONSIBILITY	●																			
5.1 Management Commitment	●																●			
5.2 Customer Focus	●																●			
5.3 Quality Policy	●																			
5.4 Planning	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	▲
5.5 Responsibility, Authority, and Communication	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	▲
5.6 Management Review	●														●		●			
6.0 RESOURCE MANAGEMENT	●																			
6.1 Provision of resources	●	●																		
6.2 Human Resources	●	●																		
6.3 Infrastructure	●				●		●													
6.4 Work Environment	●	●																		
7.0 PRODUCT REALIZAITON	●																			
7.1 Planning of Product Realization	●				●		●		●	●	●	●			●	●	●			
7.2 Customer-related Processes	●	●			●								●	●		●				
7.3 Design and Development	●		▲																	
7.4 Purchasing	●			●			●	●		●	●									
7.5 Production and Service Provision	●				●	●	●	●	●			●	●	●		●				
7.6 Control of Monitoring and Measuring Devices	●								●	●	●	●								
8.0 MEASUREMENT,ANALYSIS,IMPROVEMENT	●																			
8.1 General	●									●	●				●		●			
8.2 Monitoring and Measurement	●								●						●		●			
8.3 Control of Nonconforming product	●									●				●	●					
8.4 Analysis of Data	●									●					●		●			▲
8.5 Improvement	●														●		●			
10 CFR 830.122 & DOE O 414.1D																				
MANAGEMENT	●																			
Program	●																			
Personnel Training & Qualification	●	●															●			
Quality Improvement	●	●													●		●			
Documents and Records	●				●	●										●				
PERFORMANCE	●																			
Work Processes	●				●			●	●			●	●	●						
Design	●		▲																	
Procurement	●			●			●													
Inspection and Acceptance Testing	●							●		●	●	●		●	●			●	●	▲
ASSESSMENT	●																			
Management Assessment	●														●		●			
Independent Assessment	●	●								●	●				●		●			
ADDITIONAL REQUIREMENTS	●																			
Suspect & Counterfeit Items	●			●			●			●								●		
Safety Software	●																			▲
		Compliant				●			Graded Compliance							▲				

Figure 3 - QMS vs. ISO 9001, 10 CFR 830.120 and DOE O 414.1D

In addition, the QMS and SOPs meet the requirements listed in the U.S. Army Corp of Engineers (USACE) ER 1180-1-6, *Construction Quality Management and Unified Facilities Guide*

Specifications (UFGS) 01451A, *Contractor Quality Control*; and Canadian Standards Association (CSA) N286-12, *Management System Requirements for Nuclear Facilities*. The QMS is further implemented through flow down project quality assurance plans (PQAPs), quality control plans (QCPs), and project specific procedures. The PQAP, QAP, QCP, and procedures are designed to achieve compliance with diverse customer quality requirements specified in contracts. PFNS has developed and maintains specific QA document templates to address each of these requirements to ensure quality plans and procedures are current. This hierarchy of the QMS flow-down quality requirements is presented in Figure 4.

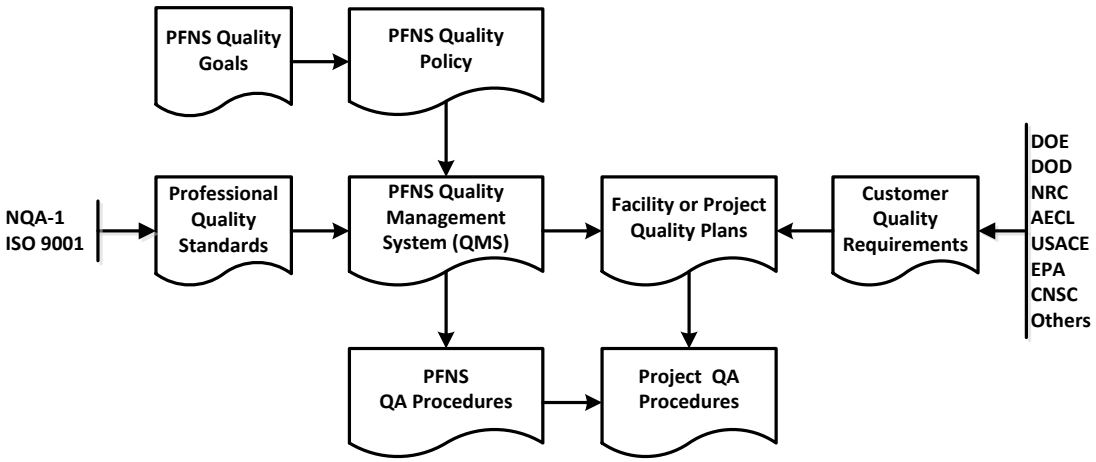


Figure 4 - QA Document Hierarchies

Many contracts require PFNS to use policies, plans, or procedures of the client company. In these circumstances, QMS requirements will apply to those areas not addressed by the client's QA program. When a PQAP, QAP, or QCP is not required by contract, clarification of customer quality requirements and applicability of these requirements will be described or incorporated in the PFNS work orders or plans required for each project. The QMS applies to all PFNS project activities unless exempt in writing by the Perma-Fix COO, PFNS SVP and CQAM, or as defined through contractual or regulatory requirements.

4.2.1. Integration of Safety Management

The QMS is applied in a manner consistent with the objectives and core components described in DOE O 450.4-1, *Integrated Safety System Manual*, USACE EM 385-1-1, *Safety and Health Requirements*, and CSA N286-12. Safety management concepts are integrated in all work processes beginning at the proposal phase and continuing through demobilization. Upon notice to proceed, PFNS will conduct a project readiness review in accordance with

PF-OPS-02, *Project Readiness Review* or participate in an equivalent review required by the customer. The review may include a separate hazard or risk review to ensure work can be conducted in a safe, compliant, and efficient manner. In addition, assessments performed during the conduct of work may include a review and evaluation of safety practices, interviews with employees on safer ways to perform work, and distribution of lessons learned.

4.2.2. Graded Approach

The QMS and flow down implementing documents will be implemented using a graded approach and applied primarily to activities, items, or services considered "*important to safety and quality*." As defined by PFNS, "important to safety and quality" means: an activity that if performed incorrectly, could have an adverse effect on employee, public safety, or the environment. As applied to an item, an item that if through failure or a non-conforming condition, could have an adverse effect on employee, public safety, or the environment. QMS implementation will consider the risks and complexity of the scope of work (SOW) and any special requirements imposed by our client. The application of a graded approach philosophy does not relieve PFNS of its responsibility to maintain compliance with federal, state, or local regulations. An initial set of items and services considered as "important to safety and quality" are identified in PF-Q-07, *Control of Purchased Items and Services*. The CQAM will maintain control of this list with consensus from the COO and SVP, and when required by contract, the client.

4.3. Training and Qualifications

Personnel involved with activities, services, or items considered "important to safety or quality" will be provided initial indoctrination and training based on their assigned responsibilities, required qualifications, and regulatory requirements. Indoctrination training may include general employee training, training on core project plans, and, on a graded approach, required reading of project specific plans and procedures.

PMs will assess the training needs of each employee assigned to a project and schedule training as necessary. Training needs will be based on critical and unique job functions, whether a level of competency must be demonstrated, or whether special certification is required. Demonstration of competency may include practical and/or written examination. When work activities include operation, maintenance, and technical support of DOE Hazard Category 1, 2, and 3 nuclear facilities, PFNS will operate in accordance with an approved training implementation plan

compliant with DOE O 5480.20A, *Personnel Selection, Qualification, and Training, Requirements for DOE Nuclear Facilities*. The plan will serve as the basis for scheduling, tracking training, and confirming qualification for all project personnel. For work activities conducted in DOE facilities less than a Category 3, PFNS will operate to a training matrix approved by the PM and maintained by the project coordinator or designee. The MP and TSM will ensure time is allotted to the employee to attend scheduled training, and the employee will be responsible for attending the training and satisfying required qualification requirements. Additional QA requirements for training are delineated in PF-Q-02, *Training and Qualifications*.

As part of continued improvement, additional and continuing training may be provided as follows:

- Training during the project Plan of the Day (POD) meeting,
- Training as a result of Lessons Learned briefings,
- Educational and/or professional training,
- Specialized training when performing tasks under a specific work order or plan,
- Training as a result of procedure changes,
- Training as a result of significant activity changes,
- Training as a result of operating experiences, and
- Training provided as a result of actions to prevent recurrence of adverse conditions.

4.4. Design Control

PFNS is not a design organization and therefore does not maintain a full design control program. However, PFNS does procure engineered items or engineering services. Procurement of these services or items is managed in accordance with PF-Q-04, *Procurement Control*. At a minimum, subcontractors providing these types of items or services may be evaluated in accordance with basic provisions described in Requirement 3, *Design Control*, of ASME NQA-1-2008 for DOE Hazard Category 1, 2 or 3 nuclear facilities, or per specific design control requirements established by PFNS or its customer. In these situations, design provisions will be identified in procurement documents. Design control requirements are delineated in PF-Q-03, *Design Control*.

Procurement of software used for design and safety analysis for DOE Hazard Category 1, 2, and 3 nuclear facilities will be controlled consistent with DOE G 414.1-4, *Safety Software Guide*, ASME NQA-1-2008 or IEEE 828-2005, the Institute of Electrical and Electronics Engineers *Standard for Software Configuration Management Plans*. Software QA requirements are delineated in PF-Q-20, *Safety Software*.

4.5. Procurement Control

PFNS has established administrative controls for procuring items and services in PF-P-001, *Purchasing Policies and Procedures*. In addition, PFNS flows down General and Special Conditions that address specific customer and quality provisions. These policies and procedures provide the administrative requirements for ensuring compliant procurement documentation.

In addition to PF-P-001, PF-Q-04, *Procurement Control*, establishes specific requirements for evaluating suppliers of services and items considered "important to safety and quality." To the extent necessary, the procurement process will require suppliers to employ a quality system consistent with the elements of the PFNS QMS and compliant with specific requirements mandated by customers or regulatory agencies. At a minimum, suppliers that do not maintain a compliant QA Program will be used only when they have been evaluated and approved by the CQAM and listed on the Perma-Fix Approved Supplier List (ASL). In these cases, the supplier will abide by the QMS on a graded approach or adhere to flow down QA requirements specified in procurement documents. The supplier may undergo specific inspections or assessments at the supplier's facility or when the items are received or services provided at the project site or facility.

4.6. Instructions, Procedures, and Drawings

PFNS will use approved work plans and/or SOPs for conducting work as dictated by the project work scope or as required by the customer. The SOP may consist only of a flow chart but should include or reference specific instructions and/or associated forms. Each SOP is reviewed periodically by the assigned SME or document sponsor to ensure content integrity. The nature of PFNS work activities does not typically result in PFNS generated engineering drawings. Engineering drawings are usually generated by the client or procured through approved service providers. In these cases, engineering drawings will be managed through the PFNS document control system, engineering, or submitted to the client under their required submittal process.

PFNS maintains a library of controlled SOPs in areas of H&S, Environmental Management, Instrument Calibration, Radiation Protection, Procurement, and QA. Each SOP is developed appropriately for each circumstance and work process area. They include requirements and/or acceptance criteria needed to provide specific direction or determine if an activity was satisfactorily accomplished. SOPs generated for projects will be identified in the PQAP, QAP, QCP, or work plan specifically developed for executing the project SOW. Requirements for SOPs or other documents that are generated for describing the work process are prescribed in PF-QA-05, *Instructions and Procedures*.

4.7. Document Control

The preparation, issue, and change of an SOP or work process document that specifies quality requirements for items or services considered "*important to safety or quality*," or ensures execution customer requirements will be controlled to ensure the required approvals are obtained and the current revision of the document is used. Controlled documents and their changes will be reviewed for adequacy and approved for release before being issued by the PFNS Document Center (DC) or project satellite document center.

Client issued documents will be managed as a controlled document when the document is issued as a controlled document to PFNS. PFNS will maintain satellite document centers which operate independently from the DC but under the equivalent document control provisions.

In general, immediate access to approved documents will be made available to project staff via the corporate Perma-Fix SharePoint® (SP) site, a SharePoint® set up for the project, a project network assisted system (NAS) or hard copies at the worksite. Documents printed from a SP site or NAS will be current the day they are printed and can continue to be used as long as the user confirms the proper version each time it is used. Specific requirements for document control are prescribed in PF-Q-06, *Document Control*.

4.8. Control of Purchased Material, Equipment, and Services

PFNS procurement controls include measures to ensure items and services considered "*important to safety and quality*" are procured through suppliers listed on the Perma-Fix ASL. Suppliers listed on the ASL are selected based on a documented evaluation of their past performance, objective evidence of an acceptable QA program or system, customer approval, approved by recognized independent auditing group, certified by an accredited entity, and/or other attributes deemed appropriate for the items or services being procured. Suppliers of items or services that may affect safety structures, systems, or components may undergo an additional site evaluation by a Perma-Fix NQA-1 lead auditor based on the complexity of the items or services provided.

Conformance to safety metrics requirements, training, certification, licensing, and other regulatory requirements are generally confirmed through a signed confirmation from the supplier or positively verified by the CQAM, Perma-Fix Contracts Administrator, or their authorized designee. PFNS procurement documents may include special provisions for receipt inspection, workmanship inspection, and right-of-access to the supplier's facility or place of business to confirm conformance to subcontract or purchase order specifications. Subcontractors performing work under the

provisions of project work plans or work orders will be suitably trained to the project H&S provisions.

Suppliers of services and items are also subject to provisions related to suspect/counterfeit items (S/CI). Suppliers are required to implement a program to preclude the introduction of potential S/CI at DOE worksites and are responsible to positively confirm items provided have been properly examined. The Perma-Fix purchasing agent and/or subcontract administrator are responsible for ensuring procurement documents clearly and adequately describe the items and services required and that suppliers of items and services considered "*important to safety and quality*" are listed on the Perma-Fix ASL. The specific requirements for control of purchased material, items, and services are described in PF-Q-07, *Control of Purchase Material, Items and Services,* PF-Q-19, *Suspect/Counterfeit Items*, and PF-P-001, *Purchasing Policies and Procedures*.

4.9. Identification and Control of Items

PFNS applies measures for the identification and control of safety and quality (SQ) items to ensure their proper usage, and to prevent the use of incorrect or defective items. Identification of an item will be maintained through unique marking, labeling, or tagging. When physical identification is impractical, acceptable items will be segregated from items found to be non-conforming or defective. Identification of items will be traceable to required certification documentation or known standards.

SQ items received at project worksites will be inspected and/or verified by the QAR, or by a designated competent person (DCP) designated and approved by the QAR or CQAM. Criteria for acceptance will be identified on PFNS generated checklists, inspection reports, or procurement documents. When required, these provisions will be described in the PQAP, QAP, QCP, or in project specific procedures. Specific requirements are described in PF-Q-08, *Identification and Control of Items*.

4.10. Control of Special Processes

Processes such as welding, heat treating, and Non-Destructive Examination that are highly dependent on the control of the process, the skill of the operator, or both, will be performed by qualified personnel using procedures approved by PFNS, a qualified third party, or the customer. These types of processes are typically procured through an approved supplier who has been evaluated in accordance with PF-Q-04, *Procurement Control*. Qualifications for personnel and procedures will be in accordance with specified requirements prescribed in a PQAP, QCP, QAP, or

associated procurement documents. Specific requirements are described in PF-Q-09, *Control of Special Processes*.

4.11. Inspection

PFNS will ensure items and services considered "*important to safety and quality*" conform to specified requirements through planned inspection activities. Inspections may consist of a visual examination, document verification, or traditional dimensional inspection. The majority of inspections will be performed by the assigned PQAR, FQAM, or their DCP. Inspections requiring certified or licensed inspectors will be identified as hold points in the work process to ensure appropriate time and resources are planned and scheduled. Acceptance criteria will be identified in the PQAP, QAP, QCP, associated procurement documents, or on inspection reports specifically developed for the item or service under review. Items or services found to be non-conforming or non-complying will be documented in accordance with PF-Q-15, *Issues Management*. Specific requirements for inspections will be performed in accordance with procedure PF-Q-10, *Inspection*.

4.12. Test Control

PFNS typically procures testing services to verify conformance of materials, components, or systems. These types of testing capabilities are procured though suppliers that have been evaluated and approved in accordance with PF-Q-04, *Procurement Control*. Testing criteria will be delineated in procurement documents as part of the overall procurement of services or described in separate project/facility work plans or orders. Typical tests may include DOP testing for high-efficiency particulate air (HEPA) filters; compression and slump testing of concrete; soil tests; load tests; testing of non-safety related software; and operational testing of heating, ventilation, air conditioning (HVAC), electrical systems, or waste treatment systems. Specific requirements for testing will be performed in accordance with procedure PF-Q-11, *Test Control*.

4.13. Control of Measuring and Test Equipment

PFNS uses Measuring and Test Equipment (M&TE) to confirm environmental, safety, and health; radiological; and quality compliance are achieved. Most radiological and industrial hygiene instruments are maintained by the Perma-Fix Instrument Services (IS) Group which operates in accordance with PF-IS-001, *Instrumentation Services Quality Assurance Plan*. Equipment requiring specialized calibration or repair is sent to the original equipment manufacturer (OEM), to an approved supplier qualified under PF-Q-04, *Procurement Control*, or to a supplier certified by the OEM to perform such services. Perma-Fix calibration of equipment incorporates the use of

standards traceable to the National Institute of Standards and Technology (NIST), technicians that are qualified under a rigorous job performance measure program and the use of a sophisticated calibration and recall system. Specific M&TE requirements are described in PF-Q-012, *Control of Measuring and Test Equipment*.

4.14. Handling, Storage, and Shipping

Construction equipment or materials considered critical, sensitive, perishable, or of high value to the customer and/or to PFNS are secured at approved lay-down areas located at each project or facility work site. Government furnished material or equipment are identified, documented, and tracked separately from PFNS inventory. Items such as calibration gases, radioactive sources, or NIST standards are handled, stored, packaged, and shipped in accordance with codes, standards, regulations, engineering specifications, or customer requirements. General requirements for implementing this provision are provided in PF-Q-13, *Handling, Storage, and Shipping*.

4.15. Inspection, Test, and Operating Status

The inspection status of PFNS and customer supplied equipment or material will be identified using markings, tags, and/or appropriate segregation. Items will maintain traceability while in storage, in-process, and at final installation or use. Status indicators will be sufficient to prevent inadvertent use or installation of nonconforming or defective material or operation of equipment determined to be unsafe or awaiting repair. Instrumentation used to monitor environmental, industrial hygiene, and quality compliance will be identified with the instrument model number, manufacturer, and calibration recall date. Status indicator requirements and guidance are provided by PF-Q-014, *Inspection, Test, and Operating Status*.

4.16. Nonconforming Materials, Parts, or Components

PFNS employs an Issue Reporting system that allows identification of conditions adverse to quality or safety, documentation of immediate actions, basic casual analysis, actions to prevent reoccurrence, assignment of actions, acknowledgement of action closure, and screening of potential Price-Anderson Amendments Act (PAAA) non-compliance (DOE only). The system includes reporting requirements for nonconforming materials, parts, or components and specifies control provisions for preventing unintentional installation or usage. Requirements and guidance for the reporting non-conforming items are provided within PF-Q-15, *Issues Management*.

4.17. Corrective Action

Once adverse conditions have been identified and reported, the QAR will investigate the circumstances, collect data, identify causal factors, and determine apparent causes using DOE G 231.1-2, *Occurrence Reporting Causal Analysis Guide*, or any other nationally recognized cause analysis methodology. Conditions may include non-conformances, non-compliance, safety related incidents, failures, malfunctions, deficiencies, and defective material. Significant conditions adverse to quality or safety may require a formal cause analysis performed by the CQAM assisted by a team of diverse disciplines trained in a more authoritative, root cause analysis methodology.

All reported issues will be screened for potential PAAA non-compliances (DOE only) in accordance with *Enforcement Process Overview* issued by the DOE Office of Enforcement, and also undergo an evaluation to determine if adverse conditions meet the threshold of a reportable occurrence (DOE only) in accordance DOE O 232.2, *Occurrence Reporting and Processing of Operations Information*. Requirements and guidance for the corrective action process is established within PF-Q-15, *Issues Management*.

4.18. Quality Assurance Records

In the conduct of work, PFNS generates many types of records. Records that furnish documentary evidence of quality or compliance to customer or regulatory requirements will be identified, prepared, and maintained in accordance with PF-Q-17, *Records Management*. PF-Q-17 addresses the protection, deterioration, distribution, retention, maintenance, and disposition of quality records. PFNS may maintain a satellite DC to acquire, secure, and store records as they are generated until they are no longer required to support ongoing activities or have met legal retention requirements. Hard copy records will be digitized and maintained in a separate storage medium to ensure dual repository management. When hard copy records are no longer required to support ongoing activities, PFNS will transfer them to long-term, secured storage as directed by the CQAM or its client. Requirements and guidance for the records management are established within PF-Q-17, *Records Management*.

4.19. Assessments

4.19.1. Independent Assessment

PFNS conducts compliance monitoring of project QAP/PQAP/QCP implementation and operational processes through independent assessments. Periodic assessments of project

activities ensure achievement of customer requirements and provide the project staff an opportunity to gauge the effectiveness of project work plans/orders and procedures. Independent assessments are generally performed by the Perma-Fix EHS&Q staff, but from time to time can be done by an approved subcontractor or SME. Specific requirements for conducting independent assessments are listed in PF-Q-18, *Assessments*.

4.19.2. Management Assessment

Management assessments are conducted primarily by project management or by a senior manager of the company. Management assessments focus on core management systems that support project or facility operations, such as procurement, contracts, proposal development, project controls, QA, and H&S. Project and facility line managers are responsible for conducting walk down assessments of their project/facility and reporting conditions adverse to quality or safety. Facility and project line managers are responsible for assessing their specific work process to identify opportunities for improvement. Upon request, the CQAM may conduct management assessments on behalf of the TSM or PM. In these situations, the requestor will retain overall responsibility for the planning and scheduling of the assessment, and ensuring adequate support is allocated to the CQAM to conduct an efficient, effective assessment. Specific requirements for conducting management assessments are listed in PF-Q-018, *Assessments*.

Independent and Management assessments, excluding those performed by project line management, are considered business sensitive documents and may require non-disclosure statements from non-PFNS personnel requesting copies. Line management assessment reports can be made accessible to clients through a project or facility specific SP site if approved by the CQAM and COO.

4.19.3. Quality Improvement

PFNS provides several avenues for quality improvements. In addition to Section 4.16, *Nonconforming Materials, Parts, or Components,* and Section 4.17, *Corrective Action,* PFNS periodically schedules management review meetings to discuss issues, concerns, lessons learned from industry and projects, and positive aspects observed during internal and external assessments/audits. The CQAM will provide an annual report to the SVP and COO to describe the status of observed issues and concerns that may require long term resolution to areas that might be beyond the area of responsibility of the MP or TSM. In this report, the CQAM will also discuss adverse trends and preventive actions to mitigate or eliminate

corporate and project risks and to clarify quality objectives and performance metrics across all projects and facilities. Report details are maintained on a database to focus priority, track preventive actions, and to evaluate timeliness and effectiveness of process improvements.

4.20. Suspect/Counterfeit Item Prevention

PFNS prevents introduction of S/CIs at DOE sites through procurement controls, inspection, and training. Suppliers are required to certify items provided to PFNS are screened or inspected for S/CI. Subcontractors are required to report any S/CI discovered before, during, or after the performance of their service. Procurement controls for subcontractors are implemented in accordance with PF-Q-04, *Procurement Document Control*.

PFNS inspects materials and equipment for S/CI as they arrive at the project site. Personnel performing inspections at DOE project sites will be suitably trained to DOE *S/CI Awareness Training Manual*. Inspections will be conducted on a graded approach but consistent with DOE G 414.1-3, *Suspect/Counterfeit Items Guide*. Specific requirements for inspection of potential S/CI are provided in PF-Q-10, *Inspection*, and PF-Q-19, *Suspect/Counterfeit Items*.

4.21. Safety Software Quality Requirements

PFNS does not currently design or operate safety software defined in Section 1.2 of DOE G 414.1-4, *Safety Software Guide for Use with 10 CFR 830 Subpart A, Quality Assurance Requirements*, and *DOE O 414.1D, Quality Assurance.* If such software is required as part of a DOE project deliverable, PFNS would procure this service from an approved supplier who maintains a design control program consistent with ASME NQA-1-2008, *QA Requirements for Nuclear Facility Applications*, DOE G 414.1-4, and DOE O 414.1D, *Quality Assurance*. Other requirements may be imposed on PFNS from other clients. These requirements would be specified in contract documents and addressed in procurement documents in accordance with PF-Q-04, *Procurement Control*. In the event PFNS is required to operate and manage safety software, PFNS will implement training requirements consistent with NQA-1-2008, DOE G 414.1-4, and DOE O 414.1D, or as required by the client. These training requirements would be specified in accordance with PF-Q-02, *Personnel Training and Qualifications* and PF-Q-20, *Safety Software*.

XXX Response

Massillon, Ohio

April 12, 2016

Prepared by:
Perma-Fix Environmental Services, Inc.
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Knoxville, TN 37931

Prepared for:

XXX, Inc.
5875 Landerbrook Drive, Suite 200
Mayfield Heights, OH 44124

Decontamination Work Plan
XXX, Inc.: Massillon, Ohio

Contract Services Agreement 041515

Decontamination Work Plan Approvals

By their specific signature, the undersigned certify that they prepared, reviewed, or provided comments on this Decontamination Work Plan (DWP) for XXX, Inc. (Massillon, Ohio).

Prepared by:	Stace Johnson, Manager of Projects	April 12, 2016 Date
Concurrence:	Eric Laning, Technical Services Manager	April 12, 2016 Date
Concurrence:	Andrew Williams, Deputy Project Manager/ES&H/Waste Manager	April 12, 2016 Date
Approval:	Andy Lombardo, Senior Vice President	April 12, 2016 Date
Approval:	Will Hansard, PSC Client Representative	April 12, 2016 Date
Approval:	Chuck McCracken, Ohio Department of Health	 Date

TABLE OF CONTENTS

APPENDICES

FIGURES

TABLES

ACRONYMS

ABHP	American Board of Health Physics
ACGIH	American Conference of Governmental Industrial Hygienists
ACP	Access Control Point
AHA	Activity Hazard Analysis
ALARA	As Low As Reasonably Achievable
ANSI	American National Standards Institute
ASR	Automotive Shredder Residue
Bi	Bismuth
BMP	Best Management Practice
C&D	Construction and Demolition
CEO	Chief Executive Officer
CFR	Code of Federal Regulations
CHP	Certified Health Physicist
cm^2	square centimeter
COC	Contaminant of Concern
cpd	counts per disintegration
cpm	counts per minute
CPR	Cardiopulmonary Resuscitation
dB (A)	decibels A-weighted
dpm	disintegrations per minute
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DQO	Data Quality Objective
DWP	Decontamination Work Plan
EEWP	Energized Electrical Work Permit
EPA	U.S. Environmental Protection Agency
ES	Energy*Solutions*
ES&H	Environmental Safety and Health
FSS	Final Status Survey
ft^2	square foot
g	gram
GCMS	Gas Chromatography Mass Spectroscopy
GFCI	Ground Fault Circuit Interrupter
GPS	Global Positioning System
GWS	Gamma Walkover Survey
HDPE	High Density Polyethylene
HEPA	High Efficiency Particulate Air
HP	Health Physics, Health Physicist
HPGe	High-purity Germanium
HPT	Health Physics Technician
HRP	HRP Associates, Inc.
ICP-MS	Inductively Coupled Plasma Mass Spectrometry
IDLH	Immediately Dangerous to Life or Health
IMC	Intermodal Container
ISMS	Integrated Safety Management System
K	Potassium
keV	kilo-electron volt
LAW	Large Area Wipe
m	meter
m^2	square meter
m^3	cubic meter
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDA	Minimum Detection Activity
MDC	Minimum Detectable Concentration
MeV	megaelectronvolt

mg	milligram
mrem	millirem
MSHA	Mine Safety and Health Administration
NaI	Sodium Iodide
NELAC	National Environmental Laboratory Accreditation Conference
NFPA	National Fire Protection Association
NESHAP	National Emission Standards for Hazardous Air Pollutants
NIOSH	National Institute for Occupational Safety and Health
NRC	Nuclear Regulatory Commission
NRRPT	National Registry of Radiation Protection Technologists
ODH	Ohio Department of Health
OSHA	Occupational Safety and Health Administration
OTR	Over the Road
Pace	Pace Pace Analytical Services, Inc.
Pb	Lead
pCi	picocurie
PCHP	Project Certified Health Physicist
PEL	Permissible Exposure Limit
Perma-Fix	Perma-Fix Environmental Services, Inc.
POD	Plan of the Day
PPE	Personal Protective Equipment
PM	Project Manager
PSN	Proper Shipping Name
QA	Quality Assurance
QC	Quality Control
Ra	Radium
RCRA	Resource Conservation and Recovery Act
RCT	Radiological Control Technician
REL	Recommended Exposure Limit
Rn	Radon
ROC	Radionuclide of Concern
RPP	Radiation Protection Plan
RQ	Reportable Quantity
RSO	Radiation Safety Officer
RWP	Radiological Work Permit
SAP	Sampling and Analysis Plan
SCBA	Self-contained Breathing Apparatus
SDS	Safety Data Sheet
SEC	Safety and Ecology Corporation
SOR	Sum of Ratios
SOW	Scope of Work
SSHO	Site Safety and Health Officer
SU	Survey Unit
SVE	Soil Vapor Extraction
SVOC	Semivolatile Organic Compound
TBD	To Be Determined
TCLP	Toxicity Characteristic Leaching Procedure
TLV	Threshold Limit Value
TSCA	Toxic Substances Control Act
TWA	Time-weighted Average
USEI	US Ecology Idaho
VOC	Volatile Organic Compound
WAC	Waste Acceptance Criteria
WBGT	Wet Bulb Globe Temperature
WCS	Waste Control Specialists, LLC
WRS	Wilcoxon Rank Sum
yd^3	cubic yard

1.0 INTRODUCTION

Perma-Fix Environmental Services, Inc. (Perma-Fix) is contracted by XXX Inc. (XXX) to assist with radiological response actions, characterization, remediation, disposition of materials, and final status surveys (FSSs) at their Massillon, Ohio facility as a result of accidentally processing radium (Ra)-226 contaminated materials on or about February 23, 2016.

The Massillon facility is located at 359 State Avenue NW. The 84,000 square foot (ft^2) facility features four interconnected concrete and metal buildings situated on a 17-acre lot. Three of the four buildings house the non-ferrous Automotive Shredder Residue (ASR) sorting operation and include the main processing bay, the small fraction ("fines") sorting area, and the upgrade processing structure in which the scale house is located. The main processing bay structure features a sub-basement and a second floor break room/offices area. In total, the structural footprint covers approximately 5.5 acres of the 18.5-acre property. There is also a front office building (one-story concrete block) which covers approximately 2,500 ft^2 of floor space. **Figure 2** (see page 8) presents a satellite view of the Massillon site over which initial gamma walkover survey (GWS) data has been plotted and an initial estimate of the limits of the radiologically impacted area.

Alpha release criteria for structural and fixed-equipment surfaces is based on the surface concentration equivalent to 25 mrem/yr for Ra-226 referenced in Table 5.19 of NUREG-5512, Volume 3 (1999). The selected release criteria reflect a risk tolerance (P_{crit}) of 0.90, and an assumption that residual removable activity will be limited to 10% of total surface activity. The beta-gamma emitters release criteria is based on limits provided in Table 1 of Regulatory Guide 1.86, Atomic Energy Commission (1974).

The volumetric release criterion of 0.7 pCi/g, above natural background for soil and soil-like materials for total radium is based Table 6.91 of NUREG-5512, Volume 3 (1999). See **Table 1**.

Table 1. XXX, Inc. Response Release Criteria

Decay Mode	Average	Maximum	Removable	Reference
Alpha (Ra-226)	1,120 dpm / 100 cm^2	N/A	112 dpm / 100 cm^2	Table 5.19 NUREG-5512
Beta/Gamma (all other beta-gamma emitters including Ra-226 progeny)	5,000 dpm / 100 cm^2	N/A	1,000 dpm / 100 cm^2	Table 1 Regulatory Guide 1.86
Total Radium (volumetric concentration, e.g., soil, solid debris)	N/A	0.7 pCi/g above background	N/A	Table 6.91 NUREG-5512

This Decontamination Work Plan (DWP) is developed in accordance with applicable XXX site health and safety requirements, Perma-Fix Radiological License, and reciprocity agreement. Once decontamination activities are completed, the impacted areas of the site will be released in accordance with NUREG-1575, *Multi-Agency Radiation Site Survey and Investigation Manual* (MARSSIM), Revision 1.

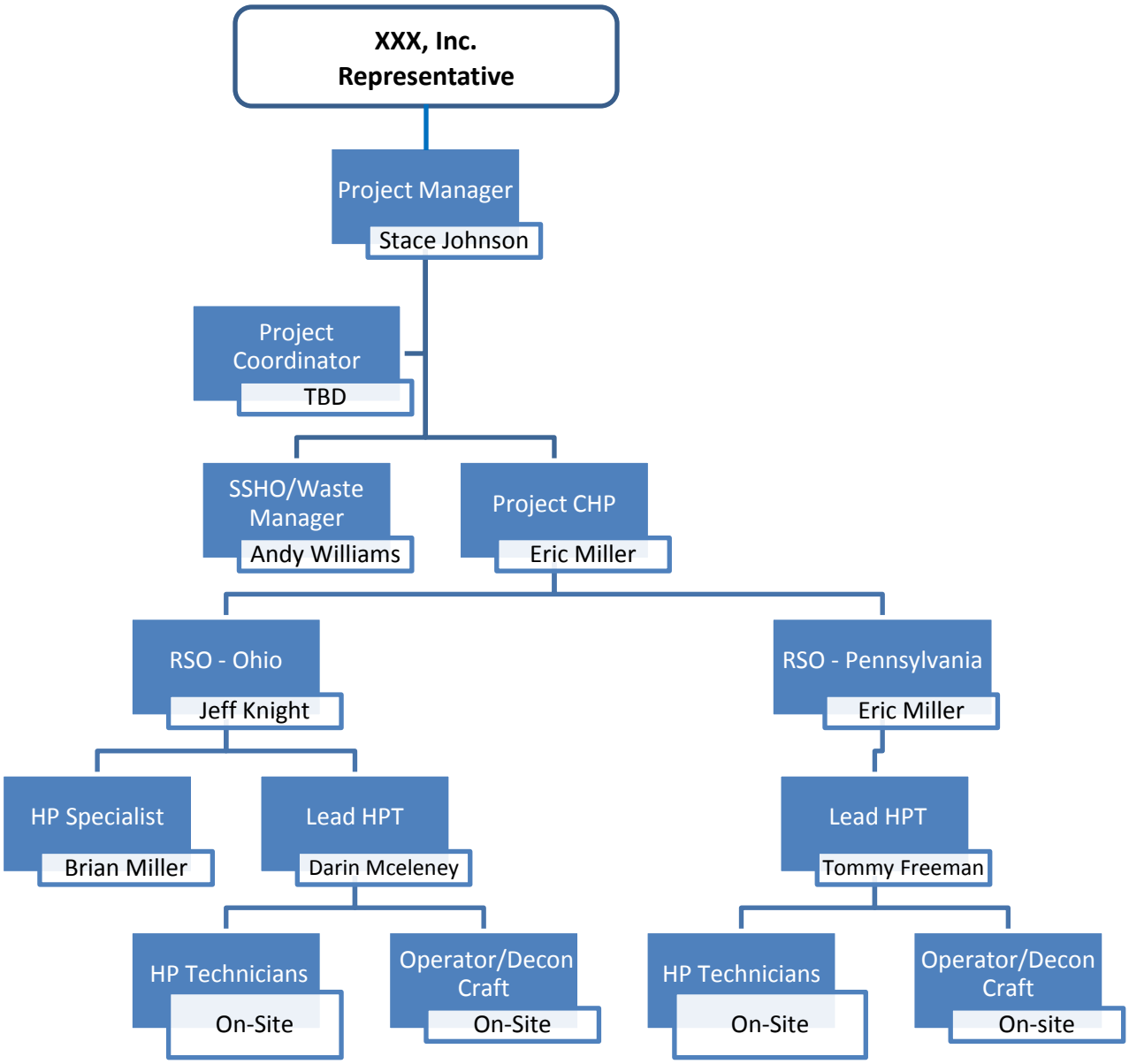
1.1 Project Organization

The project organization is presented in **Figure 1**. Key personnel for this project are as follows:

- Project Manager (PM): Stace Johnson
- Project Certified Health Physicist (CHP): Eric Miller
- Radiation Safety Officer (Site Lead at Massillon, Ohio): Jeffrey Knight
- Radiation Safety Officer (Site Lead at Beaver Falls, Pennsylvania): Eric Miller
- Site Safety and Health Officer (SSHO)/Waste Manager: Andy Williams
- Health Physics Technicians (HPTs): On-site
- Equipment Operators and Decontamination Technicians: On-site

Interfaces for key personnel are also included in **Figure 1**. No work shall be performed on-site unless the PM (or designee) and the SSHO (or Company approved designee) have approved the work activities.

Figure 1. Project Organization



The Perma-Fix PM, Stace Johnson, is the dedicated point of contact with the XXX PM. Roles, responsibilities, and required radiological qualifications of the key project personnel are outlined in **Table 2**.

1.2 Project Schedule

The project baseline schedule (see **Appendix A**) contains necessary milestones included in the contract. A weekly schedule reflecting actual progress will be developed using input from the field team and the daily reports prepared each day by the PM or designee. The proposed schedule is based on preliminary assumptions based on available characterization data, site history, and site conditions. The schedule is built upon working 5 days per week at 10 hours per day and an 8-hour work day on Saturday. No Sundays are planned to be worked.

Table 2. Responsibilities and Required Qualifications of Key Personnel

Key Personnel	Required Radiological Qualification(s)	Responsibilities
Project Manager (PM)	• Radiation Worker II Training.	• Overall responsibility for meeting contract requirements. • Dedicated, single point of contact between Perma-Fix and the XXX PM to communicate project status, upcoming schedule activities, resource needs, and other contract issues as necessary. • Authority to commit Perma-Fix resources to the project. • Responsible for ensuring quality assurance (QA) compliance. • Responsible for ensuring the SSHO and Radiation Safety Officer (RSO) have the necessary resources to safely and efficiently execute the project scope of work (SOW). • Responsible for execution of all work as specified in approved project work plans and Activity Hazard Analysis (AHA). • Provides direction to site personnel and coordinates activities among the various labor types. • Responsible for the effective utilization of the labor workforce and equipment. • Leads or designates a lead to perform plan of the day (POD) meetings and POD debriefing meetings with focus on safety, method of accomplishment for scheduled activities, and lessons learned. • Responsible for creating, embracing, and reinforcing a safe and productive work environment.
Project Certified Health Physicist (PCHP)	• American Board of Health Physics (ABHP) certification. • Minimum 10 years of experience. • Authorized user of Safety and Ecology (SEC) Corporation Radioactive Materials License Number 201-650-15.	• Overall responsibility for the implementation of site radiological work activities in accordance with the approved Radiation Protection Plan (RPP) and As Low as Reasonably Achievable (ALARA) principles. • Provides technical support and health physics (HP) direction to the RSO. • Supports preparation of project work plans, work instructions, and Final Report. • Responsible for creating, embracing, and reinforcing a safe and productive work environment. • May be designated as an RSO if working multiple sites.
Site Safety and Health Officer (SSHO)	• Radiation Worker II Training.	• Responsible for assuring all field activities are conducted in accordance with requirements of the project Health and Safety Plan (see Section 4.0) and AHA (see **Appendix B**). • Responsible for necessary revisions to project Health and Safety Plan (see Section 4.0) and AHA (**Appendix B**). • Participate in development of the POD/plan of the week meetings and POD debriefing meetings to discuss safety and health requirements for scheduled work activities and lessons learned, and reinforce importance of safe work practices and a safe work environment. • Interfaces with the client to assure all work is executed in a safe manner. • Continuously communicate Integrated Safety Management System (ISMS) and zero accident requirements and commitments to the work force. • Responsible for ensuring quality control (QC) compliance. • Verification of utility isolation with XXX personnel prior to intrusive field activities. • Responsible for creating, embracing, and reinforcing a safe and productive work environment.
Radiation Safety Officer (RSO)	• ABHP certification or (NRRPT) member. • Minimum 10 years of related field experience. • Minimum 2 years working within the SEC Radiation Protection Program.	• Implementing and ensuring compliance with RPP's policies and procedures. • Inspect work activities to ensure operations, including off-normal activities, are being conducted according to the facility or project requirements, applicable Federal regulations, and industry accepted ALARA principles. • Reviewing and approving work plans, radiological work permits (RWPs), and RPP procedures. • Trending radiation work performance of project personnel including contamination and radiation exposure control. • Identifying, reviewing, and documenting nonconformance and their causes and corrective actions for incidents associated with radiation protection. • Ensuring an effective ALARA program including conducting on-site radiation safety and health briefings. • Ensuring documentation of any RPP safety violation. • Reviewing survey data. • Conducting briefings concerning radiological work activities. • Ensuring that radiological records are complete, clear, and legible, meet the intended purpose, and are regularly transmitted to document control for archive. • Ensuring Restricted Areas are correctly identified, posted, and marked. • Responsible for creating, embracing, and reinforcing a safe and productive work environment.
Health Physicist	• NRRPT certification and/or Baccalaureate Degree in Applied Science (e.g., Chemistry, Geology, Physics, Environmental Studies). • Minimum 5 years' experience in decommissioning survey design and implementation.	• Support the PCHP and RSO with the design, implementation, and reporting of decontamination and FSSs. • Interface with the client regarding technical and engineering issues relating to the design and implementation of decontamination and FSSs.
Health Physics Technician (HPT)	• Minimum 36 months documented radiation protection experience [American National Standards Institute (ANSI) 3.1 or U.S. Department of Energy (DOE) Radiological Control Technician (RCT)]. • Minimum 2 years working within the SEC Radiation Protection Program.	• Perform daily QC checks of instrumentation used in support of site decontamination and decommissioning activities. • Perform decontamination support surveys; perform FSSs.
Waste Manager	• Radiation Worker II Training. • DOT 49 Code of Federal Regulations (CFR) 173 Training Certification. • Minimum 5 years related field experience in handling, packaging, transporting, and disposal of radioactive waste.	• Preparing waste forms and other supporting documentation for transport and disposal of wastes. • Inspecting waste containers and verifying contents meet disposal facility waste acceptance criteria (WAC). • Inspecting trucks and trailers prior to transport. • Tracking shipments and containers through final disposition. • Maintaining an up-to-date inventory of containers.

2.0 PRE-MOBILIZATION/MOBILIZATION ACTIVITIES

All required training for project personnel shall be performed before personnel are allowed to work on the site. Medical examinations, medical monitoring, and training shall be conducted in accordance with the Health and Safety Plan (see Section 4.0), while other project-specific training will be performed as outlined in the project Training Matrix. The Training Matrix is simply a specialized spreadsheet set up to document and track the status of all required training, certifications, and qualifications for Perma-Fix employees performing work activities described within this DWP. Controlled copies of the Health and Safety Plan and Training Matrix will be kept at the project site. Original versions of the plans will be maintained at the Perma-Fix Corporate Office in Document Control. Personnel shall also be required to review this DWP and all attachments, including the AHA identifying field activities and associated hazards.

2.1 Training

Training requirements for all project personnel are detailed in the Health and Safety Plan (see Section 4.0). Due to the scope of the decontamination activities, personnel engaged in these activities are required to have the following additional training (in addition to the training described in the Health and Safety Plan) as noted below:

- Respiratory Protection (for all personnel wearing respirators).
- Rad Worker (all personnel).
- Aerial Lift (for personnel working from aerial lifts).
- Fall Protection (for personnel working at heights greater than 5 feet).
- Equipment as required (e.g., fork lift, skid steer, loader, back hoe, excavator, etc.)
- Other project-specific plan and AHA training (all personnel).

Personnel will be trained to the DWP, the RWP, and will maintain other required training as noted in the Training Matrix. Evidence of training records will be obtained and kept in the project files and reviewed on a periodic basis during the project to ensure all training is kept current and available to XXX personnel upon request.

2.2 Work Control Boundaries

The Massillon facility is in a temporary state of operational shutdown. Access to the facility is controlled with a security guard stationed at the site entrance requiring all personnel to sign in/out. The site is under 24/7 video surveillance that is monitored remotely by a third party security firm. Relief from third party security services may be obtained by the Ohio Department of Health (ODH) based on hazards and physical security safe guards. Radiological work Areas are controlled with rope barriers and signage in accordance with SEC-RP-102, *Radiological Posting.* A portable chain link fence will be installed around the southeast courtyard corner where Piles 1 and 2 are presently stored to prevent inadvertent access. All other radioactive materials are sufficiently controlled within the main process building.

2.3 Access Control Measures

Personnel must sign in on the entry/exit log maintained by the security officer at the Massillon site access point. Personnel must sign in and sign out for each entry and exit event, respectively. Once the requirement for 24/7 security staffing is downgraded, personnel will sign in/out of XXX generated and provided access logs. Perma-Fix will identify any areas that will require special traffic control measures (e.g., spotters and flagmen) for pedestrian and vehicular traffic while the project is in process. Signage and controls will be used to direct pedestrian traffic where it may encounter the decontamination work area.

3.0 WORK SUMMARY

3.1 Stockpiles Characterization

Additional sampling and characterization of contaminated ASR, waste, and product piles will be necessary to quantify the radionuclide mixture in the impacted media. Representative samples of waste will be collected and analyzed at an off-site laboratory for radiological and chemical [Toxicity Characteristic Leaching Procedure (TCLP) – Resource Conservation and Recovery Act (RCRA) metals] analyses. The impacted “Pile 1” and “Pile 2” material currently staged and secured in the Massillon courtyard have been selected as the basis for the XXX waste characterization profile. Waste planning and management as well as personnel protective strategies will be based on the results of the sampling.

All current stockpiles of material at the Massillon site including ASR, waste, and finished product piles shall be considered potentially contaminated until they have been radiologically surveyed and documented in accordance with ODH approved release methods for unrestricted use criteria. Aside from identifying and isolating a modest volume of the most elevated source material from the courtyard ASR (Pile 1 and Pile 2) for investigative purposes, the current operating assumption is that all material stockpiles at the Massillon site will be bulk loaded and shipped off-site for disposal as low-level radioactive waste.

Volume reduction methods including conveyorized sorting and/or "spreading, scanning, and sampling" material stockpiles are not currently being considered. Although unlikely, if a volume reduction approach is selected for use at a later date, an amendment to this DWP will be prepared to explain the step-wise details and correlate the proposed pile survey strategy to a technically defensible MARSSIM- and ODH-compliant method.

3.2 Decontamination – Process Equipment

Preliminary surveys indicate the presence of contamination at several locations on the surfaces of the sorting process equipment, including the incoming hopper, Trommel, Bivi-tec, and interconnecting conveyor belts and rollers. Upon approval of this DWP, additional intrusive characterization will be performed. Based on these results, RWPs will be prepared to incorporate additional controls and hold points.

Equipment decontamination activities will include removal of all ASR hold-up material remaining inside the incoming hopper, Trommel unit, and Bivi-tec. Impacted ASR will be containerized and then sampled for waste characterization purposes. All known contaminated conveyor belts and other replaceable items will be removed, followed by high efficiency particulate air (HEPA) vacuuming, hot water pressure washing ("Hotsy"), and wet wiping of internal surfaces. It is not anticipated that sanding, grinding, and other abrasive decontamination techniques will be needed for process equipment. All work activities will be performed in accordance with the approved RWP. Any decontamination wash water generated will be collected in catch basins or tubs and containerized for eventual treatment and off-site disposal. If hot washing is used, all nearby floor drains will be sealed.

Mobile material handling equipment used at Massillon include front end loaders, forklifts, Bobcat 4x4 haulers, and manlifts, As part of the initial site stabilization and recovery process, several pieces of mobile handling equipment have undergone release surveys and are now used outside posted Radiological Areas. Some pieces of site equipment remain inside posted Contamination Areas. Prior to demobilization, all pieces of mobile material handling equipment with residual contamination will be decontaminated using some combination of HEPA vacuuming, "Hotsy," and wet wipe-downs. Decontaminated equipment will undergo free release, which will include 100% scanning of accessible surfaces, a minimum of 20 static measurements (for larger items) biased toward locations most likely to retain residual contamination, and smears taken at each direct measurement location. Large area wipes (LAWs) using Masslinn cloths are often used to supplement equipment release surveys.

All independently-owned tractor-trailer combinations which were radioactively impacted by hauling contaminated ASR to and/or from the Massillon facility have been radiologically surveyed for unrestricted use. As of this DWP submittal date, ODH has reviewed the survey data and has authorized the release of all tractor-trailers back to their owner-operators with the exception of B&T Truck #126 which is currently parked in the Warehouse Building at Massillon.

3.3 Decontamination – Impacted Structures

Impacted structures include the Main Process Building, Fines Area, Administration Building, sections of the Warehouse, the Courtyard slab, and a portion of the south parking lot asphalt. Initial surveys indicate minimal fixed surface contamination in the Administration Building, specifically the kitchen and adjacent office. These remaining areas will be decontaminated and released in accordance with MARSSIM protocols.

Within the Main Process Building, structural areas currently known to exceed release criteria (Class 1) include sections of the ASR storage bay floor and the northern end of the Main Bay floor around the Trommel and Bivi-tec units. Certain sections of the floor in the Small Fraction, or "Fines" Area may also exceed release criteria. The overall extent of the impacted area is shown in **Figure 2** (page 8). However, due to non-uniform dispersion of dust-like Ra-226 particles, all areas within the Main Processing Building are considered potentially contaminated (i.e., impacted) until surveyed and documented as meeting the ODH-approved release for unrestricted use. Other potentially contaminated areas such as overhead areas, a sub-basement, second story break room/office area, and below grade pits are currently Class 2 or Class 3. However, Class 2 or Class 3 areas may be upgraded to Class 1 if survey information gathered during characterization and decontamination indicates a more stringent designation is warranted.

First, Perma-Fix will attempt to decontaminate identified areas of elevated concrete floor activity using HEPA vacuuming and wet wiping. Post-decontamination surveys will be performed to assess the effectiveness of the initial decontamination. If results indicate that more aggressive intrusive decontamination is required, the methodology for concrete removal will depend on the depth to which the concrete is contaminated. For shallow depths (less than 1 inch), Perma-Fix may utilize scarification, scabbling, chipping, and/or roto-peen scalers to remove the affected concrete. For deeper depth, Perma-Fix may utilize chipping hammers to remove the affected concrete. Operational descriptions of these equipment types and their intended uses follow in the succeeding paragraphs.

Scarification equipment used will be equipped with a shroud and port onto which a HEPA-filtered vacuum will be attached to capture and collect any fugitive dust. In cases where shrouds cannot be installed, localized negative ventilation will be provided at the point at which cutting, scabbling, or chipping is being performed. The ventilation will be provided via the use of a HEPA-filtered vacuum. The suction end of the hose will be held directly at the point at which the operation is being performed to capture any dust, debris, and/or contamination that is generated. The majority of equipment used to remove contaminated concrete (including the scabblers, scarifiers, and grinding wheels) generally feature shrouds. Chipping hammers, if needed, generally do not feature shrouds. However, if chipping hammers are used to remove discreet spots of radioactive contamination in concrete, the Perma-Fix HPT will mark the bounds of the discreet contaminated spot. Perma-Fix will then use the chipping hammer around the outside of the perimeter of the markings, in the non-contaminated concrete, minimizing the disturbances to the contaminated concrete. Finally, the Perma-Fix RSO will evaluate any operations where decontamination is being performed without shrouded equipment and determine the need to set up local containment around the area using poly sheeting or pre-fabricated tents featuring negative air inside. These engineering controls will be used as needed and as determined by the RSO to provide additional control of contamination. A reference to RP-111, Radioactive Material Control Program (RPP procedure) has been added as providing additional reference procedure for controlling and monitoring contamination during decontamination activities.

Additionally, work area air sampling and personnel lapel air sampling will be performed when decontamination work is performed. The results of the initial surveys used to identify the areas to be decontaminated do not have activity concentrations high enough to warrant respiratory protection. Decontamination and re-survey will be conducted in an iterative process and will continue until release criteria are met or until otherwise directed by XXX.

The use of chipping hammers, scarifiers, scabblers, and/or roto-peen scalers is described below:

- Prior to initiating decontamination, the HPT will clearly mark the boundaries of the area to be decontaminated. These boundary demarcations will be verified by XXX.
- The decontamination technician(s) and HPTs will verify with the PM that there are no utilities or other obstructions present in the area of concrete to be removed.
- The decontamination technician(s) will inspect the equipment (scarifier, scabbler, or roto-peen scaler) and will inspect the HEPA filter and vacuum hoses. If any defects are noted, he must stop work and notify his supervisor immediately.
- The Perma-Fix decontamination technician(s) will attach the vacuum hose to the shroud of the equipment and will ensure that a good, tight seal is achieved.
- The decontamination technician(s) will prepare the HEPA vacuum in accordance with manufacturer's instructions and will position the vacuum so that the exhaust is pointed away from the work area and any potential hazards.
- The decontamination technician(s) will don appropriate hearing protection and face protection as specified in the AHA and/or RWP.
- The decontamination technician(s) will turn on the HEPA vacuum and ensure that sufficient negative pressure is achieved at the vacuum hose end or within the shroud of the equipment.
- Being careful to stay within the boundaries of the contaminated area (already demarcated), the decontamination technician will begin scabbling the concrete to remove the top 1/4 inch of material. The technician will operate the equipment in strict accordance with manufacturer's instruction manual(s). While scabbling the concrete, the vacuum operator should place the vacuum nozzle in the vicinity of the scabbling to capture the dust and small debris generated. The vacuum operator must maintain a safe distance from the scabbler tip while the tool is operating. An extension to the vacuum hose should be used so the operator can remain a safe distance from the nozzle.
- Once the contaminated concrete material has been removed, turn the scabbler off and place it aside. The vacuum operator should meticulously vacuum the area to remove the fine debris and dust.

- Once cleaning is complete, the HPT will survey the area to determine if additional scarification is needed. If contamination has not been fully removed, consult supervisor before repeating the scabbling procedure listed above.

3.4 Decontamination - Surface Soils

Results of the initial GWS of the Massillon operational area (see **Figure 2**) shows no indications that surface soil has been contaminated beyond the courtyard area where contaminated ASR and plant waste stockpiles (e.g., "Pile 1," "Pile 2," et al.) are currently staged. Any contaminated soils identified under or adjacent to the Courtyard slab will be excavated either manually or by mini-excavator depending on the extent of contamination. Although the entire Courtyard area is designated a Class 1 area, any area on the site where soil is found to exceed release criteria and is remediated automatically becomes a Class 1 Survey Unit (SU).

To facilitate accurate and verifiable sampling locations, the footprints of each pile shall be physically delineated with marking paint or other durable marker prior to their removal form the courtyard. The courtyard area is covered by a concrete slab, but there are some significant cracks found throughout. A **minimum** of eight soil samples will be collected after removal of contaminated stockpiles and concrete slab decontamination. These samples will be collected judgmentally and biased toward down gradient locations where cracks, breaks, or depressions can facilitate soil sampling by manual means. These biased courtyard soil samples should to the extent possible be collected as 6-inch vertical grabs. The amount of biased courtyard samples ($\geq$ 8) was selected since it agrees with a typical number of systematic or random soil samples in a successfully remediated land SU using MARSSIM guidance. This biased sampling requirement for the Courtyard will also apply to the Class 1 South Parking Lot area and periphery.

After pile removals, concrete decontamination, and biased soil sampling, the entire Courtyard will undergo FSS as a Class 1 SU, using the same instrumentation as would be used on a structural surface. However, since this is an outdoor area, the courtyard SUs will be limited to 2,000 square meters (m^2) in area.

In addition to the Class 1 survey and soil sampling in the courtyard area, all storm water drains, catch basins, and/or other potential runoff accumulation areas (no dry wells are present) down gradient to staged stockpiles will be radiologically surveyed and at least one soil/sediment sample collected and analyzed from each.

Prior to land area FSS activities, radium background concentration levels in soil will be determined after an evaluation of analytical data from soil samples collected in a nearby non-impacted reference area in accordance with MARSSIM.

The performance of FSS in open land areas is discussed in further detail in Section 3.5.3.

3.5 Unrestricted Release Protocols (Final Status Surveys)

Once post-decontamination surveys indicate structural and equipment surfaces have been sufficiently decontaminated, FSSs will be implemented in accordance with MARSSIM.

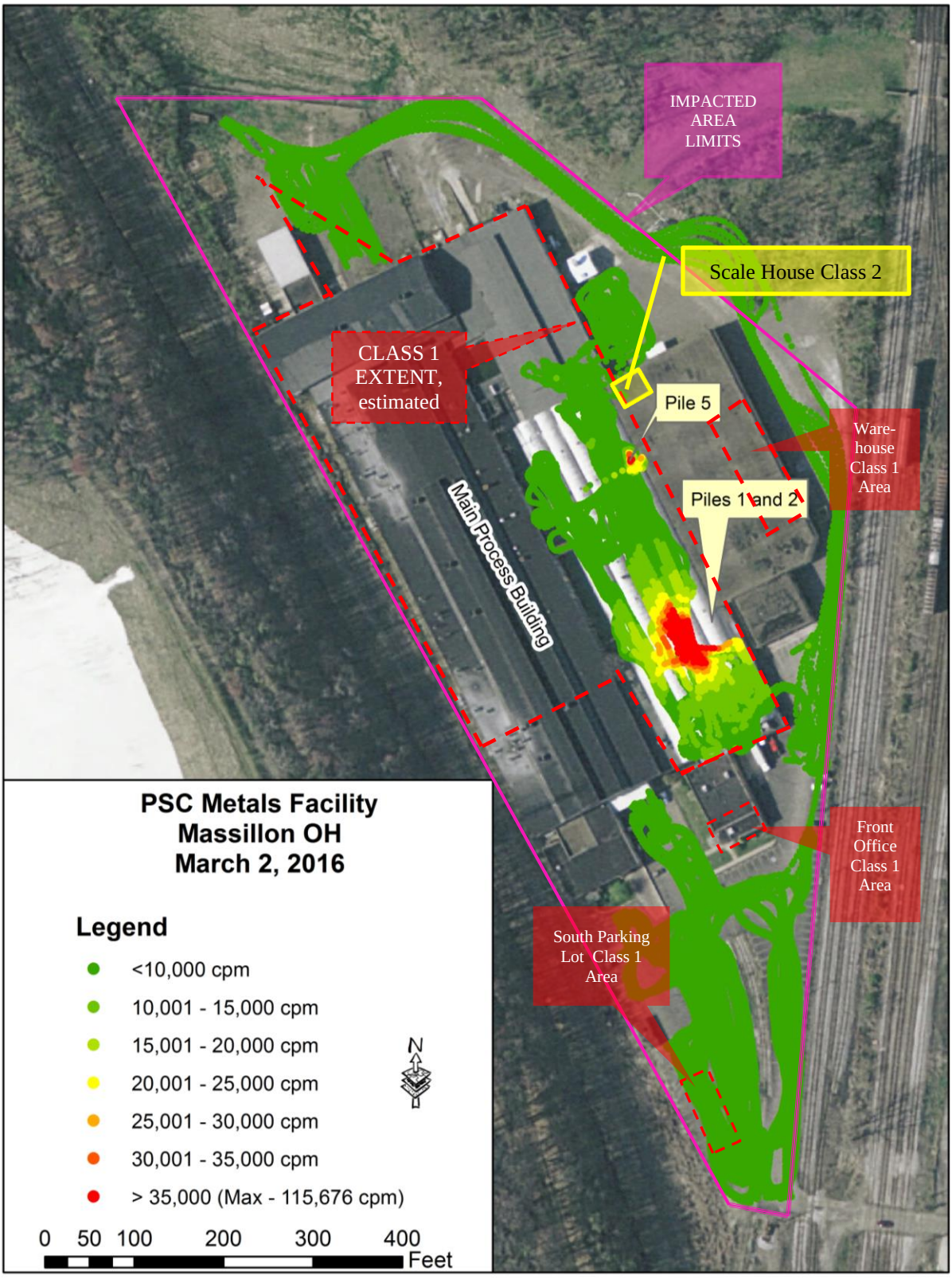
FSS measurement data collected from soil and structural surfaces will be evaluated using the Wilcoxon Rank Sum (WRS) Test in accordance with guidance provided in MARSSIM. Decision inputs used in selecting the WRS Test included: 1) the single radionuclide of concern (ROC) Ra-226 is present in background, 2) material (soil and various building materials) background values collected from similar non-impacted areas and materials will be subtracted from gross measurements for compliance comparisons, 3) some residual surface radioactivity measurements could represent a significant fraction of the total alpha release criterion of 1,120 disintegrations per minute (dpm)/100 square centimeters (cm^2), and 4) some residual soil concentration levels could represent a significant fraction of the release criterion of 0.7 pCi/g above background.

3.5.1 Final Status Survey – Process Equipment

FSS includes a combination of scanning, static measurements, and swipe samples. Survey Units (SUs) will be established following the size limits established in MARSSIM. For the purposes of bounding the survey area in which the scanning measurements will be collected, equipment and machinery surfaces designated as Class 1 will be limited to a maximum size of 100 m^2. Class 2 equipment and machinery surface SUs will be limited to a maximum size of 1,000 m^2. Class 3 equipment and machinery surface SUs will be limited to a maximum size of 10,000 m^2.

Machinery and equipment scanning instrumentation, such as the Ludlum 43-93, will be set to collect measurements for alpha only and alpha+beta at each location. Prior to equipment scanning, the HPT will determine background level measurements (alpha and beta-gamma) upon an uncontaminated sample of steel-framed machinery or

Figure 2. Satellite View of XXX – Massillon Impacted Area and General MARSSIM Class Layout



equipment within the non-impacted area of the Massillon facility. This value will be subtracted from the gross activity measurements encountered during the scanning survey. Using the background level and using the calculated instrument efficiency, the HPT will determine an action level [the instrument reading in gross counts per minute (cpm)] which correlates to the 1,120 dpm/100 cm^2 surface contamination limit.

The HPT will move the handheld survey probe systematically across equipment surfaces at a speed between 1 and 2 inches per second while holding the probe as close (nominally ¼ inch, but not to exceed ½ inch) to the surface as conditions allow. The scanning surveys will cover the percentage of the accessible equipment surface areas within the area of interest as indicated in **Table 3**.

Table 3. Massillon Equipment and Machinery Units

Equipment Item	Surface	Preliminary Classification	Scan Coverage	Estimated Number of Direct Measurements
Vibratory Batch Feeder (ASR Infeed)	All (Interior, Exterior)	Class 1	100%	15
Trommel	Interior	Class 1	100%	15
Bivi-tec	Interior	Class 1	100%	15
Trommel	Exterior	Class 2	≥10%	15
Bivi-tec	Exterior	Class 2	≥10%	15
Eddy Current Units	Contact Surfaces	Class 1	100%	15
Fines Room	All (Conveyors, Equipment)	Class 1	100%	15
Conveyor Lines (M101 ~ M207)	All	Class 1	100%	15
Aspirators	Interior	TBD	TBD	15
Aspirators	Exterior	TBD	TBD	15
Cyclones	Interior	TBD	TBD	15
Cyclones	Exterior	TBD	TBD	15
Conveyor Lines (M301 ~ M311)	All	Class 2	≥10%	15
Sensor Deck Platform (Lines 1, 2, 3)	All	Class 2	≥10%	15
Other Undetermined Equipment	All	TBD	TBD	15
Mobile: Volvo loader in Courtyard; other equipment (e.g., manlifts) used for decontamination	All	Unrestricted Equipment Release	100%	15
Mobile: All other (forklifts, skid steers, Bobcat, outside loaders, etc.)	All	Unrestricted Equipment Release	100%	15

During the equipment scan, the HPT should pause at certain high potential surface features such as lower horizontal ledges, grease/lube joints, exhaust ports, conveyor belt surfaces, diversion frame rails, etc. These features have the potential for accumulating residual radioactivity and may be suitable candidates for static, biased, or sentinel measurements.

Upon completion of scanning within a given piece of equipment, a series of static direct measurements will be performed commensurate with the potential for residual radioactivity as given in **Table 3**. The direct measurements will be collected using the 100 cm^2 Ludlum 43-93 handheld probe for a period of one minute.

Once structural and engineering design drawings (electronic .dwg format, preferably) for the impacted XXX facilities are received from XXX and have been evaluated to determine surface areas, more detailed SU Layout Drawings for the various equipment and machinery types will be prepared to support the FSS design process.

Upon completion of scanning and collection of direct measurements within a given machinery and equipment survey area, swipe samples will be collected in order to assess removable activity levels. After each static measurement, within the same area as the static measurement, cloth smears will be swiped with moderate pressure over an area of 100 cm^2 (a 4 inch by 4 inch square) in an S-shaped pattern in order to assess removable activity.

Mobile material handling equipment used by XXX before the incident and used by Perma-Fix during the decontamination phase will undergo unrestricted use release surveys prior to demobilization. All pieces of mobile

equipment will undergo a 100% scan of accessible surfaces, a minimum of 15 direct measurements, swipes at all direct measurement locations, and supplemental LAWs,

3.5.2 Final Status Survey – Structural Surfaces

FSS includes a combination of scanning, static measurements, and swipe samples. SUs will be established following the size limits established in MARSSIM. For the purposes of bounding the survey area in which the scanning measurements will be collected, structural surface SUs designated as Class 1 will be limited to a maximum size of 100 m^2. Class 2 equipment and machinery surface SUs will be limited to a maximum size of 1,000 m^2. Class 3 equipment and machinery surface SUs will be limited to a maximum size of 10,000 m^2.

Structural surfaces must be clean and dry. Floor scanning is performed with Ludlum 43-37-1 large area gas-proportional detectors coupled with a Ludlum 2360 scaler-ratemeter. The Ludlum 2360 features dual-channel capability (i.e., alpha and beta counts are recorded simultaneously). HPTs will determine background level measurements for both alpha and beta activity upon an uncontaminated sample of concrete or other applicable building material within the non-impacted area (such as the north maintenance room) of the Massillon facility. Each background value will be subtracted from the gross activity measurements encountered during the static measurement survey phase of floor FSS. Using the background levels for alpha and beta-gamma and the calculated instrument efficiency, the HPT will determine action levels [the instrument reading in gross cpm] which correlates to the 1,120 dpm/100 cm^2 surface contamination alpha limit and the 5,000 dpm/100 cm^2 beta-gamma limit.

While scanning, the HPT should wear headphones in order to optimize surveyor efficiency. While scanning, alpha counts are registered at a higher pitch tone than beta-gamma counts. Upon hearing a noticeable increase in alpha or beta-gamma count rate, the HPT will pause to investigate. Special attention should be paid to certain high potential surface features such as floor seams, cracks, holes, and at floor/wall interfaces. These features have the potential for accumulating residual radioactivity and may be suitable candidates for biased measurements.

The HPT will move the floor monitor systematically across the floor surface at a speed between 1 and 2 inches per second. He will ensure the probe set screws maintain a close, even distance (nominally ¼ inch, but not to exceed ½ inch) to the floor surface. A scanning survey of any tight, or cramped, floor areas the floor monitor cannot reach will be performed using a handheld Ludlum 43-93 alpha-beta scintillation detector. The HPT will move the handheld survey probe systematically across any floor areas the large area detector cannot access at a speed between 1 and 2 inches per second while holding the probe as close (nominally ¼ inch, but not to exceed ½ inch) to the surface as surface conditions allow. The scanning surveys will cover the percentage of the accessible surface areas within the area of interest as indicated in **Table 4**.

Walls in impacted areas below 2 meters (m) in height will be scanned by moving the handheld survey probe (Ludlum 43-93) systematically across the wall surface at a speed between 1 and 2 inches per second while holding the probe as close (nominally ¼ inch, but not to exceed ½ inch) to the surface as conditions allow. The scanning surveys will cover the percentage of the accessible surface areas within the area of interest as indicated in **Table 4**. Within Class 2 and Class 3 structural SUs, HPTs should preferentially scan those areas with the highest potential for residual elevated activity, such as horizontal ledges, corners, cracks, holes, openings, etc.

Upon completion of scanning, direct measurements and swipe sampling will be performed. Static direct measurements are taken for a 1-minute period to quantify total surface contamination. Swipes are collected in order to assess removable activity levels. After each static measurement, within the same area as the static measurement, cloth smears will be swiped with moderate pressure over an area of 100 cm^2 (a 4 inch by 4 inch square) in an S-shaped pattern in order to assess removable activity.

Upon ODH approval of this DWP, radiological surveys of the sub-grade soil vapor extraction (SVE) system components and groundwater monitoring stand-pipes will be expeditiously undertaken. If any levels exceeding established release criteria are encountered, all regulatory stakeholders will be immediately notified, and decontamination of affected components will be performed. FSS of the Fines Area will include SVE and groundwater monitoring components, both above and below floor level.

3.5.3 Final Status Survey – Open Land

In the context of the Massillon Impacted Area (see **Figure 2**), "open land" refers to any accessible bare soil, grassy lawn, or earth covered with readily removable and replaceable material such as mulch, gravel, graded stone, or metal plate. These areas constitute a relatively small fraction of the total impacted area at the Massillon facility. The open land areas essentially comprise the grassy landscape around the Front Office, grounds adjacent and interior to the

Table 4. Massillon Structural Units and Scanning Intensity

Building / Room	Surface	Preliminary Classification	Scan Coverage	Estimated Number of Direct Measurements (per Survey Unit)
South Parking Lot	Contamination Area (posted)	Class 1	100%	15
Other General Parking and Haul Roads	Asphalt	Class 3	10%	15
Warehouse	Floor	Class 1	100%	15
Courtyard	All Concrete Slab	Class 1	100%	15
Warehouse	Interior Walls, Ceiling	TBD	TBD	TBD
Admin Building / All	Decontaminated Surfaces	Class 1	100%	15
Admin Building / Kitchen	Sink*	*Complete removal likely, including P-trap plumbing; determine if contamination migrated past P-trap		
Fines Area	Floor, Lower Walls (including SVE system, vaults, monitoring wells)	Class 1	100%	15
Fines Area	Upper Walls (> 2 m), Ceiling	Class 2	≥10%	15
Main / ASR Bay, NE	Floor, Lower Walls	Class 1	100%	15
Vacant Room (under M106 conveyor feeding Fines Process from the Main Bay)	Roof	Class 1	100%	15
Main / Posts 6-26	Floor, Lower Walls	Class 1	100%	15
Main / Exterior Holding Bays: Product and Waste	Floor, Lower Walls	Class 1	100%	15
Main / Remainder	Floor, Lower Walls, Sub-basement and sub-grade Pits	Class 2	≥10%	15
Main / All	Upper Walls (> 2 m), Ceiling, Second Story Break/Office Area	Class 3	≥1%	15 (Randomly Determined)
All (Main, Fines, Admin, Warehouse) / All	Exterior Walls, Roofs	Non-impacted	N/A	N/A

paved areas, the transformer pad alcove and connecting utility strip, and the northerly edge of the Impacted Area. Open Land SUs do not include exterior areas covered by structural material such as the concrete Courtyard or asphalt parking lots and roadways. Since exterior Class 1 areas are limited to the Courtyard and South Parking Lot "ASR lay-down" footprint, the Open Land SUs will be surveyed as MARSSIM Class 2 or Class 3 SUs, unless new survey data indicates an upgrade to Class 1 is warranted. However, as a conservative measure, the transformer pad alcove and connecting utility strip will undergo 100% GWS coverage and judgmental biased sampling due to their proximity to the Class 1 Courtyard area and the overhead M106 "Fines" conveyor belt running between the Main Bay and the Fines Room.

FSS of Open Land areas consist of GWS and soil sampling. GWS instrumentation includes 3-inch x 3-inch Sodium Iodide (NaI) gamma scintillation detectors (Ludlum 44-20 or equivalent) coupled to Trimble global positioning system (GPS) units which correlate positional coordinates to gross gamma measurements at the rate of 1 measurement per second. Gamma walkover scan surveys (GWSs) will be performed to cover 100% of the Class 1 SU. Scan surveys will be performed using a 2" x 2" NaI detector coupled with a rate-meter/scaler that is configured to output directly to a global positioning system (GPS) unit. There may be instances where GPS data may not be available, such as alongside buildings and in areas excavations. In these instances, walkover data will be manually recorded. The basic method for performing a GWS is to walk along a path while moving the NaI detector from side to side. A 1-m path length will be used to perform the survey. The side-to-side motion of the detector must be 0.5 m per second to meet the design criteria. Therefore, each detector pass will take 2 seconds (i.e., 1 m / 0.5 m/s).

Within each land SU, approximately 10 surface soil samples will be collected. Class 1 and Class 2 soil sampling is based on a regular triangular grid with a randomly determined starting point; however, all sampling locations within Class 3 Land SUs are randomly determined. Biased surface samples may be collected after evaluation of the GWS data based on guidance from MARSSIM (e.g., measurements exceeding three standard deviations above the GWS mean).

For Class 2 and Class 3 Open Land SUs, a minimum of 10% coverage of accessible land areas will be performed. Assuming no "shine" interference from nearby contaminated stockpiles and a natural background level of 1 pCi/g Ra-226 in soil, GWS measurements exceeding two times the local background level will be demarcated for further investigation, including surface soil sampling. This should be a conservative gross gamma measurement action level correlating to the 0.7 pCi/g above background cleanup level.

During the site decontamination and FSS process, environmental radioactivity monitoring will be performed using fence line dosimetry for measurement of direct radiation exposure to the public. Airborne radioactivity effluent monitoring will be accomplished through the placement of four high-volume air sampling points placed at the north, east, south, and west cardinal compass directions along the periphery of the Massillon property.

3.5.4 Required Detection Sensitivities for FSS Instrumentation

3.5.4.1 Structural and Equipment Surfaces

Alpha Scan

There are two equations based on the MARSSIM two-stage scan methodology used to determine the alpha scanning minimum detectable concentration (MDC) depending on the background level. For a typical alpha background level of less than 3 cpm, the probability of detecting a single count while passing over the contaminated area is:

$$P(n \geq 1) = 1 - e^{\frac{-GEd}{60v}}$$

where:

P(n ≥1) = probability of observing a single count,
G = activity (dpm) (896 dpm/100 cm^2),
E = 4π (pi) detector efficiency (cpm/dpm), (20%, or 0.20),
d = width of detector in direction of scan (cm), and (7.0 cm), and
v = scan speed (cm/s). (5.1 cm/sec).

Increase the value of G (which can be interpreted as an action or "investigation" level) until the corresponding probability equals the desired confidence level (e.g., 95%). This equation is applicable to handheld instrumentation such as the Ludlum 43-93 100 cm^2 alpha-beta scintillation detector. The value selected for "G" is 80% of the total alpha surface activity criterion of 1,120 dpm/100 cm^2, or 896 dpm/100 cm^2. Using the other inputs specific to the Ludlum 43-93 and a scanning speed of 2 inches/second, **the probability of detecting a single alpha count is 0.98**. At this point, the surveyor should pause to investigate and judge if a small area of elevated activity is truly present, or the slight "uptick" was due to random background fluctuations.

For a background level of 3 cpm to about 10 cpm, the probability of detecting two or more counts while passing over the contaminated area is:

$$P(n \geq 2) = 1 - \left(1 + \frac{(GE + B)d}{60v}\right)\left(e^{-\frac{(GE+B)d}{60v}}\right)$$

Where:

P(n ≥ 2) = probability of observing two or more counts,
G = activity (dpm),
E = 4π (pi) detector efficiency (cpm/dpm),
B = background count rate (cpm),
d = width of detector in direction of scan (cm), and
v = scan speed (cm/s).

Increase the value of G until the corresponding probability equals the desired confidence level (e.g., 95%). This equation is applicable to portable instrumentation such as the Ludlum 43-37-1 821 cm^2 alpha-beta scintillation

detector typically used for scanning floors. The value selected for "G" is 80% of the total alpha surface activity criterion of 1,120 dpm/100 cm^2, or 896 dpm/100 cm^2. Using the other inputs specific to the Ludlum 43-37-1 and a scanning speed of 3 inches/second, **the probability of detecting two or more alpha counts is 0.97**. At this point, the surveyor should pause to investigate and judge if a small area of elevated activity is truly present, or the slight "uptick" was due to random background fluctuations.

Beta Scanning

Based on the MARSSIM two-stage scan methodology, the beta scanning MDC at a 95% confidence level is calculated using the following equation which is a combination of MARSSIM Equations 6-8, 6-9, and 6-10:

$$MDC_{scan} = \frac{d'\sqrt{b_i}\left(\frac{60}{i}\right)}{\sqrt{p}\cdot E_{tot}\cdot\frac{A}{100cm^2}}$$

where:

MDC_{scan} = MDC level in dpm/100 cm^2,
d' = desired performance variable (nominally 1.38),
b_i = background counts during the residence interval,
i = residence interval in seconds,
r = surveyor efficiency (0.5 – 0.75, 0.5 is conservative),
A = detector probe physical (active) area in cm^2, and
E_{tot} = total detector efficiency for radionuclide emission of
= Ei x E_s,
where:
E_i = 2π (pi) instrument efficiency in counts per disintegration (cpd) and
E_s = source (or surface contamination) efficiency.

Note: E_s values can be determined or the default values provided in NUREG-1507 can be used as follows: 0.25 for all alpha energies and beta maximum energies between 0.15 and 0.4 megaelectronvolts (MeV), 0.5 for all beta maximum energies greater than 0.4 MeV. Note that instrument efficiency will be provided in the calibration records for each instrument. See **Table 5** for the estimated Beta Scan MDAs for both the Ludlum 43-93 (handheld) and Ludlum 43-37-1 (floor cart).

Alpha or Beta Static Counts

Minimum counting times for static counts of total and removable contamination will be chosen to provide an MDC that is a fraction (25% to 75%) of the site-specific acceptance criteria. MARSSIM equations have been modified to convert to units of dpm/100 cm^2. Count times are determined using the equation below. Static counting MDCs at a 95% confidence level are calculated using the following equation which is an expansion of NUREG-1507, Equation 6-7 (Strom & Stansbury, 1992):

$$MDC_{static} = \frac{3+3.29\sqrt{B_r\cdot t_s\cdot(1+\frac{t_s}{t_b})}}{t_s\cdot E_{tot}\cdot\frac{A}{100}}$$

where:

MDC_{static} = minimum detectable concentration level in dpm/100 cm^2,
B_R = background count rate in cpm,
t_B = background count time in minutes,
t_S = sample count time in minutes,
A = detector probe physical (active) area in cm^2, and
E_{tot} = total detector efficiency for radionuclide emission of
= E_i x E_s,

where:

E_i = 2π (pi) instrument efficiency in cpd and

E_s = source (or surface contamination) efficiency.

Note: Es values can be determined or the default values provided in NUREG-1507 can be used as follows: 0.25 for all alpha energies and beta maximum energies between 0.15 and 0.4 MeV, 0.5 for all beta maximum energies greater than 0.4 MeV.

Static Sample Point Measurements

Static sample point measurements are taken at each sample point location to determine the total contamination. Static measurements for gross alpha are performed by placing the detector on the surface to be measured. Care should be taken if removable contamination is suspected. Notes about the surface condition (e.g., smooth or porous) should be taken. Static sample point measurements will be taken on building surfaces in impacted areas utilizing instrumentation capable of detecting a modest fraction of the total surface activity release criteria and the best geometry based on the surface at the survey location. Additionally, locations of elevated activity identified and marked during the scan survey will require direct survey measurements (i.e., biased measurements).

Direct measurements will be taken using the hand-held 100 cm^2 scintillation detectors (Ludlum 43-93) or 821 cm^2 gas proportional detectors (Ludlum 43-37-1). Total surface activity measurements are taken at each identified sample point. Scaled count times (typically 1 minute) will be determined based on the MDC_{static} of the applicable survey instrument. Scanning MDAs for instrumentation to be used during the FSS at the XXX Canton and Massillon facility are given in the **Table 5** below.

Table 5. Scanning and Static MDAs for XXX (Ohio Sites) FSS Instrumentation

Instrumentation (Detector)	Alpha Scan Probability	Beta Scan MDA	Alpha Static MDA	Beta Static MDA
Ludlum 43-37-1	0.97 (2 counts or more)	228 dpm/100 cm^2	41 dpm/100 cm^2	93 dpm/100 cm^2
Ludlum 43-93	0.98 (single count)	627 dpm/100 cm^2	196 dpm/100 cm^2	238 dpm/100 cm^2

3.5.4.2 Open Land Areas

The MARSSIM framework for determining the MDC for field instrument scanning activities is based on the premise that there are two stages of scanning. That is, surveyors do not make decisions on the basis of a single indication; rather, upon noting an increased number of counts, they pause briefly and then decide whether to move on or take further measurements. Thus, scanning consists of two components: continuous monitoring and stationary sampling. Accordingly, field instrument surveyor scan MDCs, $MDCR_S$, are calculated to control the occurrence of Type I (false negative) and Type II (false positive) errors using the following MARSSIM equation:

$$MDCR_S = \frac{MDCR}{\sqrt{p\varepsilon}}$$

where *MDCR* is the minimum detectable count rate (cpm), *p* is the surveyor efficiency (estimated in MARSSIM to between 0.5 and 0.75; the value of 0.5 results in a more conservative $MDCR_S$ calculation and, therefore, shall be used), and ε is the instrument efficiency (cpm per µR/hr; Table 6.4 of NUREG-1507). In addition:

$$MDCR = s_i\left(\frac{60}{i}\right)$$

$$s_i = d'\sqrt{b_i}$$

where s_i (counts) is the minimal number of net source counts required for a specified level of performance for the counting interval *i* (seconds); d' is the index of sensitivity; and b_i is the number of background counts in the interval. Index of sensitivity d' values are listed in MARSSIM Table 6.5 based on the proportions for required true positive and tolerable false positive occurrence rates. The index of sensitivity value selected for initial use at the PSC Ohio Sites is 1.38, corresponding to a true positive proportion of 0.95 and a false positive proportion of 0.60. While this index of sensitivity value shall result in at least 95% "correct" scanning detections for Type I error control, up to 60% "incorrect" (false positive) scanning detections may occur. Should this become an intolerable compromise, a larger

index of sensitivity value corresponding to the 0.95 true positive proportion may instead be used provided the required scan MDC is achieved.

Ra-226 scan MDCs for a survey instrument equipped with 3x3 NaI detector using this MARSSIM two-stage scanning framework are summarized in **Table 6** for increasing background count rates.

Table 6. Typical Soil Scan Sensitivities for Ra-226 Detection Using a 3 x 3 NaI Detector[a]

Bkg cpm	***I*** sec	***P***	***ε*** cpm per μR/hr	***d′***	s_i Counts	***MDCR*** ncpm	$MDCR_S$ ncpm	***CF***[b]	***Scan MDC***[c]	
									μR/hr	pCi/g
5,000	1	0.5	1,946	1.38	13	756	1,069	1.41	0.55	**0.8**
10,000					18	1,069	1,512		0.78	**1.1**

a. Ra-226 in equilibrium with progeny uniformly distributed in a source thickness of 6 inches.
b. Conversion factor (pCi/g per μR/hr) taken from NUREG-1507, modeled using *MicroShield*. CF = Scan MDC (pCi/g) / Scan MDC (μR/hr).
c. *Scan MDC* (μR/hr) = $MDCR_S/\varepsilon$ and *Scan MDC* (pCi/g) = $(MDCR_S/\varepsilon)CF$.

4.0 HEALTH AND SAFETY PLAN

4.1 Environmental Health and Safety Policy

Perma-Fix is dedicated to the health and safety of project workers, the community, and the protection of the environment during work conducted at all XXX, Inc. facilities. Perma-Fix will take all responsible precautions in the work performed during the decontamination and survey project to protect the health and safety of employees and the public, to minimize danger from hazards to life and property.

NOTE: Perma-Fix employees are expected to accept personal responsibility and concern for the protection of the environment, the health and safety of themselves, fellow workers, subcontractors, and visitors through compliance with company programs and policies, training programs, and abiding by established rules and procedures.

In order to ensure continued commitment to Environmental Safety and Health (ES&H) policies, Perma-Fix has established subcontractor ES&H goals, objectives, and performance indicators. Perma-Fix maintains, as its primary goal: zero injuries, zero environmental impacts, and zero defects through the course of the project.

4.1.1 Safety and Health Goals and Objectives

Perma-Fix is dedicated to the concept that all accidents are preventable. Accordingly, Perma-Fix is committed to achieving and sustaining "Zero Accident Performance" through continuous improvement practices. Zero Accident Performance includes zero non-permitted discharges or releases with respect to protection of the environment. Perma-Fix views the success of the Zero Accident Performance Policy as being based upon three very fundamental goals. First, management supports the zero accident policy from the Chief Executive Officer (CEO)/President down through the Corporate and project management staff. This daily demonstration of commitment to Zero Accidents is essential to inculcate this philosophy to all levels of the company and its projects. Second, our employees are encouraged and directly involved in all elements of the work process. It has been proven that worker involvement is the most important element to ensure safe practices. Third, management, supervisors, and workers must be trained on case management regarding response, worker down time management, medical treatment options, and reporting requirements. This promotes responsiveness and compliance with applicable rules and regulations.

4.1.2 Integrated Safety Management System

ISMS objectives are in continual use for the planning and execution of all Perma-Fix project plans. Perma-Fix establishes and maintains a systematic approach to incorporate ES&H requirements effectively into all work performed. Protection of the public, the workers, and the environment shall be integrated into the project. For the purpose of ISMS, the term "Safety" encompasses environmental protection, safety and health, and includes pollution prevention, waste minimization, and resource conservation. Safety management activities shall include the five core functions:

- Define the Summary of Work.
- Analyze the Hazards.
- Develop and Implement Controls.
- Perform Work Within the Controls.

- Provide Feedback and Continuous Improvement.

These five, core safety-management functions are applied as a continuous cycle with a degree of rigor appropriate to the work activity and hazard involved. The order of priority for hazard controls is:

1) Engineering Controls.
2) Administrative Controls.
3) Personal Protective Equipment (PPE).

Controls shall be tailored to the work's complexity and associated hazards as defined in the work plan(s)/AHA.

Perma-Fix is firmly committed to the ISMS concept to enhance worker safety. We have adopted this concept and embraced the process by incorporating it into all projects. The following steps are part of the Perma-Fix incorporation process:

- Require safety and ISMS training at all management and project execution levels, including solicitation of lessons learned from workers' past experience.
- Promulgation of safety policies, programs, procedures, and acknowledgement from workers of their acceptance.
- Requiring subcontractor commitment to ZERO ACCIDENT PERFORMANCE and to the core functions of ISMS from the contractual, training, and practical standpoints.
- Initial review for identification of potential environmental hazards and development/implementation of controls.
- Subcontractors and craft workers' integration into the Perma-Fix safety culture.
- Reiteration, reinforcement, and feedback through daily safety meetings.
- Active solicitation of worker input to address safety concerns or suggestions for improvement.
- Safety policies, programs, and procedures enforcement.

4.1.3 Safety Inspection Program

Perma-Fix utilizes a safety inspection process to ensure that a systematic approach is used to review each safety and health component and project activity. In addition, instructions are provided to site employees regarding employee rights, protection, and employer obligations regarding nondiscrimination, filing complaints, availability of standards, and inspector accompaniment rights as it pertains to safety and health standards and enforcement. The safety inspection is performed by the SSHO or designated person at a frequency based on the hazards of the project, which is provided by the PM. After the inspection(s) are conducted, the results are documented and provided to the PM and maintained in the project files. Any identified issues are discussed with the crew during the following day's POD meeting.

4.2 Project Hazard Analysis Program

General and site-specific hazards that have been identified for the project are included in **Table 7**. Additional hazards that are identified during the project will be addressed and mitigations determined. Personnel will be trained in the daily PODs or as the hazards are identified on mitigation and hazard awareness.

Table 7. Potential Hazards at XXX – Massillon, Ohio

General Hazards and Mitigations	
Temperature Extremes (Cold Stress and Heat Stress)	The Perma-Fix SSHO shall determine by performing environmental and/or physiological monitoring when workers need rest breaks to prevent heat stress or need warm-up exercises to prevent cold stress. Personnel shall be trained on the hazards associated with working in temperature extremes and on the identification of temperature induced stress signs and symptoms. Worker physiological indicators that point to potential cold or heat stress shall be observed. A work-rest schedule shall be implemented when required by environmental conditions, and workers shall be provided with climate-controlled break areas and plenty of drinking water.
Work in Potential Mercury Contaminated Areas	Before concrete scabbling or coring activities, Perma-Fix shall clearly monitor areas that may contain mercury, as indicated by historical analyses and other hazards. Perma-Fix shall ensure that workers are fully trained to the hazards present and the proper mitigation of those hazards and don the appropriate PPE.
Slips, Trips, and Falls	The risk of fall-type accidents will be encountered throughout the project site. To mitigate these risks, Perma-Fix will ensure all people are properly trained and will implement a rigorous program of marking potential fall hazard areas as well as fall avoidance training and reminders during the daily tailgate meetings.

General Hazards and Mitigations	
Elevated Work	All elevated work shall be in accordance with the approved fall protection training and applicable AHA. Each employee performing elevated work shall wear the required fall protection equipment. The work area shall be posted and roped off to prevent unauthorized personnel entry.
Electrical/Work in Low Light Conditions	During work in low light conditions, task lighting will be used to illuminate the work areas until enough daylight is present to allow for safe working conditions. Any temporary lighting units will be on a dedicated separate circuit and will be hard wired by a qualified electrician. Task/activity lighting will be tied into a ground fault circuit interrupter (GFCI) protected regular circuit.
Work near energized utilities and lines	All work performed in utility isolation zones will be performed under the direct supervision of a subject matter expert and/or the SSHO. Perma-Fix will utilize additional spotters and will perform extensive pre-demolition training of the work crew so that they know the exact location of the lines and the methods of demolition to ensure the lines are not disturbed.
Fire	In the event that a fire is discovered, contact XXX representative or Fire Department and inform them of location of the fire. The fire watch will remain at the site until the Fire Department arrives. If the fire watch determines that they can contain or control the fire safely by use of a fire extinguisher, they may do so.
Radiological Abatement Activities	Prior to performing radiological abatement activities, all employees entering a radiological area shall be briefed on the RWP which will specify appropriate controls. All radiological abatement activities will be performed in accordance with AHA-02, Radiological Abatement. All workers who perform work within a Radiological Area shall have current Radiation Worker II training certificates, or equivalent.
Operation of Chipping Hammers, Scarifiers, and Scabblers	All mechanical concrete decontamination activities will be performed in compliance with AHA-02, Radiological Abatement.
Working Around or Near the Trench	Prior to beginning any activities, the area around the trench will be roped off and the floor will be marked with caution tape. Any work on the suspended concrete floor area shall not exceed the load limitation.

4.2.1 Hazard Analysis/AHA

Perma-Fix will develop a general AHA to support mobilization activities. Touring the facility and obtaining information regarding initial site conditions and activities will be considered. XXX personnel will lead the Perma-Fix team on the tour. During the tour, the specific work tasks and their associated hazards will be identified to ensure that adequate controls are implemented. The SSHO will brief the site personnel accordingly during the pre-job and daily safety meetings. These job tasks and controls will be incorporated into Perma-Fix's existing AHA to address project-specific challenges and incorporate continuous worker feedback. Once the SSHO determines the job-specific controls needed to mitigate work activity hazards, the Lead HPT will review the controls to determine if they can be implemented in the field. Once an existing AHA has been revised to ensure that controls are adequate for the hazards and appropriate to be implemented in the field, Perma-Fix will submit the AHA to XXX for review and approval. Once approved, the AHA will be presented to the workers who will train to and sign the document, indicating their willingness and commitment to comply with the AHA and their understanding of the AHA objectives.

The AHA anticipated for the Decontamination project include:

- Mobilization/General Activities,
- Radiological Decontamination and Abatement,
- Concrete Decontamination, and
- Waste Loading/Transport.

AHAs will be prepared as necessary to address other hazards identified as the work activities progress. In addition to these deliverables, the training records, health and safety records, medical information, and any equipment testing results will be provided for XXX to review for verification of completeness when requested.

The work plan/AHA shall be developed and reviewed with the employees who will be performing the defined task. The work plan/AHA shall be readily available on-site for personnel review. All modifications shall be developed as the project progresses to ensure all hazards are appropriately addressed.

The work plan/AHA and all revisions shall be signed by the SSHO and PM and all applicable workers and subcontractor personnel prior to commencing the work activity, certifying that the work plan/AHA has been reviewed and approved.

4.3 Medical Surveillance

4.3.1 Baseline and Annual Health Assessment

A baseline physical examination may be provided for personnel working on the project site as required by their work assignment and applicable standards/regulations. The extent of the physical examination will be determined by the performing or consulting physician based on the task to be performed and the established standards requirements [i.e., 29 Code of Federal Regulations (CFR) 1910.120].

4.3.2 Post-Employment Examination

Upon employment termination or post project activities, site personnel who have been on-site for six months or greater will be requested to undergo an examination equivalent to the baseline health assessment. Dependent upon the specific work the employee performed on site, each employee receiving the examination will have the opportunity to undergo a post-employment physical.

4.3.3 Supplemental Examination

If, during the course of the project, there is an identified risk for any worker to be potentially overexposed to contaminants identified in any of the structures, personnel may undergo a supplemental examination, if deemed appropriate by the examining or consulting physician.

4.3.4 On-site and Site-Specific Record Keeping

The SSHO shall maintain a record of Perma-Fix on-site personnel who are under medical surveillance. For each employee these records shall include, at a minimum, the following:

- The employee's name and social security number (last four digits only).
- A physician's written statement releasing the employee to perform work on a hazardous waste site without restrictions, or
- A physician's written statement recommending limitations for an employee to perform activities on a hazardous waste site.
- Other required task-specific (e.g., radiation and/or asbestos worker) training records as needed.

Personal medical and exposures shall be available only with written permission from the employee. Records will be kept in accordance to the Occupational Safety and Health Administration (OSHA) Log 300 policies and procedures.

The safety records/reports and training/qualification certifications, work plans, visitor's logs, daily pre-job briefings, permits etc., if applicable, will be kept on-site at all times.

4.4 Training Requirements

All project personnel that will be working full time on the site shall receive training and be thoroughly familiar with programs and procedures contained in this DWP, other project plans, and other written programs or job description. Employees shall receive a full site orientation and briefing before commencing work. Any additional training required shall be verified before work commences or be provided before beginning any tasks requiring the training. In addition to reading and understanding the required plans, the following subsection provides an overview of other training that may be required for site personnel. Only appropriately trained and qualified personnel shall be used to perform work on this project.

4.4.1 First Aid/Cardiopulmonary Resuscitation Training

At least one individual at each worksite shall have and maintain current certification from the American Red Cross or equivalent in basic first aid and cardiopulmonary resuscitation (CPR). These training records shall be maintained on-site.

4.4.2 Personal Protective Equipment Training

All personnel should have received training in PPE use, inspection, and maintenance as required by 29 CFR 1926, Subpart E. The PPE training shall have addressed at a minimum the following:

- Allowing the user to become familiar with the equipment in a non-hazardous situation.
- Making the user aware of the equipment's limitations and capabilities.
- Increasing the efficiency of operations performed by workers wearing PPE.
- Reducing PPE maintenance expense.

Before site activities commence, Perma-Fix shall compile copies of project employees' training certificates to be maintained in the project training files, if necessary.

4.5 Restricted Work Area/Site Control

The purpose of restricted work areas and site control for XXX facilities is to control site access and to minimize or prevent the migration of site-specific contamination from affecting the environment. Emergency communications will be performed using cellular phones. Emergency numbers will be posted on-site and readily available to all personnel.

Site control shall be maintained by erecting physical barriers such as construction tape, stanchions, and signs. Fire extinguishers shall be present at all times on the site per OSHA 1926. Site control will be maintained at all times and with all activities. The project activities will take place in the general order listed below:

- Mobilization to the site and establishment of waste characterization, hazardous work area boundaries, and controls.
- Surveys and decontamination.
- Waste transportation and disposal.
- Performance of FSSs.
- Demobilization.

4.5.1 Pedestrian Control

Personnel accountability will be performed using the project's visitors log and sign in sheet from the daily safety meeting. In the event of any site emergency, the sign in sheets will act as the first line of personnel notification and accountability.

4.6 Personal Protective Equipment

All personnel shall wear PPE appropriate for the task and the anticipated known contaminants contact when engineering or administrative controls cannot eliminate potential exposure. The subsections below outline the different protection levels that may be used.

4.6.1 Level A

Level A is used when the greatest respiratory, skin, and eye protection level is required:

- Positive pressure, full face piece, self-contained breathing apparatus (SCBA), or
- Positive pressure supplied air respirator with escape SCBA, approved by the National Institute for Occupational Safety and Health (NIOSH).
- Totally-encapsulating chemical protective suit.
- Inner chemical resistant gloves.
- Outer chemical resistant gloves.
- Chemical resistant boots – steel toe and shank.
- Hard hat.
- Optional as applicable to the job are:
  - Boots,
  - Leather gloves,
  - Coveralls,
  - Long underwear, and
  - Disposal protective suit.

4.6.2 Level B

Level B is used when the highest respiratory protection level is required, but a lesser skin protection level is needed.

- Positive pressure, full face piece, SCBA or
- Positive pressure, supplied air respirator with escape SCBA, approved by NIOSH.
- Hooded chemical resistant clothing (disposable chemical resistant overalls).
- Outer chemical resistant gloves.
- Inner chemical resistant gloves.
- Boots, outer, chemical resistant steel toe and shank.

- Hard hat.
- Optional as applicable to job are:
  - Coveralls,
  - Long underwear,
  - Disposal protective suit,
  - Leather gloves, and
  - Boots.

4.6.3 Level C

Level C is used when the airborne contaminants' concentration and types are known and the air purifying respirators criteria are met.

- Full face air purifying respirator, NIOSH-approved.
- Outer chemical resistant gloves.
- Inner chemical resistant gloves,
- Hooded chemical resistant clothing (disposable chemical resistant overalls).
- Hardhat.
- Boots, outer, chemical resistant steel toe and shank.

4.6.4 Level D

Level D is a work uniform affording minimal protection, used for nuisance contamination only.

- Long pants and shirts with 4-inch sleeves or coveralls.
- Hard hat [American National Standards Institute) (ANSI)].
- Safety glasses with side shields.
- ANSI protective toe footwear.
- Optional as applicable to job are:
  - Gloves,
  - Leather gloves,
  - Face shields, and
  - Disposal boot covers.

It should be noted each of these ensembles may be modified to fit the work situation and specific hazards. If applicable, PPE specified by a RWP shall be integrated into PPE ensembles described.

4.6.5 Eye Protection

All work conducted inside the demolition zone that poses a potential hazard from flying debris or objects shall require appropriate eye protection use. When safety glasses are required, they shall meet the current ANSI Z87.1 Standard. Safety glasses used to protect eyes against particles and projectiles do not provide adequate protection against dusts, vapors, or mists. Where such material forms could be encountered, chemical safety goggles or full-face respirators shall be worn.

4.6.6 Hearing Protection

Personnel who are required to perform tasks around equipment producing noise levels at or above 85 decibels A-weighted [dB (A)] on an 8-hour time-weighted average (TWA) shall wear earplugs or muffs. The SSHO shall provide a noise level survey for undefined areas as necessary. OSHA 29 CFR 1926.52 noise standard requirements shall be used as reference. Good hygiene in ear protection use shall be carefully considered due to the increased potential of chemical constituents being introduced into the ear because of their use.

4.6.7 Hand Protection

Glove selection for the project is contingent upon requirements for dermal protection based on site activities and associated hazards.

4.6.8 Head Protection

Hard hats shall be worn in designated areas or as defined in the AHA based on the hazards and task to be performed. Hard hats shall meet ANSI Z89.1-1986 and OSHA 29 CFR 1926.100 specifications.

4.7 Respiratory Protection

If respiratory protection is required, project personnel will be subject to respirator training.

4.7.1 Medical Requirements

The medical surveillance program as specified in this DWP applies to all Perma-Fix and subcontractor personnel required to wear respiratory protection during specific remedial action activities such as asbestos abatement.

As determined by the examining physician, any failed test during the medical examination may disqualify a worker from employment or may require restrictions on work assignments for that worker as determined by the examining physician. No employee shall be assigned to work tasks that require respirator use unless s/he is medically qualified.

4.7.2 Respirator Selection

Perma-Fix shall provide respirators as needed. The Perma-Fix SSHO shall determine the respiratory protection levels and types required based on the types of activities being performed. The AHA for each specific task shall provide some guidance in the respiratory protection selection process.

The SSHO shall ensure appropriate selection consider the following information:

- The estimated contaminant concentration is in the range requiring respiratory protection, as determined by industrial hygiene monitoring information.
- Limits exceeded for the contaminant may be:
  - Permissible Exposure Limit (PEL),
  - Threshold Limit Value (TLV),
  - Short-term exposure limit,
  - Action levels, or
  - Ceiling value.
- The contaminant is:
  - Gas,
  - Vapor,
  - Mist,
  - Dust, and
  - Fumes.
- The contaminant concentration could be termed Immediately Dangerous to Life or Health (IDLH).
- The contaminant is flammable and the estimated concentrations may approach the lower explosive limit.
- The contaminant has poor warning properties (i.e., odor, irritation, or taste).

Respirator approval is granted by NIOSH via test certification numbers. Only NIOSH approved equipment shall be accepted. All component and replacement parts shall also have NIOSH approval. In addition, respirators are approved as a system. Parts of the system, which cannot be interchanged among different brands of equipment or even among the equipment of a given manufacturer unless specifically approved, include:

- Cartridges,
- Canisters,
- Filters,
- Airlines, and
- Regulators.

4.7.3 Respirator Fit Testing

All personnel that will be working on the project are required to be enrolled in a current medical surveillance program which includes a current physical and chest x-ray, and will have passed a respiratory fit test. The Perma-Fix Project Coordinator will be responsible for obtaining certificates from all personnel to verify their training is current. Copies of this information will be provided to the XXX PM upon request.

Each individual required to wear a respirator is required to be clean-shaven in the areas corresponding to the respirator face piece sealing areas. Each respirator user shall be respirator fit tested using quantitative testing at least annually. Testing is generally completed during the individual's yearly medical. A qualified technician shall perform the quantitative fit testing. Upon donning the respirator device or before entering any restricted work area, each respirator wearer is required to perform a negative and positive pressure fit test.

4.7.4 Respirator Cleaning, Inspection, Maintenance, Sanitization, and Storage

Respirators shall be sanitized and stored in a sanitary container. Parts that require inspection include the:

- Valves,
- Nosepiece,
- Straps, and
- Eyepiece.

Each worker is responsible for the inspection and correct storage of her/his respirator and supplied-air equipment and shall be trained in the correct methods and procedures. Equipment inspection sheets shall be maintained with each respirator.

4.7.5 Respirator Use General Considerations and Limitations

The following criteria shall be followed:

- Oxygen Deficient Atmosphere (containing less than 19.5% oxygen) atmosphere-supplying (Supplied Air) respirators shall be used in environments IDLH.
- Eye irritation – when working in contaminated environments or where there is a potential for eye irritation, a full face piece unit shall be used.
- Nuisance dust – any approved filter respirator may be used for nuisance dusts.

4.7.6 Air Purifying Respirators

All air purifying respirators and filter cartridges used by employees shall meet NIOSH/Mine Safety and Health Administration (MSHA) approval, and conform to OSHA standards/regulations.

4.7.7 Cartridge Changes

Respirator cartridges will be changed based on the type of cartridge being used and the environment. Particulate cartridges will be changed weekly at a minimum. Chemical cartridges have a color indicator which turns colors to indicate the need to change. If working in a radiological environment with respiratory protection, new respirators and cartridges will be used each time new PPE is donned. Water saturation of filters or dusty conditions may necessitate changes that are more frequent. Changes are to occur when the wearer begins to experience increased inhalation resistance, or a chemical warning property breakthrough.

4.7.8 Corrective Lenses

Normal eyeglasses cannot be worn under full-face respirators because the temple bars interfere with the respirators sealing surfaces. For workers requiring corrective lenses, special optical inserts designed for use with respirators shall be provided.

4.8 Engineering Controls

The use of engineering controls in conjunction with administrative controls to mitigate or reduce the potential for exposure in the workplace is always preferable to the use of PPE. In some conditions where the hazards can vary in type, location, intensity, or form, implementing engineering controls is not always possible. Engineering controls for potentially hazardous chemical or waste usually provide two functions: (1) to reduce the potential or actual exposure and (2) to reduce the potential for off-site migration of contaminate constituents.

4.9 Inspection and Maintenance Program

Various equipment use is planned for the XXX project. When the equipment is delivered to the site, the SSHO and operators will perform an initial inspection to ensure the equipment meets the necessary requirements for which it was procured. During the project, lift equipment operators shall inspect all heavy equipment before performing assigned tasks daily. The inspection shall include:

- Fluids,
- Belts,
- Lights,
- Attachments,
- Safety equipment,
- Safety systems,

- Warning devices, and
- Hoses and lines.

Evidence of the equipment inspections shall be recorded on designated Equipment Inspection Forms and maintained on-site. Any deficiency that cannot be readily repaired is to be reported to the PM and or SSHO for appropriate action. Equipment may not run over hoses, grating covers, debris, or other similar material. Caution is to be used in operating lift equipment around scaffolding and other elevated platforms.

Operator/owner's manuals shall be on-site readily available for reference. Strict adherence to the owner's manual is required including manufacturer's operation, inspection, and maintenance recommendations. All operators shall review and understand the operator/owner's manual for the equipment that person operates. Objective evidence from personnel of the operator manual training understanding and comprehension shall be obtained by the responsible management and kept in the project training records. Documentation of the operator's qualifications shall be kept in the project training files.

Perma-Fix shall obtain certification from the supplier prior to delivery to the site that each piece of equipment has been inspected for the presence of suspect and/or counterfeit items by a qualified inspector. Evidence of this inspection shall be maintained within the equipment inspection records.

Equipment operators are responsible for ensuring upon completion of the task each day that the equipment is secured observing a zero gravity policy for the bucket, boom, etc.

Equipment operators shall utilize all safety equipment and warning devices when the equipment is in operation. The SSHO shall ensure the use of such devices or equipment.

The SSHO shall randomly inspect equipment and tools used during the project to ensure they have appropriate safety devices, are environmentally acceptable, and adequate for the task. Pre-notification is required before moving tools and equipment on or off the work site. Tools and equipment shall be gathered and secured at the end of each work shift.

Personnel shall ensure tools and equipment are inspected prior to use. Items to be inspected include lifting devices, hand tools, etc. Defective or otherwise unsafe equipment is to be tagged "Do Not Use." After repairs are made, the SSHO shall re-inspect the equipment before use.

Prior to an operator using equipment on-site, the SSHO shall ensure that all operators of motor vehicles have a current, valid state driver's license as well as verifiable documentation validating that the operator(s) have been certified and/or qualified to operate each piece of heavy equipment.

Perma-Fix shall be responsible for the safe operation of all vehicles and heavy equipment operated by Perma-Fix personnel, and the oversight of subcontracted personnel operating equipment for safe operation. Vehicle and equipment drivers and/or operators shall use caution when operating in close proximity to other equipment and tools (e.g., vehicles, heavy equipment, scaffolding, hoses, cords, etc.).

Drivers shall be responsible for the all passengers' safety and the stability of materials being hauled. Personnel shall not mount or dismount moving vehicles. Personnel shall not ride in the bed of any vehicle. Vehicles used to transport employees shall have seats firmly secured and adequate for the number of employees to be carried. The use of seat belts shall be mandatory when operating or riding in vehicles.

All heavy equipment shall be equipped with functioning back-up alarm systems that are clearly audible above surrounding noise. Motion alarms shall be used as applicable. See **Appendix C** for daily inspection forms for equipment, etc.

4.10 Environmental Protection

Perma-Fix demonstrates a strong commitment to protect the welfare of the environment during every project. Potential hazards to the environment that may be present on a project are identified prior to mobilization and addressed during training. These include air pollution, water quality, managing storm water runoff, dust suppression, and spill prevention and countermeasure controls. Additional potential environmental impacts identified during the duration of a project are addressed during the morning POD with workers so that environmental awareness is in place. Spill prevention will be addressed by inspections and constant monitoring. In the event a spill occurs, the spill kit on-site will be utilized. The spill will be controlled and contained using environmentally friendly materials.

4.10.1 Air Pollution Prevention

If required during the project to avoid fugitive emissions from project activities, Perma-Fix shall provide dust suppression measures as discussed in Section 4.10.2 of this plan. Pursuant to American Congress of Governmental Industrial Hygienists (ACGIH) TLV for particulates, total airborne dust concentrations as measured in the work areas shall at no time exceed a limit of 10 milligrams (mg)/cubic meter (m^3). The limit for areas outside of the project area is 5 mg/m^3.

Perma-Fix shall manage all work activities in a manner that prevents pollution and minimizes the generation of waste and that promotes energy conservation and practice pollution prevention and waste minimization techniques including proper storage of chemicals to prevent spills, separation of waste streams to expedite material management and to prevent cross-contamination, prompt clean-up and reporting of spills, and use of non-hazardous substitutes in the place of hazardous chemicals.

Perma-Fix will make every effort to minimize waste generated during construction and demolition (C&D) and track and report the weight and volume of materials that were removed from the site as waste and shall indicate the method of disposition (e.g., reused, recycled, or disposed). The purchase and use of materials and products that provide for pollution prevention shall take advantage of reuse and recycling programs to the extent practical.

4.10.2 Dust Suppression

During any dust producing activities, Perma-Fix may use soil-tac, tarps, water spraying, or other methods as necessary to suppress dust emissions to the lowest practicable level. Excessive visible particulate emissions shall not be permitted. Total airborne dust concentrations, as measured in the work areas, shall at no time exceed a limit of 10 mg/m^3 and a respirable TLV of 3 mg/m^3. The limit for areas outside of the construction area is 5 mg/m^3.

If total airborne particulate concentration measurement is not feasible or practical, the airborne particulate levels shall be evaluated by visual inspection. If visible, Perma-Fix shall implement additional particulate control measures and, if determined necessary by the SSHO, personnel/environmental monitoring. Under this plan, Perma-Fix shall ensure that all operations are conducted in a manner that prevents airborne contaminants and total airborne particulates from exceeding established limits.

4.10.3 Spill Prevention, Control, and Countermeasures

This section prescribes that if a spill were to occur, the PM shall immediately notify the appropriate Emergency Response personnel, the PM, and the SSHO. As a result, Perma-Fix shall comply with applicable Federal, State, and local regulations pursuant to waste handling and spill response.

4.10.3.1 Contain, Control, and Collect Cleanup

Perma-Fix and its subcontractor's shall follow standard spill response and clean up techniques used for various material types. Perma-Fix shall maintain the appropriate spill response materials compatible with those materials that would present a spill hazard. These materials' location shall be made known to the project employees and posted with appropriate signage.

- Reporting Leaks and Spills:
  a) All spills and leaks shall be immediately reported to the PM.
  b) The PM shall notify the XXX Representative.
- Methods and Procedures:
  a) When alerted to a possible oil or chemical spill during the project, the PM shall direct the crew to begin containment using a cleanup kit kept on-site. In the event that the spill is large and not containable or that there is danger to human health or the environment, then emergency off-site support is to be sought.
  b) Once the spill has been contained, it shall be cleaned up per the instructions from the PM.
  c) All equipment contaminated during the spill response shall be temporarily packaged and brought to a controlled area for decontamination.
  d) All disposable spill control materials shall be discarded through the normal designated waste disposal methods.
- Handling Procedures:
  a) Any spilled materials shall be managed and disposed in a timely manner.
  b) The spill area shall remain controlled by the placement of caution/hazard tape.
  c) Erosion control barriers or absorbent sock/booms placement may be necessary to prevent any contaminated materials migration into uncontrolled area.

4.10.3.2 Secondary Containment

Perma-Fix may establish secondary containment utilizing plastic and/or earth beams for all material staging and storage areas that contain items with hazardous free liquids. Perma-Fix shall provide a secondary containment capable of containing at least the maximum quantity of the container's volume of all freestanding liquids.

4.11 Hearing Conservation

Anticipated work activities are extensive and most likely involve the use of noise-producing equipment, which may present a noise hazard exposure to workers. The SSHO shall implement safeguarding personnel from potential injury due to noise exposure in the following manner:

- Personnel subjected to excessive noise shall be trained in the hazards associated with acute and chronic noise exposures.
- Suitable hearing protection devices shall be used by personnel when exposed to excessive noise.
- Work areas with noise levels greater than 85 dBA shall be posted as a high noise area, requiring hearing protection use.
- Workers whose exposure to noise exceeds an 8-hour TWA of 85 dBA shall be placed in a medical surveillance program which includes receiving audiograms.
- Specific noise exposure precautions taken shall be in compliance with OSHA 29 CFR 1910.95.
- Whenever possible, noise hazards removal or reduction shall be accomplished through administrative and engineering controls implementation.

4.12 Temperature Extremes

Perma-Fix shall ensure that the appropriate heat/cold stress monitoring is performed during hot and cold weather. When necessary, weather data web sites will be used, or, in extreme cases, a Wet Bulb Globe Temperature (WBGT) station shall be set-up to monitor weather temperatures. This information shall be used by the SSHO to determine appropriate work/rest regimens for approved, specified implementation details. All workers shall be trained by the SSHO on temperature extremes recognition and preventive measures. This training could be met by providing this information during a POD meeting.

Perma-Fix shall ensure that employees have access to an adequate sanitary potable water supply during all periods of the day and have available electrolyte replacement drinks during seasons of the year when heat stress may occur.

4.13 Fall Protection

All project personnel who perform elevated work shall use fall prevention practices and a definition of elevated surface as anything above 6 feet. In reaching and working at elevated heights, elevated work, fall prevention requirements apply to the use of:

- Ladders,
- Scaffolds,
- Vehicle-mounted elevating and rotating work platforms,
- Harnesses,
- Roofs,
- Lifelines,
- Safety belts,
- Telescoping scaffolds,
- Warning lines,
- Stationary work platforms, and
- Other miscellaneous equipment.

Perma-Fix will inspect fall protection equipment as required by the manufacturer prior to each use and adopt a 100% fall protection policy that makes provision for secondary fall protection (full-body harness) for all employees who are working or traveling more than 6 feet (for construction) and 4 feet (for general industry) above ground.

Where personnel are required to work on unprotected roofs or other structures, Perma-Fix shall review the SOW to identify the methods to achieve 100% fall protection or prevention. A Roof Access/Fall Protection Plan will be developed for acceptance prior to start of such work.

Where lifeline systems are used, anchor points shall be capable of supporting at least 5,000 pounds. Lifelines shall be installed and maintained by qualified persons who possess the rigging knowledge necessary to ensure the integrity and safety factors necessary for lifeline system installation. Lanyards shall be secured to vertical lifelines by rope grabs only. Knots, painters-hitches, or loops are not acceptable Perma-Fix practices. Horizontal lifelines shall have tie-off points at least waist high.

Perma-Fix will assure that all supervisors and users of fall protection equipment have documented training in the care, use, and inspection of all fall protection used. A designate competent and qualified person(s) as required by 29 CFR 1926.501 will be provided for fall protection scope**.**

4.14 Electrical

Permanent or portable GFCI protection is required for electrical circuits in accordance with 29 CFR 1910 and 29 CFR 1926.

GFCI shall be used and connected at the power source. All lights are to be equipped with protective, nonconductive covers, and all light bulbs in any light stringers are to be shatterproof. Exposed, empty light sockets or broken bulbs are not permitted. If any light sockets are found in an unsatisfactory condition, the light socket shall be placed back to a working condition in accordance with the appropriate AHA. Burned-out bulbs shall be replaced as identified. Portable lighting used in wet or in other conductive locations shall be operated at 12 volts or less. However, 120 volt lighting may be used if it is hooked up to GFCI.

Electrical cords and equipment shall not be hung or tied to steel or hung with wire unless a nonconductive material is used to insulate the cord from the metal. Plastic-coated wire shall not be used to hang electrical cords. Cords that pass through doorways or holes, or are exposed to vehicle or equipment traffic, shall be protected from damage. Flexible electrical cords shall not be spliced or have insulation repaired with tape. Replacement cord ends used for flexible electrical cord repair shall be constructed of plastic or rubber and shall encapsulate all connections. Extension cords shall be made of No. 12 (or better) conductor S.O. cord or larger. Portable electrical equipment and extension cords used in highly conductive work locations (e.g., areas inundated with water or other conductive liquids) or in locations where employees are likely to have contact with water or conductive liquids, shall be approved by the SSHO for use in those locations. Employees shall not plug or unplug flexible electrical cords while their hands are wet or when standing in accumulated water or other conductive liquids.

Portable electric tools (except battery powered) shall either be double insulated, case grounded or low voltage.

Perma-Fix will assure that all workers who may be exposed to facility electrical hazards meet the training requirements outlined in OSHA, National Fire Protection Association (NFPA) 70, and NFPA 70E for "qualified person(s)" and will assure that electrical workers have adequate training in electrical safety.

For work on or near exposed electrical hazards, which includes activities such as zero energy checks, adjustments, troubleshooting, and maintaining and/or repairing electrical equipment, Perma-Fix will develop and follow an Energized Electrical Work Permit (EEWP) that meets the requirements of NFPA 70E.

4.15 Illumination

The Perma-Fix SSHO shall ensure that adequate illumination intensity is provided in all active work areas. A minimum of 5 foot candles shall be met; however, 1926.56 requires more in some areas. Therefore, the SSHO will ascertain the lighting conditions and establish a level suitable to worker safety.

4.16 Housekeeping

Housekeeping shall strictly be enforced during project duration. All material, scrap, tools and toolboxes, and other equipment shall be stored in a neat and orderly fashion. Trash and scrap should be removed from the work area on a regular basis (i.e., as needed or at a minimum of every three days) and shall never be allowed to accumulate, especially in walkways, under stairs, at the bases and landings of stairs and ladders, and near flammable substances.

Perma-Fix will provide the necessary resources to ensure all work areas are kept neat and orderly at all times by implementing the following housekeeping practices:

- Keep tools and materials properly stored when not in use and remove all materials that are no longer needed.
- Keep floors clear of trip and slip hazards, including hoses, electric cords, liquids, and other obstacles. Keep cords, hoses, and leads clear of walkways, roadways, and other locations where possible exposure to damage exists.

- Ensure protruding nails, screws, staples, and other sharp objects are protected or removed and do not present a hazard.
- Provide and keep eating and sanitary facilities maintained in a clean and sanitary condition at all times, including adequate washing facilities with soap and disposable towels.

4.17 Radiological Hazards

Radiological contamination will be managed with instructions developed within RWPs and in the RPP.

4.18 Industrial Hygiene Monitoring

Instantaneous monitoring equipment used by the SSHO shall be operated in accordance with manufacturer specifications and operation procedures. A copy of the manufacturers' procedure or specification shall be maintained at the project site for review, as necessary.

The SSHO shall maintain industrial hygiene sampling data on-site. Monitoring results from direct-reading instruments shall be documented in the project log. Personal monitoring results shall be presented and explained to the employee within 48 hours of receipt of the results.

4.19 Injury/Illness Occurrence Reporting (OSHA 300 Log)

The PM and/or any worker has the responsibility to immediately notify the PM of all injuries, illness, potentially serious hazards to personnel, or unusual occurrence at the site. The PM, with assistance from the SSHO, shall jointly investigate all injuries, illness, incidents, or occurrences. The SSHO shall administer the investigation and supervision. Workers involved shall be required to participate. Perma-Fix will notify the XXX Representative of any accident, injury, or incident immediately and provide all applicable information.

The PM shall follow Perma-Fix incident report procedures and notify the Corporate Health and Safety Manager and the XXX Representative within two hours of the event. Supporting documentation shall be provided to the PM as soon as available.

Events to be reported and investigated include, but are not limited to:

- Events involving OSHA recordable injuries or illnesses.
- Potentially serious hazards to personnel.
- Other abnormal events.
- Near miss events.
- Equipment failures.
- PPE issues.

Each injury, illnesses, incident, or occurrence shall be investigated by Perma-Fix health and safety personnel to determine the root cause. Feedback shall be developed and integrated back into affected plans and AHA. A "Lessons Learned" shall be developed and distributed to all project employees.

4.20 Emergency Procedures

4.20.1 Emergency Notification

In the event of an emergency (i.e., medical, fire, chemical spill, etc.) during this project, the PM shall, immediately upon learning of the emergency, notify the SSHO. If notification is made, the following information, at a minimum, should be provided:

- Name of the person calling.
- The emergency's nature and type.
- The emergency's exact location.
- Location and number from which the call is made.

Perma-Fix shall ensure all personnel are accounted for during work activities. Specific details of personnel accountability will be established through coordination between the Perma-Fix PM and SSHO prior to start of work activities. At the start of the project, the SSHO shall identify the nearest Assembly Point for site emergencies and shall instruct personnel on the need for evacuating to the designated Assembly Station.

4.20.2 Fire Protection/Prevention

Fire prevention and protection measures shall be in place to address specific fire/explosive hazards if required or identified by the AHA and OSHA 1926.150 (a) (1). All combustible debris and/or material shall be put away or safely stored at the work shift's end. If any plastic sheeting or tarpaulins are to be used, Perma-Fix shall obtain sheeting or tarpaulins that meet the NFPA 701 fire retardant standards.

4.20.3 First Aid/Cardiopulmonary Resuscitation

The SSHO shall be trained and certified in both first aid and CPR. Upon notification of a medical illness or injury, the appropriate basic life support will be provided until additional aid arrives. Available first aid supplies and equipment shall be readily available on-site to provide basic life support. The SSHO shall inspect and maintain first aid supplies and equipment weekly. A weekly inspection log shall be kept with first aid supplies and shall be maintained by the SSHO.

4.20.4 Hospital Route

The project SSHO will establish the hospital routes from each of the XXX sites to the nearest medical facility. The routes should be utilized when necessary to take personnel for non-emergency medical treatment.

4.21 Hazard Communications Plan

The following will apply to all commercial products containing hazardous substances brought on-site during the project, in accordance with the OSHA Hazard Communication Standard, 29 CFR 1910.1200, as follows:

- Perma-Fix Hazard Communication procedure (PF-IH-08) will be followed for hazardous materials brought on-site. This procedure will be made available to all site personnel.
- The SSHO will maintain a safety data sheet (SDS) for each hazardous material brought to or used on-site.
- The SSHO will affix a hazard communication label providing information on health and physical hazards information to each container of hazardous material for those containers of hazardous materials not supplied with an adequate hazard label.
- The SSHO will train site personnel working with hazardous materials in accordance with the requirements of hazard communications training per 29 CFR 1910.1200.
- The SSHO will maintain an inventory of hazardous materials used on-site.
- The SSHO will inform personnel, including those employed by subcontractors, of the hazards of hazardous materials on-site and the location of appropriate SDSs.
- Subcontractors are required to provide SDSs to Perma-Fix and obtain approval of the SSHO prior to bringing hazardous materials on-site.

5.0 RADIATION PROTECTION PLAN

The RPP is included as **Appendix D**. Perma-Fix will adapt and tailor the Corporate Radiation Protection Program requirements as necessary to the site-specific radiological hazard associated with the XXX facility in Massillon, specifically discrete and dispersed Ra-226 source contamination. For example, air sampling performed for personnel inhalation and environmental airborne radioactivity will be compared to the established occupational and environmental effluent limits for Ra-226 as given in 10 CFR Appendix B to Part 20.

6.0 FIELD SAMPLING PLAN

Radiological surveys and sampling performed for this characterization may consist of: (a) field gamma screening, (b) direct alpha and beta total contamination surveys, (c) smear or removable contamination surveys, and (d) sampling for off-site radiological and laboratory analyses. This section summarizes the scope and objectives of these survey activities; a detailed description of field screening and sampling are presented in Sections 6.3 and 6.4, respectively.

6.1 Scope of Field Screening Activities

Field screening activities will consist of using field instruments and detectors to identify the possible presence of Ra-226 contamination within the XXX facilities. Screening of solid and aqueous samples will also be performed. Field screening activities will include gamma walkover data collection (ground surfaces) across exterior areas of the facility. Contamination surveys will be conducted within facility buildings and equipment. Both total and

removable contamination will be evaluated throughout the facility including the shredder operation, process machinery, buildings, trucks, and mobile site equipment.

Direct-reading radiological instruments and detectors will be used throughout the field operations of the project for scanning and surveying of personnel, sample equipment, and areas. The instruments and detectors will be operated and maintained by trained Perma-Fix personnel and will undergo routine QC checks as required by Perma-Fix operating procedure RP-108. Proposed types of instruments, detectors, and equipment (or their equivalents) to be used on-site during field screening are listed in **Table 8**.

Table 8. Field Screening Equipment

Instrument	Detector	Parameters/Usage
Ludlum Model 2221, or Equivalent	Ludlum Model 44-20 or equivalent, 3x3 NaI Scintillator	Portable scaler/ratemeter (high energy gamma)
Bicron Microrem , or Equivalent	--	Portable low-level dose rate meter (gamma)
Ludlum Model RO20		Portable high-level dose rate meter (gamma)
Ludlum Model 3, or Equivalent	Ludlum Model 44-9 Pancake Frisker	General purpose survey meter (beta/gamma)
Ludlum Model 19 Micro-R Meter	1x1 NaI Scintillator	Exposure rate survey meter (high energy gamma)
Ludlum Model 2929 or Equivalent	43-10-1	Portable removable smear counter
Ludlum Model 2360	43-93 or Equivalent, Plastic Scintillator	Portable scaler/ratemeter (alpha-beta)
Ludlum Model 2350	43-37 or Equivalent, Gas Proportional	Large area (alpha-beta)

6.2 Scope of Field Sampling Activities

Field sampling will be conducted to support a variety of activities. Activities include characterization and scoping surveys, waste characterization surveys, and FSSs. Sampling will include the collection of smears for removable contamination, water samples to characterize surface water, and soil/solid samples to characterize site soils and waste.

The following types of field samples will be collected for the purposes identified:

- Removable surface contamination will be evaluated by collecting smears at elevated surface measurements. Smears will also be collected as contamination control.
- Direct Alpha and Beta measurements will be collected to determine total contamination levels.
- Gamma surface scans with direct read radiological equipment paired with a GPS that simultaneously records soil gamma intensities in cpm and locations.
- Exposure Rate Measurements will be collected for the purpose of determining radiological postings and ALARA.
- Air samples will be collected for personnel and general work area to monitor for potential airborne activity.

Off-site analyses of solid and aqueous samples may include the following parameters:

- Gamma spectroscopy to identify Ra-226 and daughter radionuclides.
- Inductively coupled plasma mass spectrometry (ICP-MS) for metals.
- Gas chromatography mass spectroscopy (GCMS) for semivolatile organic compounds (SVOCs) and volatile organic compounds (VOCs).

6.3 Field Screening and Testing Activities

Procedures and activities for radiological field surveys (screening) surfaces, soils, solid and aqueous samples, and sampling areas are described below.

6.3.1 Gross Gamma Screening (“Walkovers”)

Gross Gamma Radiological Surveys will be performed utilizing a Ludlum Model 2221 survey instrument with a Ludlum Model 44-20 or equivalent NaI Detector. The radiological instrumentation will be paired with a GPS to collect data at a rate of about 1 measurement per second. Measurements will be collected by traversing areas on foot or, for large open land areas data may be collected by mounting a series of detectors to the back of a vehicle.

6.3.2 Exposure Rate Screening

Exposure rate measurements will be conducted prior to entering uncharacterized areas and to maintain gamma exposures ALARA.

6.3.3 Total Contamination Screening

Total contamination screening will be performed on solid surfaces throughout the facilities. A combination of both hand held instrumentation (Ludlum 43-93 plastic scintillation) and floor carts with larger detectors (Ludlum 43-37 gas proportional). A combination of scanning and static measurements will be utilized to locate contamination throughout the facility.

6.3.4 Removable Contamination Screening

Forty-four millimeter cloth smears/wipes will be used to collect information about removable contamination. A wipe will be firmly rubbed against a surface over an area of approximately 100 cm^2. Smears will be counted on a low background smear counter (Ludlum model 2929). Additional large area removable contamination screening may be performed using Masslinn® or other cloth. The purpose of large area screening is to determine if tools or other items have removable contamination present.

6.3.5 Soil and Solid Sampling

Soils and solids may be sampled primarily for waste characterization. The data will be used to determine the concentration of Ra-226 as well as other constituents such as metals, VOCs, and SVOCs to ensure the materials meet the WAC of the facility where they will be dispositioned.

Biased soil samples may also be collected to determine the activity concentration of Ra-226 in the soils. This may be determined by elevated measurements collected during the gamma survey.

6.3.6 Water Sample Collection

HRP Associates, Inc. (HRP) has been retained by XXX to develop a Sampling and Analysis Plan (SAP) for groundwater wells at the Massillon site. Beginning April 7, 2016, HRP plans to perform a multi-day groundwater sampling campaign for VOC and radium at a minimum of 17 monitoring wells on the Massillon property; HRP personnel will collect water level measurements at a minimum of 25 monitoring wells in total for developing a hydrological model of groundwater flow gradient and direction. Most wells will be sampled for VOCs only; however, at least five downgradient monitoring wells closest to the two outdoor stockpiles of contaminated ASR (Pile 1 and Pile 2) and the Fines Processing Area will be sampled and analyzed for radium. At least two up gradient well locations located at the north end of the site near the former "Lagoon" have been selected for sampling to determine the local background concentrations of radium in groundwater.

Prior to and during the April groundwater sampling event, Perma-Fix HPTs are conducting removable activity surveys at all planned well sampling locations (all are exterior locations). Swipe samples are being collected within the casing and around the outside of the riser pipes and are being counted on site.

One of the first post-incident stabilization actions undertaken by Perma-Fix was the installation of best management practices (BMP) to mitigate storm water runoff impact, including covering and securing ASR Pile 1 and Pile 2 with tarps and surrounding outdoor stockpiles with absorbent berms; protecting catch basin drains with secured geotextile filter fabric, straw bales, and/or cori rolls; and installing silt fence and straw bales around the down-gradient periphery of the Impacted Area polygon. The two runoff outfalls identified by the HRP hydrogeologist consultant are protected by all necessary BMPs. During mid-March 2016, dust control agent ("Soiltac®") was applied to all uncovered outdoor stockpiles of ASR at Massillon, and will continue to be applied as necessary to suppress fugitive stockpile dust.

Upon ODH approval of this DWP, radiological surveys of the sub-grade SVE system components and interior groundwater monitoring well casings and vaults will be expeditiously performed. If any levels exceeding established release criteria are encountered, all regulatory stakeholders will be immediately notified, and decontamination of affected components will be performed. FSS of the Fines Area will include SVE and groundwater monitoring components, both above and below floor level.

In limited cases, surface water may be collected from areas where water ponds or pools on the site. The purpose of water samples will be to provide further characterization to determine additional waste streams. Water will be collected by dipping the water from the pond or puddle with a high density polyethylene (HDPE) dipper.

6.4 Field Sampling Activities

This section describes sampling and analyses to be performed by off-site laboratories. The quantitative analytical data that are generated as a result of these activities will be sufficient in type, quantity, and quality such that data quality objectives (DQOs) discussed in this field sampling plan are met.

Specific sampling parameters, laboratory analytical methods, and numbers of samples are discussed further within Section 6.7 and are summarized in **Table 9**.

6.4.1 Objectives

There are two primary objectives for sending materials to an off-site laboratory. The first objective is to determine the waste characterization information necessary to facilitate disposal. As discussed previously, this would include both the radiological constituents as well as non-radiological constituents.

Additionally, samples will be collected to determine if site clean-up goals have been met.

6.4.2 Sampling Methods

Solid samples will be collected using decontaminated reusable or disposable sampling tools (e.g., stainless steel trowels or auger). Other methods may be employed based on the solid to be sampled. Sampling tools may be decontaminated prior to first use on-site, between sampling locations, and following last use on-site (i.e., before demobilizing that equipment) as appropriate based on survey data. The samples selected for analysis will be placed into laboratory approved containers immediately following collection and labels promptly affixed to the sample containers. The samples will be transported via delivery service under chain-of-custody control to the off-site subcontract laboratory for analysis.

6.4.3 Laboratory Analysis

Solid samples will be analyzed for radiological contaminants of concern (COCs) in the off-site laboratory, including Ra-226, bismuth (Bi)-214, lead (Pb)-214, and potassium (K)-40. Additional non-radiological parameters may be evaluated to ensure the disposal facility WAC is met. This may include, but is not limited to metals, SVOCs, and VOCs.

Aqueous samples will be analyzed primarily for radiological COCs to determine if surface water has been contaminated. Aqueous sample analysis will also include Ra-226, Bi-214, Pb-214, and K-40.

6.4.4 Equipment Decontamination Procedures

Reusable sample equipment will be used. Such equipment will be decontaminated both prior to sampling in the field and between uses, as appropriate. The following decontamination steps will be performed for reusable equipment, in the following order as necessary:

1. Remove any bulk soil from the equipment with a disposable towel.
2. If necessary, spray with potable water and use scrub brush to remove any additional materials.
3. Rinse again with potable water.
4. Survey with a Geiger Mueller detector (Ludlum 44-9) to ensure no contamination is present on the sample equipment.
5. Repeat if contamination is found.

6.4.5 Field Documentation

6.4.5.1 Log Books and Field Data Sheets

Information pertinent to field activities will be recorded on field logbooks. The logbooks will be bound and the pages will be consecutively numbered. Sufficient information will be recorded in the logbooks to permit reconstruction of site sampling activities. Information recorded on official project documents (e.g., survey forms, chains-of-custody, etc.) will not be repeated in the log books except in summary form or cross reference notation where determined necessary. Field log books will be kept in the possession of the appropriate field personnel, or in a secure place when not being utilized during field work. Entries recorded in log books will be made in blue or black waterproof ink and may include, but not be limited to the following information:

- Surveyor/sampler, date, and times of arrival at and departure from the site;
- Description of the field activity and summary of daily tasks;

- Names and responsibilities of field crew members;
- Sample collection method and number/volume of sample(s) collected;
- Information regarding activity changes and scheduling modifications;
- Field observations and weather conditions;
- Types of field instruments used and results;
- Field measurements made and quantities/volumes of material sampled;
- Scanning/surveying of equipment and materials; and
- GPS coordinates as appropriate.

Field data sheets and Radiological Survey forms may be used to record field information in addition to the use of log books.

6.4.5.2 Sample Numbering System

A unique sample numbering scheme will be used to identify each sample collected and designated for on-site and off-site laboratory analysis. The purpose of this numbering scheme is to provide a tracking system for the retrieval of analytical and field data on each sample. Sample identification numbers will be recorded on sample labels or tags, field data sheets and/or logbooks, chain-of-custody records, and all other applicable documentation used during the project.

6.4.5.3 Sample Labels

Labels will be affixed to all sample containers during sampling activities. Information will be recorded on each sample container label at the time of sample collection. The information to be recorded on the labels will be as follows:

- Sample identification number,
- Sample type (discrete or composite),
- Analysis to be performed,
- Type of chemical preservative present in container,
- Date and time of sample collection, and
- Sample collector's name and initials.

6.4.5.4 Chain-of-Custody Records

Chain-of-custody procedures implemented for the project will provide documentation of the handling of each sample from the time of collection until completion of laboratory analysis. The chain-of-custody form serves as a legal record of possession of the sample. A sample is considered to be under custody if one or more of the following criteria are met:

- The sample is in the sampler's possession,
- The sample is in the sampler's view after being in possession,
- The sample was in the sampler's possession and then was placed into a locked area to prevent tampering, and/or
- The sample is in a designated secure area.

Custody will be documented throughout the project field sampling activities by a chain-of-custody form initiated each day during which samples are collected. The chain-of-custody will accompany the samples from the site to the laboratory and will be returned to the laboratory coordinator with the final analytical report. Personnel with sample custody responsibilities will be required to sign, date, and note the time on a chain-of-custody form when relinquishing samples from their immediate custody (except in the case where samples are placed into designated secure areas for temporary storage prior to shipment). Bills of lading or air bills will be used as custody documentation during times when the samples are being shipped from the site to the laboratory, and will be retained as part of the permanent sample custody documentation.

Chain-of-custody forms will be used to document the integrity of all samples collected. To maintain a record of sample collection, transfer between personnel, shipment, and receipt by the laboratory, chain-of-custody forms will be filled out for sample sets as determined appropriate during the course of fieldwork.

The individual responsible for shipping of the samples from the field to the laboratory will be responsible for completing the chain-of-custody form and noting the date and time of shipment. This individual will also inspect the form for completeness and accuracy. After the form has been inspected and determined to be satisfactorily completed,

the responsible individual will sign, date, and note the time of transfer on the form. The chain-of-custody form will be placed in a sealable plastic bag and placed inside the cooler used for sample transport after the field copy of the form has been detached. The field copy of the form will be appropriately filed and kept at the site for the duration of the site decontamination activities.

Chain-of-custody seals may also be placed on each cooler used for sample transport. These seals will consist of a tamper-proof adhesive material placed across the lid and body of the coolers. The chain-of-custody seals will be used to ensure that no sample tampering occurs between the time the samples are placed into the coolers and the time the coolers are opened for analysis at the laboratory. Cooler custody seals will be signed and dated by the individual responsible for completing the chain-of-custody form contained within the cooler.

6.4.5.5 Documentation Procedures

The tracking procedure to be utilized for documentation of all samples collected during the project will involve the following steps:

- Collect and place samples into laboratory sample containers;
- Complete sample container label information;
- Complete sample documentation information in the field logbook;
- Complete project and sampling information sections of the chain-of-custody form(s);
- Complete the air bill for the cooler to be shipped to off-site laboratory, if applicable;
- Perform a completeness and accuracy check of the chain-of-custody form(s);
- Complete sample relinquishment section of form(s) and place the form(s) into cooler;
- Place chain-of-custody seals on the exterior of the cooler; and
- Package and ship the cooler to the laboratory.

The following steps will be made upon receipt of the cooler at the subcontract laboratory:

- Inspection of contents,
- Complete requested analyses, and
- Transmit original chain-of-custody form(s) with final analytical results from laboratory.

6.4.5.6 Corrections to Documentation

Original information and data in field logbooks, on sample labels, on chain-of-custody forms, and on any other project-related documentation will be recorded in blue or black waterproof ink and in a completely legible manner. Errors made on any accountable document will be corrected by crossing out the error and entering the correct information or data. An error discovered on a document will be corrected by the individual responsible for the entry, as possible. Erroneous information or data will be corrected in a manner that will not obliterate the original entry, and corrections will be initialed and dated by the individual responsible for the entry.

6.5 Sample Packaging and Shipping

Sample containers destined for off-site laboratory analysis will be packaged in thermally insulated rigid-body coolers and will be stored in a secure area during the time period between collection and shipment to the off-site subcontract laboratory. These samples will be packaged, classified, labeled, stored, shipped, and tracked in accordance with current U.S. Department of Transportation (DOT) regulations (e.g., 49 CFR 173 et. seq.).

6.6 Management and Retention of Records

Original copies of field data, field records, analytical data, training records, and other project-specific documentation will be retained by Perma-Fix.

6.7 Laboratory Analysis

Pace Analytical Services, Inc. (Pace) shall perform radiological analysis of solid and aqueous samples for characterization. The Pace Radiochemistry Laboratory has prior experience and is capable of providing the analytical services required to meet the project objectives. Pace is accredited by both Pennsylvania and Ohio and the National Environmental Laboratory Accreditation Conference (NELAC) for all of the project required analyses.

Solid and aqueous samples will be transported to off-site laboratories for analyses in accordance with documented laboratory-specific standard methods listed in the Analysis Methods column of **Table 9**.

Table 9. Summary of Sampling/Laboratory Analysis

Sample Type	Media/ Sample Type	Analytical Parameters	Analysis Methods	Frequency
Soil and Sediment Samples	Soil/soil-like	Gamma spectroscopy to identify radionuclides	USEPA 901.1 Modified	As necessary
Water	Aqueous (Grab)	Gamma spectroscopy to identify radionuclides	USEPA 901.1 Modified	As necessary

6.7.1 Spectroscopic Energy Lines

Radiological COCs for these samples may be quantified for activity concentrations directly via gamma decays, or inferred via gamma-emitting progeny, assuming a secular equilibrium state. **Table 10** lists gamma and x-ray emissions from site radiological COCs that may be used for determining soil activity concentrations. The list is broken down into direct emissions from the radiological COC itself or from its decay progeny, which can be used to infer the parent's activity.

Ra-226 may be measured directly by detection of its 186.2 kilo-electron volt (keV) energy line for high activity waste samples for waste characterization. However, the presence of U-235 can cause interference with direct Ra-226 detection since it has a gamma line of similar energy (185.7 keV). Ra-226 concentrations in soil samples collected for FSS purposes will be inferred through the short-lived daughter products of Bi-214 and Pb-214, providing MDAs of 0.10 pCi/g or less. Characterization sample results have shown these daughter products to be in secular equilibrium with the Ra-226 parent. Unfortunately, once the soil is disturbed, these short-lived daughters must be allowed to grow back in. The parent of these daughters, radon (Rn)-222 has a moderate half-life of 3.8 days, therefore requiring at least 21 days of progeny ingrowth to reestablish equilibrium. Gamma spectroscopy will also identify other gamma emitting radionuclides that may be present in samples.

Table 10. Spectroscopic Gamma Energy Lines for Site Radiological COCs

Radiological COC	Direct / Inferred	Inferred Nuclide	Photon Emission (keV), *Primary	Yield (%)	Sample HPGe MDA (pCi/g)[(a)]
Ra-226	Direct	Not Applicable	*186.2	3.59	0.5 – 2.5
	Inferred	Bi-214	609.3	46.3,	0.05
		Pb-214	1,764.5	15.8	0.04
			295.2, 351.9	19.2, 37.2	

Note:
(a) The nuclide minimum detection activity (MDA) values stated in the table are from pre-remediation samples analyzed by the High-purity Germanium (HPGe) in a 1 liter Marinelli beaker counted for 15 minutes inside a lead shield.

6.7.2 Laboratory Quality Control

Since Pace is a Pennsylvania and Ohio State- and NELAC-accredited laboratory, they will utilize their own QC program including instrument source checks, matrix spikes, and counting duplicates.

6.8 Quality Assurance Program

The Perma-Fix Quality Management System (QMS) is attached as **Appendix E**.

7.0 WASTE MANAGEMENT PLAN

Perma-Fix will manage all waste in accordance with the latest Federal and State requirements, rules, regulations, ordinances, and laws and comply with the applicable requirements of XXX management will be contacted for coordination of waste transportation and disposal activities.

The Waste Manager will prepare the transportation and disposal documents including waste profiles and manifests as required for the transportation and disposal of the wastes. All truck drivers will have proper certification in place and be signatory to the daily POD and waste-related project documents. They will don proper PPE as specified by the

approved plans and the SSHO. All trucks will bear proper placarding and signage, follow all posted speed limits and drivers will utilize seat belts at all times.

Should an incident, spill or release occur during shipment of waste, the PM or Waste Manager will notify XXX management within one hour. In addition, Perma-Fix will make any required notification to the appropriate local, State, and Federal regulatory agencies and remedy any situation arising from an incident, spill or release in accordance with applicable local, State, and Federal laws. Waste management tasks associated with the XXX response project will include sorting and segregation, packaging, transportation and disposal for the following identified waste streams:

Waste shall be segregated into the following categories:

- Radiologically contaminated waste,
- General C&D debris and waste, and
- Mixed waste with RCRA metals.

Radiological Material: The radiological material will be downsized as required and placed into the designated appropriate container. Waste containers and conveyances will be surveyed by an HPT, accounted for, and labeled as necessary, to meet the WAC. Perma-Fix will manage the container of radiological waste for ultimate disposition.

Mixed Waste with RCRA Metals: Any mixed waste radiological debris will be segregated from the non-RCRA debris and placed in separate containers. RCRA metals-contaminated radiological debris will be segregated, characterized, and placed into the designated container. All containers will have been surveyed by an HPT, accounted for, and labeled as necessary, to meet the WAC. Perma-Fix will manage the container of RCRA Metals-contaminated radiological waste for ultimate disposition.

General C&D Debris: The non-contaminated general debris resulting from the decontamination and preparation activities at XXX will be disposed of at a local landfill. A table of various disposition pathways is included in **Table 11**. A flow chart describing proper shipping name (PSN) determination for DOT compliance is shown in **Figure 3**.

7.1 Title 49 CFR Compliance for Low Level Radioactive Wastes, Low Level Mixed Wastes, and Hazardous Wastes

The Perma-Fix team will evaluate the waste generated during the XXX project by consistently implementing the following methodology for determining the regulatory requirements for managing the waste:

1. Review characterization data for both the radiological and chemical constituents that may be present.
2. If chemicals are present and they are "Pure Technical Chemicals," 49 CFR 172.101 will be reviewed to determine if the chemical is specifically listed. If not, the appropriate SDS will be used to determine the chemistry make-up and review the appropriate Hazard Class Definition beginning in 49 CFR 171.8.
3. If the waste is a mixture, mixture properties and components will be evaluated to determine the Primary Hazard Class in accordance with 49 CFR 173.2a. This evaluation will determine if the waste will be regulated under RCRA, Toxic Substances Control Act (TSCA) and or National Emission Standards for Hazardous Air Pollutants (NESHAP), and any applicable State regulations.
4. A determination will be made on whether or not the waste is Class 7 Radioactive Material.
5. When both the chemical and radiological properties are properly assessed, the Hazard Class will be determined.
6. Next, the constituents, both chemical and radiological, will be evaluated to determine if they meet the definition of a Hazardous Substance as provided in 49 CFR 172.101 Appendix A and/or Appendix B.
7. If the material meets the definition of a Reportable Quantity (RQ) for a Chemical Hazardous Substance, the appropriate shipping paper and marking requirements will be implemented for each package/shipment. If waste meets the definition of a hazardous substance, but does not meet the definition of radioactive material per 49 CFR 173.403, or any other hazard class, the hazardous substance will be given the appropriate DOT PSN in the Hazard Class 9 Category. The Class 9 PSN will determine packaging and transportation requirements.
8. Hazardous substances found at XXX will typically be transported as Class 9 shipments with a PSN of "RQ, UN3077, Environmentally Hazardous Substances, Solid, N.O.S, (Hazardous Constituent)."

8.0 DEMOBILIZATION

Once all decontamination and survey activities are complete, Perma-Fix will begin demobilization activities in a phased approach as various site activities are concluded. Equipment and materials shall be surveyed and removed from the site once they are no longer needed. Demobilization shall be considered complete when Perma-Fix has:

- Removed equipment and material from the site.
- Performed a final walk down of the site with XXX and closed out all punch list items to the client's satisfaction.
- Provided the required project records, including waste shipments, to the PM.

Perma-Fix shall implement good housekeeping measures throughout the project. The job site shall be kept clean and free of debris to the extent possible. This "clean as you go" technique will not only minimize the risk for potential injury, but should also decrease the time necessary to perform site cleanup at job completion.

9.0 REPORTING

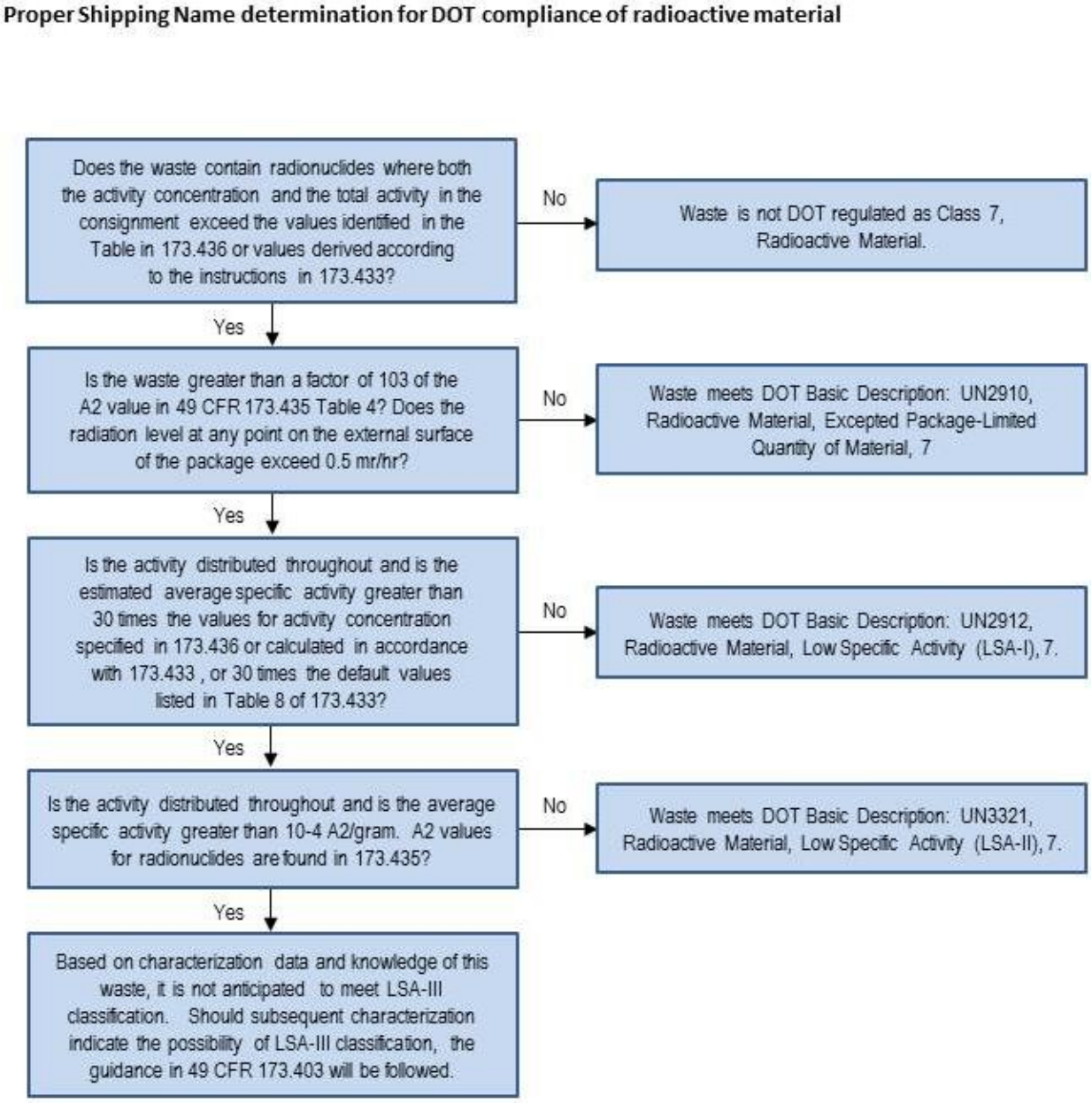
Upon completion of individual FSS units, FSS documentation will be submitted to the ODH to support the unconditional release decision of structural or land areas. These reports will be submitted either individually or in groups of SUs as expeditiously as possible after completion.

The FSS Reports will include a summary of the survey activities performed, presentation of all survey and sampling results, a data evaluation, and conclusion.

Table 11. Disposition Pathway Options

Waste Disposition Facility	Site	Waste Acceptance Criteria	Transportation	Rationale/Cost Savings over next best option
US Ecology Idaho (USEI) Subtitle C Landfill	US Ecology Idaho, 20400 Lemley Rd., Grand View, ID 83624	Can dispose of Ra-226 up to 1,500 pCi/gm and average waste total activity concentration of 3,000 pCi/gm	Lined dump trucks transloaded nearby into lined and lidded gondolas appropriately manifested (Class 7, Class 9 as applicable). Waste can also be loaded into intermodal containers and transloaded to ABC rail cars.	Lowest cost option using railcars. Gondola rail cars can either be loaded on-site, transported to Veolia Services' Alaron facility, or transported to Shale Mountain Resources facility in NE Ohio in sealed intermodal containers for loading onto a railcar.
Waste Control Specialists, LLC (WCS) Subtitle C Landfill	Exempt Cell Waste Control Specialists, 9998 West State Hwy 176, Andrews, TX 79714	Established limits table provides quick determination of sum of ratios (SOR) comparison of candidate waste with site WAC criteria	Must receive as packaged waste for facility's material handling for sampling and in situ cross-characterization methods, unlike the above option. Can still trans as eight 9-yd^3 lift liners in lidded rail gondola car, or two per over the road (OTR) flat-bed, and can always take in more robust intermodal containers (IMCs). Requires 540/541 manifest.	Lower cost option than ES and WAC is open to Class A waste limits; less transport distance than USEI and ES, but higher disposal and packaging costs than US Ecology. Debris is required to have undergone a volume reduction factor of 3 prior to disposal at WCS, and they now offer shredding at the site as an option.
Energy*Solutions* (ES) Licensed Radioactive Waste and Permitted Hazardous Waste Disposal Facility	Energy*Solutions*, Interstate 80, Exit 49, Grantsville, UT 84029	Can dispose of Ra-226 up to 10,000 pCi/gm	Lined dump trucks or packaged material transloaded nearby into lined lidded gondolas appropriately manifested with Nuclear Regulatory Commission (NRC) form 540 and 541 (Class 7, Class 9 as applicable). Waste can also be loaded into IMCs and transloaded to ABC rail cars. Smaller quantities of material can be sent in drums or B-25 Boxes via truck.	Direct rail served and has landfill-owned ICMs and ABC rail cars, as well as high-sided rail gondola cars. Fully licensed commercially operated low-level radioactive waste disposal landfill. Lower than the Class A waste limits and cost is significantly higher than WCS or US Ecology. Less sampling frequency than required by WCS.

Figure 3. DOT Flow Chart for Radioactive Material Shipment

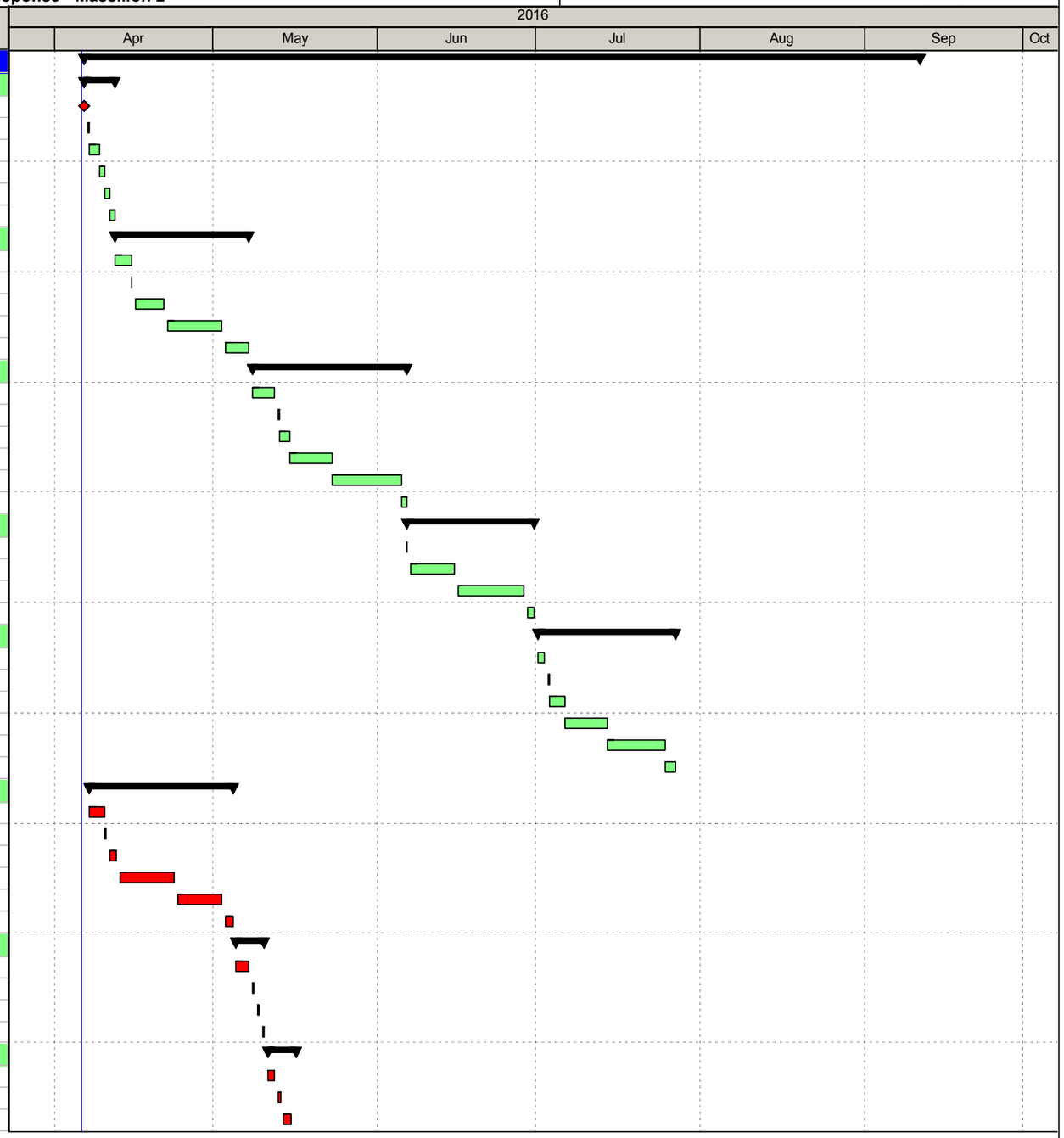


APPENDIX A
Schedule

PSC Response - Massillon 2

Data Date: 4-6-16

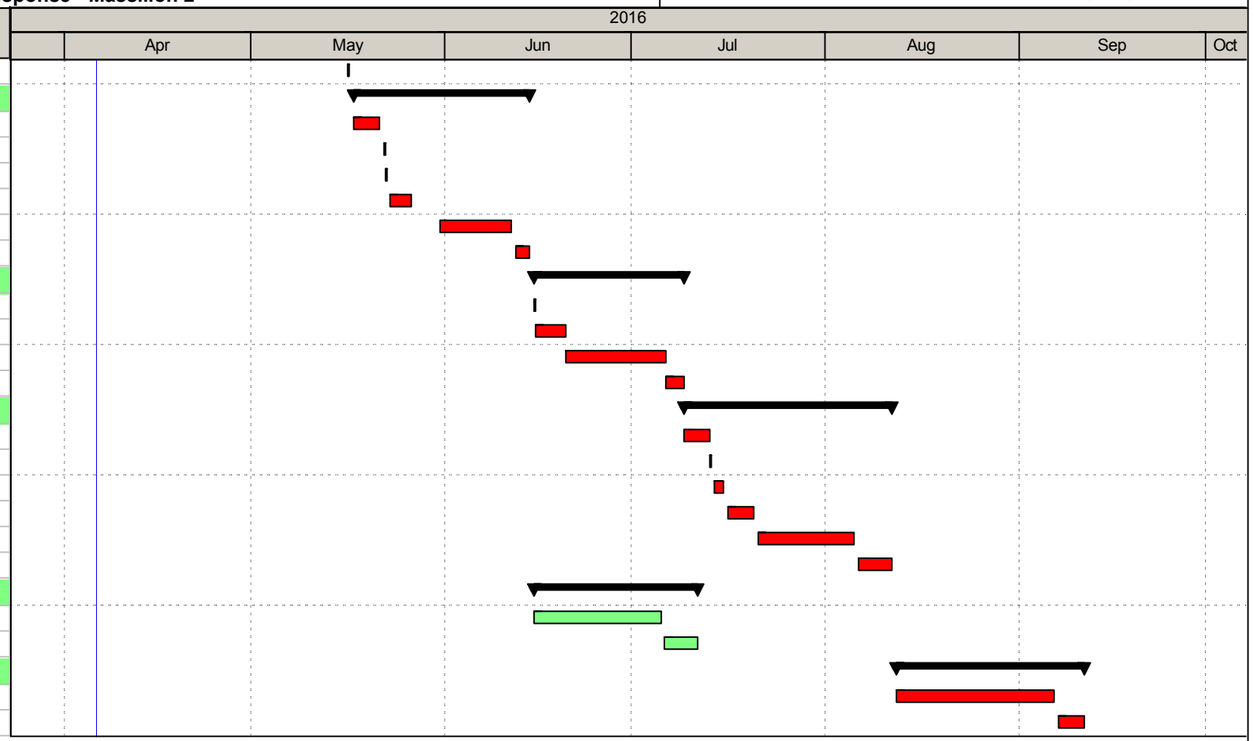
#	Activity ID	Activity Name	Orig Dur	Start	Finish
1	**PSC Response - Massillon 2**		152.00	4-6-16	9-11-16
2	**Warehouse and Shipping Dock (Green Team)**		5.50	4-6-16	4-12-16
3	A1090	DWP Approval	0.00		4-6-16*
4	A1100	Run System (Purge)	0.50	4-7-16	4-7-16
5	A1080	Load-Out ASR Debris Piles	2.00	4-7-16	4-9-16
6	A1110	Hi-Vac Accessible Surfaces	1.00	4-9-16	4-10-16
7	A1120	Decontaminate	1.00	4-10-16	4-11-16
8	A1130	Survey	1.00	4-11-16	4-12-16
9	**Courtyard & Intermodal Conveyor (Green Team)**		25.50	4-12-16	5-7-16
10	A1160	Load-Out ASR Debris Piles	3.00	4-12-16	4-15-16
11	A1170	LO/TO & Verification (Conveyor)	0.50	4-15-16	4-15-16
12	A1190	Hi-Vac Accessible Surfaces	6.00	4-16-16	4-21-16
13	A1200	Decontaminate	11.00	4-22-16	5-2-16
14	A1210	Survey	5.00	5-3-16	5-7-16
15	**Main Bay (South and South West) & Sensor Decks 1-3 (Green Team)**		25.50	5-8-16	6-6-16
16	A1240	Load-Out ASR Debris Piles/Carts	5.00	5-8-16	5-12-16
17	A1250	LO/TO Sensor Decks & Applicable Areas	0.50	5-13-16	5-13-16
18	A1260	Install Wet Work Protective Measures (Electrical & Sensors)	2.00	5-13-16	5-15-16
19	A1270	Hi-Vac Accessible Surfaces	8.00	5-15-16	5-23-16
20	A1280	Decontaminate	9.00	5-23-16	6-5-16
21	A1290	Survey	1.00	6-5-16	6-6-16
22	**Aspirator Cyclones (Green Team)**		24.50	6-6-16	6-30-16
23	A1330	LO/TO Verification (Cyclones) & Applicable Areas	0.50	6-6-16	6-6-16
24	A1350	Hi-Vac Accessible Surfaces	9.00	6-7-16	6-15-16
25	A1360	Decontaminate	13.00	6-16-16	6-28-16
26	A1370	Survey	2.00	6-29-16	6-30-16
27	**Eddie Current Sorting Decks (Green Team)**		25.50	7-1-16	7-27-16
28	A1400	Load-Out ASR Debris Piles	2.00	7-1-16	7-2-16
29	A1410	LO/TO & Verification Sorting Decks, Shaker Table, DSRP, ECS & Applic	0.50	7-3-16	7-3-16
30	A1860	Install Wet Work Protective Measures (Electrical & Sensors)	2.00	7-3-16	7-6-16
31	A1430	Hi-Vac Accessible Surfaces	8.00	7-6-16	7-14-16
32	A1440	Decontaminate	11.00	7-14-16	7-25-16
33	A1450	Survey	2.00	7-25-16	7-27-16
34	**Fines Processing (Blue Team)**		27.50	4-7-16	5-4-16
35	A1480	Load-Out ASR Debris Piles/Carts	3.00	4-7-16	4-10-16
36	A1490	LO/TO Entire System & Applicable Areas	0.50	4-10-16	4-10-16
37	A1500	Install Wet Work Protective Measures (Electrical & Sensors)	2.00	4-11-16	4-12-16
38	A1510	Hi-Vac Accessible Surfaces	11.00	4-13-16	4-23-16
39	A1520	Decontaminate	9.00	4-24-16	5-2-16
40	A1530	Survey	2.00	5-3-16	5-4-16
41	**ASR Storage Bay (Northwest) (Blue Team)**		6.00	5-5-16	5-10-16
42	A1560	Load-Out ASR Debris Piles	3.00	5-5-16	5-7-16
43	A1590	Hi-Vac Accessible Surfaces	1.00	5-8-16	5-8-16
44	A1600	Decontaminate	1.00	5-9-16	5-9-16
45	A1610	Survey	1.00	5-10-16	5-10-16
46	**ASR Storage Bay (East) (Blue Team)**		6.00	5-11-16	5-16-16
47	A1640	Load-Out ASR Debris Piles	2.00	5-11-16	5-12-16
48	A1650	Hi-Vac Accessible Surfaces	1.00	5-13-16	5-13-16
49	A1660	Decontaminate	2.00	5-14-16	5-15-16



Remaining Level of Effort
Actual Work
Remaining Work
Critical Remaining Work
Milestone
Critical Milesto...

TASK filter: All Activities

#	Activity ID	Activity Name	Orig Dur	Start	Finish
50	A1670	Survey	1.00	5-16-16	5-16-16
51	**ASR Storage Bay (West) & Bins & Hopper (Blue Team)**		25.00	5-17-16	6-14-16
52	A1700	Load-Out ASR Debris Piles/Carts	5.00	5-17-16	5-21-16
53	A1710	LO/TO Hopper & Applicable Areas	0.50	5-22-16	5-22-16
54	A1720	Install Wet Work Protective Measures (Electrical & Sensors)	0.50	5-22-16	5-22-16
55	A1730	Hi-Vac Accessible Surfaces	4.00	5-23-16	5-26-16
56	A1740	Decontaminate	12.00	5-31-16	6-11-16
57	A1750	Survey	3.00	6-12-16	6-14-16
58	**Trommel (Blue Team)**		23.50	6-15-16	7-9-16
59	A1790	LO/TO & Verification (Trommel) & Applicable Areas	0.50	6-15-16	6-15-16
60	A1810	Hi-Vac Accessible Surfaces	5.00	6-15-16	6-20-16
61	A1820	Decontaminate	15.00	6-20-16	7-6-16
62	A1830	Survey	3.00	7-6-16	7-9-16
63	**Bivi-Tec (Blue Team)**		33.50	7-9-16	8-11-16
64	A1000	Load-Out ASR Debris Piles/Carts	4.00	7-9-16	7-13-16
65	A1010	LO/TO Bivi-Tec & Applicable Areas	0.50	7-13-16	7-13-16
66	A1020	Install Wet Work Protective Measures (Electrical & Sensors)	2.00	7-14-16	7-15-16
67	A1030	Hi-Vac Accessible Surfaces	5.00	7-16-16	7-20-16
68	A1040	Decontaminate	16.00	7-21-16	8-5-16
69	A1050	Survey	6.00	8-6-16	8-11-16
70	**Outside Main Process Facility**		26.00	6-15-16	7-11-16
71	A1870	Perform Final Status Survey (Outside)	20.00	6-15-16	7-5-16
72	A1880	ODH Performs Independent Final Status Survey (Outside)	6.00	7-6-16	7-11-16
73	**Inside Main Process Facility**		30.00	8-12-16	9-11-16
74	A1890	Perform Final Status Survey (Inside)	25.00	8-12-16	9-6-16
75	A1900	ODH Performs Independent Final Status Survey (Inside)	5.00	9-7-16	9-11-16



Remaining Level of Effort
Actual Work
Remaining Work
Critical Remaining Work
Milestone
Critical Milesto...

TASK filter: All Activities

APPENDIX B
Activity Hazard Analysis

Activity Hazard Analysis (AHA) - 01 – Mobilization and General Work Activities	**Hazard Analysis (HA)**
	Originating Organization: Perma-Fix Environmental Services, Inc.
	Subcontract No:
Job Description/Title: XXX Response	**Date of Analysis:** 2/28/16
KEY PERSONNEL: **Project Manager** : Stace Johnson **Site Radiation Safety Officer:** Jeff Knight **Site Safety & Health Officer**: Andy Williams	**Training Requirements:** Fall Protection, Hearing Protection, Radworker II. In addition, First Aid and CPR for Project SSHO. **Medical Monitoring and Surveillance Requirements:** Annual Medical Surveillance for Employees.
Emergency Communication	Radio and cell phone.
Facilities Covered	Massillon, OH; Canton, OH; Beaver Falls, PA
Emergency Assembly Points	Per drawing.
Shelter-In-Place Locations	Per drawing.
Permits Required	Radiological Work Permit.
Special Instructions	**Preventive Measure:** Prior to implementation, Perma-Fix will evaluate controls specified in all permits to ensure that there are no conflicts and will STOP WORK if conflicts are found until the affected permits are revised.
	Radiological contamination: A characterization survey will be performed at each site to determine rad conditions.
	Alarming dosimeter: N/A
	Fire patrols: N/A

HA Preface:

**** ALL EMPLOYEES HAVE SUSPEND/STOP WORK AUTHORITY –** All employees, are reminded that they have both the authority and responsibility to stop work when they perceive that an unsafe condition exists that threatens themselves, their coworkers, or the environment. Every employee has the right to a safe workplace, safe working conditions, and to understand the hazards of the workplace.

ALL INJURIES, ILLNESSES, AND INCIDENTS MUST BE REPORTED TO THE SITE ENVIRONMENT, SAFETY, AND HEALTH REPRESENTATIVE IMMEDIATELY. See the Emergency Response Plan included in the Site Environment, Safety, and Health Plan.

ALL PERSONNEL ARE ENCOURAGED TO ASK QUESTIONS AND OFFER SUGGESTIONS. Feedback on work methods, procedures, hazard controls, and preventative measures during all phases of work is essential to continuous improvement of work processes and is a part of the Integrated Safety Management System. Help us make your job easier and safer!

Signature of Site Safety and Health Manager: **Date:**

Task/Activity	Hazards	Preventive Measures and Responses
General Activities	Unauthorized Personnel / Visitor Control	• Access to regulated areas is limited to personnel meeting the requirements for protective clothing and equipment, medical surveillance, training and respirator fitting as required. Site boundaries shall be established that outline the appropriate training and personal protection required to enter different areas of the project, i.e. Rad Worker Training for Rad Workers. • Site boundaries will be enforced and controlled so that unauthorized personnel do not enter the controlled work areas. • All site visitors will be required to sign and visitor's log, which will be maintained and the site access/entry point. • The SSHO will verify visitor's training and PPE prior to allowing them entry to the site. • Visitors with inadequate training may be allowed entry to the site – however, they will require a full-time escort, and entry into active work areas may be restricted (even with escort). • All visitors will be required to follow the PPE and posted instructions with regards to the work being performed in the area.
	Radiological Contamination	• Radiological contamination is present on the project. • Entry into radiologically contaminated areas will be controlled through a Radiation Work Permit (RWP). The RWP will prescribe the necessary PPE, controls and work steps to mitigate the contamination hazard – workers must be trained to and sign off on the RWP prior to entry into contaminated areas. • Mitigation and/or decontamination may include wet-wipe, HEPA vacuum, minor removal, and other methods approved by RSO. • Visitors will not be allowed entry into radiologically controlled areas without verified training, signature on the active RWP and/or proper PPE. • Radiologically contaminated areas will be cordoned off from the remainder of the work areas using barricades, warning tape, signs and postings. • Entry into radiologically contaminated areas will be controlled by the RCTs using the RWP process.
	Radiological Emergency	• In the event of a radiological emergency, all personnel shall follow the instructions of the SSHO and RSO as given over communication devices.
	Exposure to Radiation and Radioactive Material	• All workers who must perform work within a Radiological Area shall have at least a current Radiation Worker II training certificate or be under escort of a trained Radiation Worker. • Smoking, chewing tobacco or gum, eating, drinking, or use of cosmetics is prohibited in radiological areas. • **HOLD POINT**: If work is to be conducted in radiological areas, contamination areas, systems with internal contamination, or as determined by RADCON, request an RWP from RADCON. • Personal protective equipment shall be specified in the Radiation Work Permit (RWP). • Radiation exposure shall be monitored by TLD or ED. • A Radiation Work Permit is required for operations as determined by RADCON and area posting. All personnel shall follow requirements outlined in the RWP and the directions given by RADCON personnel. • Personnel shall sign the RWP prior to each entry. • Personnel shall record their entry and exit times on the RWP. • Personnel shall review the RWP prior to each entry to check for any changes to the RWP, check its expiration date, and obey all area postings.

Task/Activity	Hazards	Preventive Measures and Responses
General Activities (cont'd)	Exposure to Chemicals	• All chemical products used in the performance of project completion shall have an SDS on file, the appropriate PPE available, and Industrial Hygiene Monitoring based on the SSHO recommendations. • An MSDS file shall be kept onsite so that personnel can review the SDS at any time. • During the AHA briefing, personnel shall be informed of the location of the SDS files.
	Events Causing Injury/Illness and Near Miss Events	• Any event that results in an Injury/Illness shall be reported to the SSHO and Project Manager who in response shall perform an investigation and evaluation using ISMS principles and fundamentals to determine the cause and implement corrective measures, if needed, to prevent reoccurrence. • Any small injury, even a First Aid, shall be reported to the SSHO and PM immediately.
	Slips, Trips, and Falls	• Determine the best access route before transporting equipment. • Basic housekeeping requirements shall apply to the job site. • Continually inspect the work area for slip, trip and fall hazards and be aware of the changes in surfaces and conditions that may occur during demolition.
	Eye/Head/Foot Injuries from Work Activities	• Safety glasses meeting ANSI Z87.1 standards are required at all times in work areas. • Dark safety glasses are not to be worn inside a building. • Post flagging and signs around the area that say "Danger Overhead Hazard." • Hard hats with the brim facing forward are to be worn at all times. (Iron workers can wear hard hats with rim facing backward only while in Hoisting/Rigging operations or while welding/cutting with a welding hood). • Safety shoes are required in all work areas with the exception of the office and break trailers. • Break areas and designated smoking areas may be exempt from PPE requirements. These areas will be clearly marked as break/smoking areas and workers will be trained as to their locations. All areas will be considered non-exempt from the PPE requirements unless specifically posted as such.
	Injury Due to Stepping, Lifting, and Carrying	• Do not step over barriers and boundary control tapes or ropes. Use a gate or make one. Stepping over is a trip hazard. • Keep walkways clear of materials, scrap, and debris. • Wear safety shoes with toe protection that are high enough to protect ankles. • Do not wear worn-out shoes that need sole or heel replacement. • Look, before you step to be sure you have a solid place to step. • Do not step on materials, debris, or scrap. • Do not jump over objects or obstructions. Go around. • Do not jump off docks, other raised places, or steps. • Do not carry over 50 pounds without assistance. • Do not carry items that block your view. • Use proper lifting techniques to prevent back injuries. Lift using the power of the legs and not the back. Squat down, pull the load close to the trunk, and get up slowly.

Task/Activity	Hazards	Preventive Measures and Responses
General Activities (cont'd)	Injuries Caused by Improper Manual Material Handling	• Consider size, shape, and weight of the object. Lifts greater than 50 pounds require assistance or the aid of mechanical equipment. • Use safe lifting techniques such as keeping back straight, feet planted for balance, bend at the knees, keep the load close and low to your body, lift smoothly, and do not twist. • Do not lift a load that cannot be seen over. • Gloves and the object should be free of dirt or grease that could prevent a firm grip. • Always evaluate pinch hazards prior to handling material or any other activity that involves possible pinch point hazards.
	Hand Injuries (abrasions, cuts, lacerations, etc.)	• Leather work gloves are to be worn at all times while handling rough material or equipment and tools that present hazards to hands. • Be aware of the presence of protruding nails, jagged edges that are typically exposed on materials during demolition.
	Injury from Falls	• All work that is 6-feet above the floor, deck, or platform, requires 100% fall protection requirements implementation and compliance. • Personnel working in scissor lifts will be required to follow manufacturer's instructions when operating the lift. • Keep fall protection equipment free of dirt, grease and chemicals that can reduce integrity. • Personnel shall have fall protection training prior to use of fall protection devices. • Do not do any work while sitting or standing on any surface that is six or more feet above the floor, deck, or landing below, without fall protection, unless the surface is an approved work surface protected by hand rails and kick boards. • Inspect all fall protection equipment before each use. • Do not leave fall protection equipment on the ground. • Store fall protection equipment in a dry storage area, hanging up.
	Fire	• In case of fire, the fire department shall be notified immediately. • In case of fire, evacuate the work area. All personnel will report to the rally point designated by the SSHO. • Fire extinguishers of the appropriate size and type shall be located at the project site. (20 lbs, multi-purpose ABC at points of fuel and flammable storage points). Perma-Fix shall provide and maintain these extinguishers. • When an employee finds damaged or broken fire extinguishers he/she shall mark it in some way so it is not used again until it can be disposed for repair or disposed from the work site. • No hot-cutting or welding will be allowed on the project. • Fuel not in a vehicle or motorized device, shall be in an approved metal fuel can with safety cap and flash arrestor. • Fire retardant poly shall be used for all abatement enclosures. • Flammables are to be stored at least 50 feet away from a source of ignition or in a fireproof cabinet. • Smoking is allowed only in designated areas. • Personnel shall have "Hands On" training in the use of fire extinguishers as necessary.

Task/Activity	Hazards	Preventive Measures and Responses
General Activities (cont'd)	Fall from Ladder	• All ladders shall be inspected prior to each use. • When an employee finds damaged or broken ladder, he/she shall mark in some way so the ladder is not used again until it can be disposed for repair or from the work site. • Damaged or broken ladders shall not be used and they are to be marked by tape or tag and removed from service. • Marked damaged and broken ladders are to be reported to the SSHO. • Secure, by tying off, extension ladders so that they do not slip during use. • Use fall protection when above six feet off the deck and on an extension ladder, unless the task only requires one hand and the other hand can be used to hold onto the ladder. If fall protection is not used, maintain three points contact with ladder. • Be sure that an extension ladder is properly placed, one foot out at the base for every four feet of height. • Be sure that the ladder extends three feet above any point of transfer on and off at the top of the ladder. • Do not lean out to the side while working from an extension or step ladder. • Have an assistant hold any extension ladder that is not tied off until the ladder is tied off. • Have an assistant while working from a step ladder if the task is not a short up and down. • Do not stand on the last step and the top of a step ladder. • Do not place any ladder in a door or walkway without posting warnings in any direction required to warn oncoming traffic. • Take all ladders down at the end of the shift unless the ladder is an extension ladder that is tied off and is to be used during the next shift. • Store all ladders were they will not be damaged and will not cause a trip hazard.
	Electric Shock	• A Ground Fault Circuit Interrupter (GFCI) shall precede all connected extension cords and electric tools. • No work shall occur on existing wiring without verification of deactivation. • Personnel shall obtain an excavation permit when necessary. • Abandoned and active utilities (above and underground) shall be marked and identified with colors identifying status. • Any excavation in soil by air-hammer or excavator shall not be done until the equipment has been connected to an approved electrical ground.
	Noise	• Potential high noise sources (e.g., generators, heavy equipment, etc., shall be identified). • Hearing protection shall be required where noise levels exceed 85 dBA. Employees are to follow the Perma-Fix Hearing Conservation Program which considers the ACGIH guidelines of noise exposure/sampling. • Should noise levels (w/o quantitative data) be in question, employees shall use hearing protection at all times unless specified otherwise by the SSHO – use good judgments!

Task/Activity	Hazards	Preventive Measures and Responses
General Activities (cont'd)	Unsafe Equipment, Tools, Ladders, and Electric Cords	• Employees shall inspect all equipment tools, ladders, and electric cords prior to each use. • When an employee finds a defective and/or damaged item, he/she shall "Tag Out" the item for repair/removal from the site. • Small tools shall not be carried by hand up ladders accessing the roof. Implement the use of tool belts, rope-bucket tie-offs. • Extension cords, which have faulty plugs, damaged insulation or are unsafe in any way, shall be removed from service. • Electric cords shall be free of breaks, splices, or taped repairs or otherwise disposed for disposal. • NO equipment is allowed to run over electrical cords.
	Inadequate Illumination	• Illumination shall meet the General Construction Lighting requirements of five-foot candles. • Additional lighting (i.e. portable lighting) shall be added as needed.
	Ergonomics – Repetitive Motion and Vibration Injury	• To reduce and/or eliminate cumulative trauma disorders personnel will be encouraged to find alternative methods for performing repetitive motion tasks such as change of position, using different hand positions, use of PPE, and using a support and good posture. • The use of job/task rotation may also be used to eliminate these hazards.
	Inadequate Housekeeping Causing Hazards	• Keeping all areas and walking/working surfaces neat and clear of unnecessary materials, tools, debris, etc. • Placing materials, tools, etc. in areas that will not cause tripping hazards. • Picking up nails and any other objects that cause injury to personnel or damage to vehicles. • Placing trash in provided and marked trash receptacles. • Trash receptacles shall be emptied before becoming over full. • Placing debris in proper refuge containers, daily. • Not allowing combustible materials to accumulate, daily cleanup is required.
	Temperature Extremes	• Symptoms of heat/cold stress shall be stressed in toolbox meetings, pre-job activities, and work planning and personnel will be briefed in recognizing the signs and symptoms of temperature extremes.
	Weather	• All personnel shall observe weather conditions and warnings. • The SSHO and/or Project Manager shall determine when workers need to take shelter away from the work site by being alert to changing and threatening weather conditions such as heavy rain, strong winds, and lightning.
	Pest Hazards	• Special precautions shall be taken for animals (i.e., checking areas prior to start up to ensure area is clear of skunks, snakes, etc.). • SSHO shall inform all personnel regarding the potential of pest hazards so that all personnel are aware of potential exposure to insect pests such as chiggers, ticks, mosquitoes, spiders, and bees/wasps. • Information shall be provided to personnel on identification of poisonous snakes, plants, and insects that may be encountered. • Insect repellant shall be available for all employees as needed. • If bird or rodent droppings are present within a work area, personnel donning respiratory protection will remove the droppings by sweeping and place in a covered container. The area will be sanitized using a 10% bleach solution prior to lifting the need for respiratory protection.

Task/Activity	Hazards	Preventive Measures and Responses
General Activities (cont'd)	Hazards Associated with Motorized Wheeled Equipment On-site – Combustion Engines	• All equipment is subject to radiological surveys prior to exit from the facility as determined by the appropriate radiological personnel. • All motorized-wheeled equipment is subject to safety inspections prior to entry into the site. • All motorized shall be in good repair without cooling, hydraulic, lubricant, and fuel leaks. • Only a qualified operator shall operate any motorized-wheeled equipment. • All mobile equipment (i.e. excavators, forklifts, etc.) shall have fire extinguishers mounted where they are readily accessible to the operator. • Extreme caution shall be taken when refueling vehicles and equipment. Equipment shall be cool prior to refueling. • All motorized, wheeled work equipment shall have the required and properly inspected fire extinguishers. • Prior to initial operation for the day, all motorized-wheeled equipment and trucks over one ton capacity, shall be inspected daily using the Daily Equipment Operator Checklist that is signed by the operator. • When an employee finds damaged or broken motorized vehicle, he/she shall mark it in some way so the motorized vehicle is not used again until it can be disposed for repair or disposed from the work site. • In the event, the operator finds any damage or problem, he/she shall inform the Project Manager or SSHO. • Seat belts and other applicable operator restraints shall be worn at all times of operation. • A spotter will be used as needed when moving motorized equipment. • No motorized equipment is allowed to enter a street that is not a part of the controlled work site unless a spotter is there to control traffic. • Where there is frequent utilization of a street adjacent to a work site, appropriate signs shall be used to warn traffic that normally uses the street. • Employees needing to use motorized equipment inside a building shall inform the Project Manager and SSHO. • The SSHO shall ensure that gas or propane engines are not operated inside buildings unless there is monitoring for carbon monoxide or adequate ventilation. • All stationary or small engine devices will have fire extinguishers located adjacent to the work area (within 20 feet). • No stationary or small engine device shall be fueled until it is turned off and allowed to cool. • No equipment is allowed to run over any electric or ground wire.
	Untrained Operators	• Only qualified operators shall operate heavy equipment. • Proof of qualifications shall be documented and available for review.
	Actives Involving Work with or Near Electrical Tools or Equipment	• No work (such as changing blades) is allowed on any device, tool, conduit, or electrical cabinet, unless the device, tool, conduit, or cabinet, has been totally unplugged, been locked out under approved "Lock-Out-Tag-Out" procedure, or has been marked for removal after it has been completely isolated from any electrical power source.

Task/Activity	Hazards	Preventive Measures and Responses
General Activities (cont'd)	Electrical Shock from Unsafe or Damaged Electric Tools, Extension Cords, and Other Electric Items Used on the Work Site	• Portable electric tools and all cord and plug connected equipment shall be protected by a Ground Fault Circuit Interrupter (GFCI) device. • The Site S&H Officer shall visually inspect ALL electrical tools, portable hand tools, extension cords, and GFCI devices, for defects prior to their initial use on the work site. • Any electrical item found with a defect shall be tagged with a DO NOT USE tag and the item shall be placed in a holding area until the item is removed from the work site. • Portable electric tools, which are unsafe due to faulty plugs, damaged cords, or other reasons, shall be removed from service. • Tools shall be unplugged while servicing or changing blades/attachments. • Safety devices shall be functioning properly and cannot be modified. • The user prior to each use shall inspect electrical tools, portable hand tools and extension cords. • Electrical installation, repairs and maintenance shall be performed only by qualified individuals.
	Hazards from Using and/or Refueling Generators	• All generators shall be operated in accordance with manufacturer's instructions. • Generators shall be inspected and accepted by the SSHO prior to use. • No smoking or spark sources shall be allowed near generator refueling operations. • Personnel shall ensure that the dispenser nozzle stays in contact with the fuel tank fill tube during refueling. • Personnel will at no time lock the nozzle trigger in the open position. • Engines shall be turned off during refueling – engines will be provided enough time to cool down prior to refueling. • Smoking shall be prohibited within 50 feet of refueling operations. • Refueling will only be conducted in designated locations. • Check equipment for leaks and repair if necessary prior to use. • Avoid positioning equipment over or near unprotected storm drains, streams, etc.
	Electric Shock from Unsafe Extension Cords	• All extension cords shall be protected by GFCI device. • No extension cords shall put into service until it has an initial inspection. • Prior to each use employees are to inspect any extension cord for defects. • Extension cords, which have faulty plugs, damaged insulation, or are unsafe in any way, shall be removed from service; the employee finding a defective and/or damaged item shall identify it by taping or tagging as to why it is defective so the item is not used again until it can be disposed for repair or disposed from the work site. • Extension cords shall be protected from damage from sharp edges, projections, pinch points (doorways and walkways) and vehicular traffic. • Any electric cord that goes through a door or wall shall be protected by a nonconductive sleeve. • Extension cord connectors shall be kept out of water. • Extension cords shall be suspended only with a non-conducive support (rope, plastic ties, etc.). No wire shall be used to hang electrical cords. • No equipment is allowed to run over extension cords. • Any electric cord in place more than one shift shall be hung above the floor traffic if in motorized vehicle traffic area.

Task/Activity	Hazards	Preventive Measures and Responses
General Activities (cont'd)	Electric Shock Due to Use of Unsafe Temporary Lighting	• Temporary lighting shall be used with a GFCI device. • Temporary lighting drops shall be inspected frequently for defects. • All bulbs on temporary lighting systems shall have a protective cage. • All light sockets shall be occupied. • All temporary lighting with than one lamp shall be hung above floor traffic. • Any one lamp drop cord that is to remain after the end of one shift shall be hung above floor traffic.
	Fire Caused by High Temperature Bulbs	• Portable/temporary quartz and halogen lighting fixtures can become extremely hot and should be secured and positioned so that contact with ordinary combustibles is prevented. • Lamps and light bulbs shall be covered by a protective shield or shroud. • Temporary light drops shall be kept up above floor traffic.
	Injury Using Hand Tools and Equipment	• Before each use, any hand tool or equipment shall be inspected for defects. When an employee finds damaged or broken hand tools or equipment he/she shall mark in some way so the item is not used again until it can be disposed for repair or disposed from the work site. • Marked damaged and broken tools are to be reported to the SSHO. • Any instructions, manuals, or tags that come with specialized and unfamiliar tools or equipment shall be given to the SSHO for placement in the onsite equipment tool record. • Specialized and unfamiliar equipment shall only be operated by a user that has reviewed and signed-off that they have read the equipment's operation manual. • No hand tool or equipment is to be used unless the operator has been trained in its operation. • Hand tools and equipment are to be used only for the use they were made to do. • Hand tools and equipment shall be used in a safe manner and with all manufacturers' supplied guards in place. • Ear protection shall be used with any hand tool or equipment that makes a noise at or greater than 85dBA. • All operators are required to use the required ear protection without being reminded. • All hand tools and equipment are to be picked up and stored in their proper storage places at the end of the shift. • Do not leave hand tools and equipment in walkways or where they are a snag or trip hazard. • Use leather work gloves as required – gloves should be puncture and cut resistant. • Do not cut remove any conduit or pipe unless it has been marked and approved for removal. • Report any injury that occurs while using hand tools or equipment, even a small injury, to the SSHO.

Task/Activity	Hazards	Preventive Measures and Responses
General Activities (cont'd)	Bodily Injuries While Erecting Site Boundary and Control Barriers	• Utilize the above stated preventive measures to prevent and control bodily injury. • Establish gates in barriers to prevent trip hazards. • Utilize proper lifting techniques as stated above.
	Damage to Equipment During Erection of Boundary Controls	• Utilize the above stated preventive measures to prevent and control damage to equipment.
	Injury to the Public and Unauthorized Individuals	• Post on site control barriers signs that warn and restrict unauthorized entry. • Utilize gates and keep them closed. • Replace any barrier that has been taken down for equipment entry or exit after the equipment has entered or exited. • Utilize ground personnel to control entry any time barriers are taken down unless otherwise authorized.
	Drainage, Runoff, or Spills Damage the Environment.	• Erect silt fencing as necessary. • Place straw bales to filter silt and control runoff. • Cover drains with silt clout and anchor in place with straw bales. • Place spill kit on site. • Maintain environmental controls during the duration of the project. • Inspect all equipment for leaks prior to start of work and at the end of the day.

Print your name, badge number, signature, and date to indicate you have read and understand the AHA.

Name	Badge Number or Last Four Digits of SSN	Signature	Date

APPENDIX C
Project Forms

PermaFix environmental services A Nuclear Services and Waste Management Company	**Project Plan of the Day**	**PF-OPS-001-F5** **Rev.5**

Project Number: 144099	Project Name: XXX	Date:
Project Manager: Stace Johnson	SSHO: Andy Williams	
RSO: Jeff Knight		
Weather/Site Conditions:		
Safety Topic:	Supporting document attached: Yes No N/A	
Notes:		
Primary Activity or Feature of Work:		Reference Work Plan:

Specific Tasks/Activities (Planned)

1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	

Notes:

Required AHA: ☐ Yes ☐ No	If required, AHA #	
Permit Required? ☐ Yes ☐ No	If required, type of Permit:	Expiration Date:
RWP Required: ☐ Yes ☐ No	If required, RWP Number:	Expiration Date:
Hot Work Permit Required: ☐Yes ☐No	If required, HWP #:	Expiration Date:
Penetration/Dig Permit: ☐ Yes ☐ No	If required, Permit #:	Expiration Date:
Subcontractor work: ☐ Yes ☐No	Work performed:	Complete: ☐ Yes ☐ No

Specific Tasks/Activities (Performed)

1	See Daily Activity Report

Notes:

STOP WORK AUTHORITY:
All employees have the authority and responsibility to stop work when they perceive that an unsafe condition exists that threatens themselves, their coworkers, or the environment. Every worker has the right to a safe workplace; safe working conditions; and understands the hazards of the workplace.

Use PF-OPS-001-F5A (Project Attendance Roster) for POD

Project Manager or Designee

ES&H or Designee

PermaFix environmental services A Nuclear Services and Waste Management Company	**Project Attendance Roster**	**PF-OPS-001-F5** **Rev.4**

Project Number: 144099	Project Name: XXX Response
Project Manager: Stace Johnson	Date:

Topic: _____

Name	Signature	Last 4 of SSN	Date	Time
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
19.				
20.				

Project Manager or Designee (Name)

H&S Representative or Designee (Name)

Project Manager or Designee (Signature)

H&S Representative or Designee (Signature)

PermaFix® environmental services
A Nuclear Services and Waste Management Company

PROJECT WEEKLY SAFETY INSPECTION

PROJECT NAME: XXX Response-Massillon Project # 144099 DATE:

NUMBER OF ON-SITE PROJECT EMPLOYEES: Safety and Ecology Corporation H&S

INSPECTION PERFORMED BY:

	YES	NO	N/A	Action Taken
First Aid Kit available				
Spill Kit(s) available				
Communications device(s)				
Housekeeping:				
Walkways clear of obstacles				
Slip, trip and fall hazards				
Work area adequately lighted				
Overhead hazards				
Work area generally clean				
Biohazards				
Combustible Storage				
Holes and openings barricaded/guarded				
Waste piles covered, protected and secured				
Radiologically controlled areas are posted and demarcated				
Trash, garbage and designated smoking areas				
Electric Equipment:				
Tools & equipment are properly stored				
GFCI's are used and no daisy-chains				
Tools properly grounded				
Cords in good condition (no tape or breaks in insulation)				
Plugs & receptacles in good condition				
Fall Protection:				
Work Platform inspected (e.g., scaffold, aerial lift, etc.)				
Fall Protection equipment has been inspected prior to use				
Fall Protection equipment is properly stored				
All personnel required to tie off are adequately protected				
Personnel are trained and qualified				
Miscellaneous:				
Fire extinguisher monthly inspections are current				
All protective equipment/hard hats, safety glasses, proper clothing, safety belts, lanyards, in good condition and being worn.				
Compressed gas cylinders secured properly				
Concurrent evolutions & potential impacts				
Traffic control and transportation considerations				
Adverse weather conditions				
Storm Water Protection				
Site Security (e.g., fencing, walls, etc.)				
Discussion / Comments from Inspection :				
Signature: Date:				

APPENDIX D

Radiation Protection Plan

(The RPP is an approved Corporate document.)

	SAFETY AND ECOLOGY CORPORATION		
TITLE:	**Radiation Protection Program Procedure**	**NO.:**	RP-100
		PAGE:	1 of 6
		DATE:	May 2013

APPROVED:

5/31/13
Technical Services Manager Date

5/31/13
Corporate Certified Health Physicist Date

1.0 PURPOSE

This administrative procedure describes the major elements of the Radiation Protection Program for Safety and Ecology Corporation (SEC). As applicable, this administrative procedure references sections in the Radiation Protection Plan and project procedures which describe the program in more detail.

2.0 APPLICABILITY

These program descriptions apply to personnel who plan, review, supervise, or perform work involving radiation protection activities during remediation.

3.0 REFERENCES

References are listed in the specific Project Procedures that comprise this Radiation Protection Program.

4.0 DEFINITIONS

Radiation Work Permit (RWP): A document or series of documents prepared by Radiation Protection to inform workers of the radiological and industrial hygiene conditions that exist in the work area and the radiological requirements for the job.

Radioactive Material: Material activated or contaminated by the operation or remediation of the site and byproduct material procured and used to support the operation or remediation.

Radiological Area: Any area within a Restricted Area which require posting as a Radiation Area, Contamination Area, Airborne Radioactivity Area, High Contamination Area, or High Radiation Area.

Restricted Area: An area to which access is limited to protect individuals against undue risks from exposure to radiation, radioactive materials, and chemical contaminants. All posted radiological or chemical areas are Restricted Areas.

5.0 RESPONSIBILITIES

5.1 Radiation Safety Officer (RSO)

The RSO advises project management on all aspects of Radiation Protection and Operational Health Physics. The RSO directs all radiological safety activities on the project. The RSO has the authority to suspend operations and / or restrict personnel access at the project as a result of nonconformance to this SSHP, or other applicable regulations, and when radiological conditions change beyond the scope of an HWP. The RSO is responsible for:

- Implementing and ensuring compliance with RPP's policies and procedures.
- Inspect work activities to ensure operations, including off-normal activities, are being conducted according to the facility or project requirements, applicable federal regulations, and industry accepted As-Low-As-Reasonably-Achievable (ALARA) principles.
- Reviewing and approving work plans, Radiation Work Permits, and RPP procedures.
- Trending radiation work performance of project personnel including contamination and radiation exposure control.
- Identifying, reviewing, and documenting nonconformance, their causes and corrective actions for incidents associated with radiation protection.
- Ensuring an effective ALARA Program including conducting onsite radiation safety and health briefings.
- Ensuring documentation of any RPP safety violation.
- Reviewing survey data.
- Conducting briefings concerning radiological work activities.
- Ensuring that radiological records are complete, clear and legible, meet the intended purpose, and are regularly transmitted to document control for archive.
- Ensuring Restricted Areas are correctly identified, posted and marked.
- Performing or coordinating regular internal audits of the RPP.

5.4 Radiation Protection Technicians (RPTs)

RPTs report directly to the RSO. RPTs are assigned by the RSO to provide support to each major field activity for implementation of RPP requirements. RPTs provide guidance in RPP matters to field personnel. RPTs have stop-work authority for radiological safety matters and activities that could result in an unsafe condition being present. RPTs are responsible for the following:

- Conducting routine and job-specific radiological surveys (i.e., radiation, contamination, and airborne radioactivity).
- Establishing radiological postings.
- Implementing the personal protective equipment (PPE) and respiratory protection programs for the purpose of keeping radiation exposures ALARA.

- Maintaining and operating portable Health Physics survey instrumentation used in the performance of Radiation Protection (RP) activities.
- Performing unconditional release surveys of material from the restricted area.
- Performing transportation radiological surveys according to applicable U.S. Department of Transportation (DOT) regulations.
- Assisting the SSHO with IH&S monitoring and inspections to a level commensurate with training and experience.

5.5 Project Supervisors

All Project Supervisors are responsible for:

- Ensuring personnel under their direction comply with RPP requirements.
- Providing information on projected work activities to the RPP organization.
- Notifying RP personnel of any radiological problems encountered.
- Ensuring workers are prepared for tasks with tools, equipment and training to minimize time spent in radiological areas.

5.6 Project Radiation Workers

All Project Radiation Workers and individuals entering radiologically controlled areas are responsible for:

- Obeying promptly “stop-work” and “evacuate” orders from RP personnel and the SSHO.
- Obeying posted, oral and written radiological control instructions and procedures, including instructions on Radiation Work Permits and those in the SSHP.
- Immediately reporting lost dosimetry devices to RP personnel.
- Reporting medical radiation treatments to the RSO and supervisor.
- Keeping tack of personal radiation exposure status to ensure that administrative dose limits are not exceeded.
- Notifying RP personnel of faulty or alarming radiation protection equipment, and unsafe radiological conditions.

6.0 PREREQUISITES

None

7.0 PRECAUTIONS AND LIMITATIONS

None

8.0 APPARATUS

None

9.0 RECORDS

None

10.0 PROCEDURE

10.1 Radiation Protection Organization

1. The RPP Organization will provide appropriate personnel and resources to verify and maintain a radiologically safe working environment.
2. RPP staffing levels will be periodically reviewed to ensure that adequate staffing levels are maintained consistent with current and planned remediation activities.
3. The Project RPP Organization will have access to engineering and other personnel needed to support the Radiation Protection Program.
4. The development and control of RPP Project Procedures will be in accordance with the following guidelines:
    - Clearly defined scope, tasks, applicability, limiting conditions, precautions, consideration of special controls, reference to acceptance criteria and quality requirements.
    - Clearly understood text, using standard grammar, nomenclature and punctuation, concise instruction steps in a logical sequence, and references.
    - Review, approval, issuance, and control of changes and permanent revisions.

10.2 ALARA Program

All activities involving radiation and radioactive materials shall be conducted in such a manner that radiation exposure to workers and the general public are maintained As-Low-As-Reasonably-Achievable (ALARA), taking into account current technology and the economics of radiation exposure reduction in relationship to the benefits of health and safety. ALARA concepts are implemented throughout the entire RPP. ALARA-program requirements include:.

1. Administrative controls and procedures endeavor to reduce individual and collective radiation exposures ALARA. Minimizing radiation exposure is accomplished by preliminary planning and scheduling, using proven and innovative engineering techniques and performing engineering reviews of proposed work plan changes.
2. Worker involvement and acceptance in minimizing radiation exposure is a key component of the ALARA Program. Workers are responsible to incorporate ALARA principles into work performance.
3. Work shall be planned in accordance with ALARA principles, involving input from discipline engineers, the project RPP staff and implementing supervisors.
4. An Embryo-Fetus Protection Program has been established for the Project and is specified in RPP-113, “Embryo-Fetus Protection”

10.3 Radiation Protection Audit Program

1. Internal / External Audits of the Radiation Protection Program should be performed, documented, and be of sufficient scope, depth, and frequency to identify and resolve actual or potential performance deficiencies before

significant quality problems are encountered. Audit frequency and criteria is determined by the RSO and / or SSHO .

2. The RSO and / or SSHO shall perform an annual review of RPP content and implementation as specified in 10 CFR 20.1101(c).

10.4 External and Internal Dosimetry Program

Internal and external dosimetry and exposure control requirements are defined in the SEC Radiation Protection Plan and includes:

- A discussion of applicable regulatory limits for occupational workers and members of the public.
- ALARA goals.
- Monitoring requirements.
- Recordkeeping requirements.
- Reporting requirements for both normal operations and incidents.

10.5 Radiation Protection Instrumentation Program

All instrumentation used to measure radiation and radioactive material will be maintained in accordance with their respective technical manuals and operating procedures This includes establishing criteria and requirements for the operation, calibration, response testing, maintenance, inventory and control of radiation protection instrumentation and equipment to comply with applicable regulations and conform with applicable ANSI standards. The Instrumentation Program is detailed by specific procedures including RP-108, RP-109, and RP-110.

10.6 Access Control Program

Access controls to radiological areas will be maintained at all times at the SEC. The administrative and physical measures used to control access to Restricted and/or Radiological Areas are established procedures RP-101, RP-102, and RP-103

10.7 Radiation Protection Surveillance Program

The Radiation Protection Surveillance Program provides for the conduct of radiological surveys in all areas controlled for the purpose of radiation and/or radioactivity. The Program encompasses both routine and non-routine surveys to be performed within the SEC. The specific requirements for conducting and documenting radiological surveys at the SEC are detailed in procedures RP-104, RP-105, RP-106, and RP-107

10.8 Radioactive Material Control Program

This Program provides guidance and requirements for control of radioactive materials. The Radioactive Material Control Program includes receipt, inventory, handling, and release of materials. It also provides for radioactive sealed source control, control of materials entering Restricted Areas and control of contaminated tools and equipment. The requirements of this program are established in RP-111

10.9 Respiratory Protection Program

It is not expected that respirators will be widely used by SEC staff for radiation protection purposes at SEC. As such the Respiratory Protection Program will be administered by the SSHO in accordance with the SEC Site Safety and Health Plan. The

SSHO will consult with the RSO when respiratory protection is required for radiological purposes.

10.10 Radiological Training

The Radiological Training is required for SEC employees and/or subcontractors who perform work near, or in areas controlled for the purpose of radiation and/or radioactive materials as defined in Section 8.1 of the SEC Radiation Protection Plan. There are two basic levels of training: General Employee Radiation Training for visitors and non-radiation workers, Radiation Worker Training for workers who access Restricted Areas.

10.11 Radiation Protection Records

Radiation Protection Records are routinely developed to document all aspects of the Radiation Protection Program. Records are generated using clear concise text using standard grammar and punctuation. Records are reviewed for adequacy and completeness and transmitted to the Document Control organization for long-term retention.

APPENDIX E

Quality Management System

(The QMS is an approved Corporate document.)

Quality Management System

Applicability: Perma-Fix (PF) Nuclear Services (NS)* Revision 3

Prepared by:	Signature on File	16Nov15
	Darrell Srdoc, PF Corporate QA Manager	Date
Concurrence:	Signature on File	16Nov15
	Stace Johnson, NS Manager of Projects	Date
Concurrence:	Signature on File	16Nov15
	Eric Laning, NS Technical Services Manager	Date
Concurrence:	Signature on File	16Nov15
	Jeff Bowers, NS Vice President of Performance Assurance	Date
Concurrence:	Signature on File	16Nov15
	Andy Lombardo, NS Senior Vice President	Date
Approval:	Signature on File	16Nov15
	John Lash, PF Chief Operating Officer	Date
		20Nov15
		Effective Date

Type of Change:

- ☒ Document Revision
- ☒ Non-intent Change
- ☐ Document Rewrite
- ☐ Adequacy Review

Recommended Training:

- ☐ Classroom Training
- ☐ Management Brief
- ☒ Required Read
- ☐ Other

* Nuclear Services is a division of Perma-Fix.

Table of Contents

1. INTRODUCTION

This document, PF-Q-01, *Quality Management System* (QMS), describes the Perma-Fix Environmental Services, Inc. Nuclear Services (PFNS) quality management system. The structure of the QMS is derived from and compliant with the American Society Mechanical Engineers (ASME) Nuclear Quality Assurance (NQA) 1-2008, *Quality Assurance (QA) Program Requirements for Nuclear Facilities Applications*. This structure also allows compliance with the International Organization for Standardization (ISO) 9001, *Quality Management Systems*, and addresses government and commercial based customer quality requirements. The QMS includes a general description of the Perma-Fix business structure, primary services, Quality Policy, and the organizational and operational framework for identifying and ensuring continued compliance to NQA-1, ISO 9001, and customer quality requirements.

2. PERMA-FIX SERVICES AND BUSINESS STRUCTURE

Perma-Fix provides nuclear and waste treatment services to both government and commercial customers. The PFNS division provides project management services in the areas of waste management, environmental remediation/restoration, decontamination, decommissioning, new build construction, demolition, and radiological protection. The PFNS division also provides technical services in the areas of radiological safety and protection, health physics support, site characterization, and instrument calibration. The company's waste treatment service group operates four fixed based waste treatment facilities that treat hazardous, low-level, and mixed waste streams.

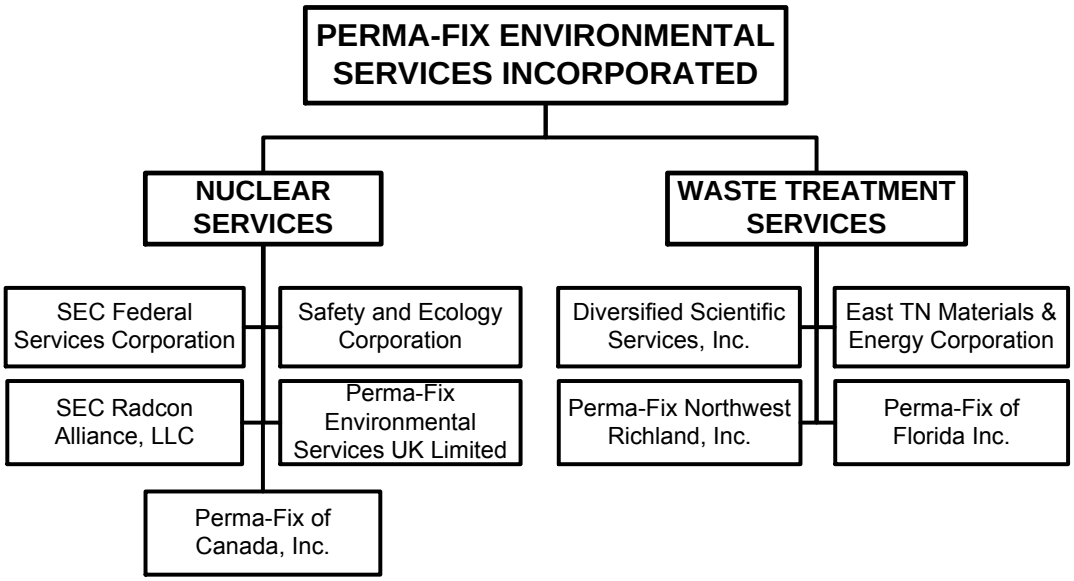


Figure 1 - Perma-Fix Services and Business Structure

Perma-Fix's headquarters is located in Atlanta, GA, with its primary business center located in Knoxville, TN. Perma-Fix corporate Human Resources, Financial, and Information Services maintain their central offices in Atlanta while PFNS functional support groups maintain their offices at the Perma-Fix Business Center (PFBC).

The PFBC provides the primary infrastructure for proposal development, contract management, procurement, human resources, project controls, project management, quality assurance (QA), health and safety (H&S), finance, and customer communication. This infrastructure provides the support necessary to ensure PFNS projects are managed effectively and compliantly from project initiation to project closure. The QMS provides the framework for assuring support groups document, implement, and monitor work processes to the extent necessary to achieve project success.

3. QUALITY POLICY

PFNS is committed to maintaining a QMS that ensures work is performed safely, meets our customer's requirements, and exceeds our customer's expectations. This is accomplished through good planning, process ownership by line management, compliant execution of daily tasks, and periodic self-assessment to assure continued improvement through preventive actions.

Each individual employed or subcontracted by PFNS is empowered to stop work if conditions present a danger to themselves, other personnel, the public, or the environment. In addition, each employee or subcontractor is responsible for identifying and reporting conditions adverse to safety or quality to their immediate supervisor.

4. QUALITY MANAGEMENT SYSTEM

4.1. Organization

As described in Section 2.0, PFNS maintains two primary service entities that consist of project based nuclear and technical services. These business entities have adopted the QMS as their program for compliance to the NQA-1 and ISO 9001 standards. Effective implementation of the QMS is sustained through an organization structure that allows sufficient independency while ensuring efficient operations. The QA organizational structure, lines of reporting, and lines of communication of key personnel are depicted in Figure 2.

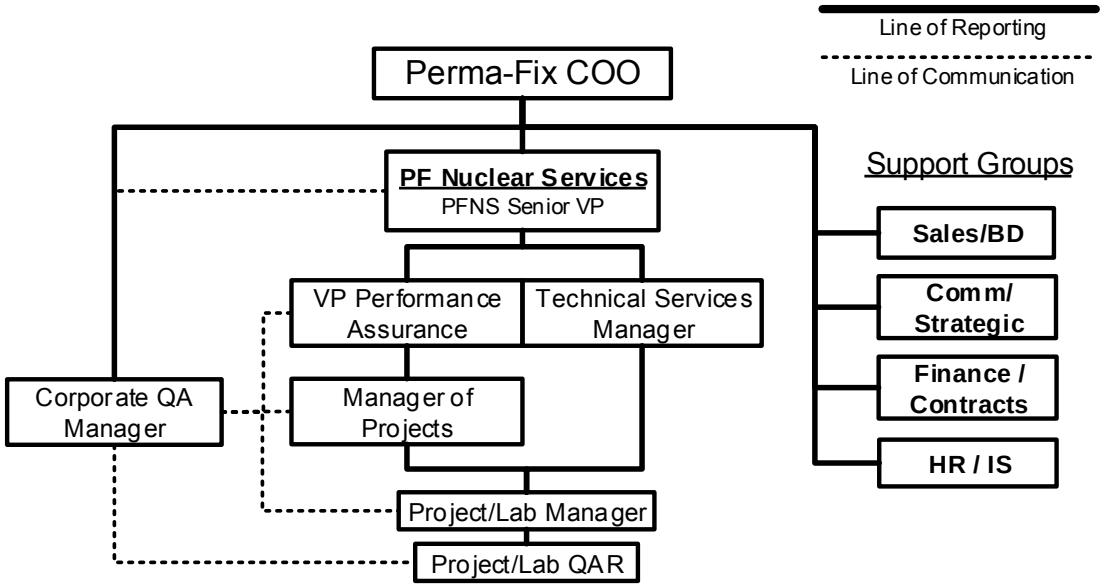


Figure 2 - PFNS Lines of Reporting and Communication

4.1.1. Chief Operating Officer

The Chief Operating Officer (COO) has complete authority for the execution of the QMS. The COO is responsible for:

- Approving the QMS,
- Ensuring internal assessments are conducted,
- Ensuring adequate resources are maintained for effective QMS execution,
- Reviewing results of completed assessments, and
- Authorizing long term preventative actions for continued improvement.

4.1.2. PFNS Senior Vice President

- The PFNS Senior Vice President (SVP) reports directly to the COO and is accountable for the effective implementation and execution of the QMS for NS. The SVP is also responsible for:
- Ensuring QSM compliance,
- Ensuring adequate resources are provided to conduct management assessments,
- Ensuring adequate resources are provided to support independent assessments,
- Ensuring observed or identified issues and concerns are resolved in a timely manner,
- Evaluating reported quality and safety issues, and
- Authorizing short or long term preventative actions for continued improvement.

4.1.3. NS Vice President of Performance Assurance

The Vice President of Performance Assurance (VPPA) manage all aspects of NS business development, oversees the NS proposal process and performs post award reviews to ensure stated objectives are met or exceeded. Other responsibilities include:

- Coordinates monthly project reviews and closures
- Supports updates and changes to the operation manual
- Provides support and oversight to the Manager of Projects
- Coordinates resources and support between remote project managers, manager of projects and home-office support

4.1.4. Manager of Projects and Technical Services Manager

The Manager of Projects (MP) reports directly to VPPA and the Technical Services Manager (TSM) reports directly to the SVP. They are primarily responsible for ensuring field implementation of the QMS. They are also responsible for:

- Ensuring quality and safety provisions are established for each project,
- Ensuring PMs comply with all quality and safety requirements,
- Ensuring PMs provide resources to conduct management assessments,
- Ensuring PMs provide resources to support independent assessments,
- Evaluating reported issues and concerns as reported, and
- Ensuring PMs provide timely closure of identified issues and concerns.

4.1.5. Support Groups

Support Groups ensure PMs are supported with proposal development, contract administration, personnel acquisition, scheduling, information technology, procurement, work execution, customer feedback and contract closure.

4.1.6. Corporate Quality Assurance Manager

The Corporate Quality Assurance Manager (CQAM) reports directly to the COO and is the senior subject matter expert (SME) on QMS development, implementation, and compliance. The CQAM is primarily responsible for assessing QMS field execution and facilitating system improvements. The CQAM is also responsible for:

- Assisting each PM to ensure effective implementation of the QMS,
- Assessing field activities to ensure conformance to the project work plans,

- Ensuring flow down QA and/or quality control (QC) plans are developed and implemented when required,
- Assisting each PM in the investigation and resolution of documented issues,
- Reviewing quality and safety issues with the COO on an annual basis,
- Identifying any trends as a result of independent and management assessments,
- Recommending preventive actions to preclude potential non-conformances or adverse conditions,
- Assisting the PM in timely closure of issues and concerns, and
- Leading root cause analysis investigations as requested by the COO.

4.1.7. Project Manager

The PM reports directly to the MP or TSM and is responsible for ensuring day-to-day activities conform to project specific QA/QC or H&S plans and procedures. The PM is also responsible for:

- Executing the project in accordance with the Project Management Operations Manual;
- Performing management assessments of project field activities;
- Ensuring independent assessments are adequately supported;
- Identifying and documenting issues that lead to conditions adverse to quality and safety;
- Investigating issues and developing corrective actions to ensure conformance and developing preventive actions to prevent recurrence; and
- Ensuring timely closure of actions that address issues, concerns, and deficiencies.

4.1.8. Project QA Representative

The Project QA Representative (QAR) reports directly to the PM with an independent communication line to the CQAM. The QAR is responsible for ensuring QA/QC provisions are met during day-to-day execution of project activities. They are also responsible for:

- Supporting implementation of project QA Plans and procedures;
- Performing oversight of day-to-day project activities;
- Performing receipt inspection of items identified as important to safety or quality;
- Identifying and documenting issues that represent conditions adverse to safety or quality;
- Investigating issues and developing corrective actions on behalf of line management;

- Screening adverse conditions for reportable occurrences or nuclear safety violations; and
- Assisting line management in the timely closure of issues, findings, and deficiencies.

4.2. Quality Management System Structure

The QMS is an "umbrella" document under which all PFNS project work is conducted and assessed. The QMS is implemented through QA standard operating procedures (SOPs) compliant with the eighteen basic requirements specified in the NQA-1 and the six basic requirements for ISO 9001. The QMS and SOPs allow PFNS to meet requirements listed in the U.S. Department of Energy (DOE) Order (O) 414.1D, *Quality Assurance* and 10 Code of Federal Regulations (CFR) Part 830.122, *Quality Assurance Criteria*, as demonstrated in Figure 3.

PF-Q-01 QMS vs ISO 9001:2008; 10 CFR 830.122; and DOE O 414.1D	Perma-Fix NQA-1 Quality Standard Operating Procedures																			
	PF-Q-01 Quality Management System	PF-Q-02 Training & Qualifications	PF-Q-03 Design Control	PF-Q-04 Procurement Control	PF-Q-05 Instructions, Procedures, & Dwgs	PF-Q-06 Document Control	PF-Q-07 Control of Purchased Items/Services	PF-Q-08 Identification and Control of Items	PF-Q-09 Control of Special Processes	PF-Q-10 Inspection	PF-Q-11 Test Control	PF-Q-12 Control of Measuring & Test Equip.	PF-Q-13 Handling, Storage, and Shipping	PF-Q-14 Inspection, Test, and Oper. Status	PF-Q-15 Issues Management	PF-Q-17 Quality Records Management	PF-Q-18 Assessments	PF-Q-19 Suspect & Counterfeit Items	PF-Q-20 Safety Software
ISO 9001:2008																				
4.0 QUALITY MANAGEMENT SYSTEM	●																			
4.1 General Requirements	●	●																		
4.2 Documentation Requirements	●				●	●										●				
5.0 MANAGEMENT RESPONSIBILITY	●																			
5.1 Management Commitment	●																●			
5.2 Customer Focus	●																●			
5.3 Quality Policy	●																			
5.4 Planning	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	▲
5.5 Responsibility, Authority, and Communication	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	▲
5.6 Management Review	●														●		●			
6.0 RESOURCE MANAGEMENT	●																			
6.1 Provision of resources	●	●																		
6.2 Human Resources	●	●																		
6.3 Infrastructure	●				●		●													
6.4 Work Environment	●	●																		
7.0 PRODUCT REALIZAITON	●																			
7.1 Planning of Product Realization	●				●		●		●	●	●	●			●	●	●			
7.2 Customer-related Processes	●	●			●								●	●		●				
7.3 Design and Development	●		▲																	
7.4 Purchasing	●			●			●	●		●	●									
7.5 Production and Service Provision	●				●	●	●	●	●			●	●	●		●				
7.6 Control of Monitoring and Measuring Devices	●								●	●	●	●								
8.0 MEASUREMENT,ANALYSIS,IMPROVEMENT	●																			
8.1 General	●									●	●				●		●			
8.2 Monitoring and Measurement	●								●						●		●			
8.3 Control of Nonconforming product	●									●				●	●					
8.4 Analysis of Data	●									●					●		●			▲
8.5 Improvement	●														●		●			
10 CFR 830.122 & DOE O 414.1D																				
MANAGEMENT	●																			
Program	●																			
Personnel Training & Qualification	●	●															●			
Quality Improvement	●	●													●		●			
Documents and Records	●				●	●										●				
PERFORMANCE	●																			
Work Processes	●				●			●	●			●	●	●						
Design	●		▲																	
Procurement	●			●			●													
Inspection and Acceptance Testing	●							●		●	●	●		●	●			●	●	▲
ASSESSMENT	●																			
Management Assessment	●														●		●			
Independent Assessment	●	●								●	●				●		●			
ADDITIONAL REQUIREMENTS	●																			
Suspect & Counterfeit Items	●			●			●			●								●		
Safety Software	●																			▲
		Compliant				●			Graded Compliance							▲				

Figure 3 - QMS vs. ISO 9001, 10 CFR 830.120 and DOE O 414.1D

In addition, the QMS and SOPs meet the requirements listed in the U.S. Army Corp of Engineers (USACE) ER 1180-1-6, *Construction Quality Management and Unified Facilities Guide*

Specifications (UFGS) 01451A, *Contractor Quality Control*; and Canadian Standards Association (CSA) N286-12, *Management System Requirements for Nuclear Facilities*. The QMS is further implemented through flow down project quality assurance plans (PQAPs), quality control plans (QCPs), and project specific procedures. The PQAP, QAP, QCP, and procedures are designed to achieve compliance with diverse customer quality requirements specified in contracts. PFNS has developed and maintains specific QA document templates to address each of these requirements to ensure quality plans and procedures are current. This hierarchy of the QMS flow-down quality requirements is presented in Figure 4.

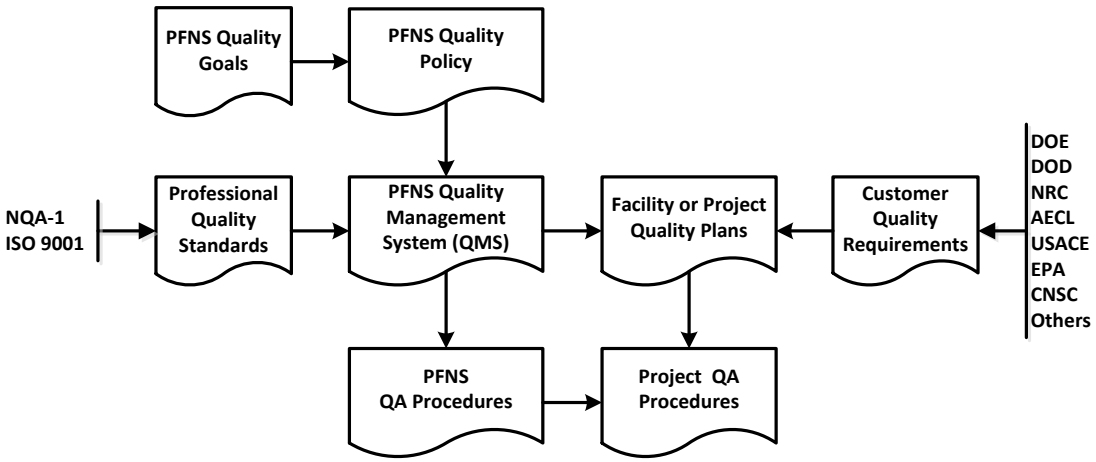


Figure 4 - QA Document Hierarchies

Many contracts require PFNS to use policies, plans, or procedures of the client company. In these circumstances, QMS requirements will apply to those areas not addressed by the client's QA program. When a PQAP, QAP, or QCP is not required by contract, clarification of customer quality requirements and applicability of these requirements will be described or incorporated in the PFNS work orders or plans required for each project. The QMS applies to all PFNS project activities unless exempt in writing by the Perma-Fix COO, PFNS SVP and CQAM, or as defined through contractual or regulatory requirements.

4.2.1. Integration of Safety Management

The QMS is applied in a manner consistent with the objectives and core components described in DOE O 450.4-1, *Integrated Safety System Manual*, USACE EM 385-1-1, *Safety and Health Requirements*, and CSA N286-12. Safety management concepts are integrated in all work processes beginning at the proposal phase and continuing through demobilization. Upon notice to proceed, PFNS will conduct a project readiness review in accordance with

PF-OPS-02, *Project Readiness Review* or participate in an equivalent review required by the customer. The review may include a separate hazard or risk review to ensure work can be conducted in a safe, compliant, and efficient manner. In addition, assessments performed during the conduct of work may include a review and evaluation of safety practices, interviews with employees on safer ways to perform work, and distribution of lessons learned.

4.2.2. Graded Approach

The QMS and flow down implementing documents will be implemented using a graded approach and applied primarily to activities, items, or services considered "*important to safety and quality*." As defined by PFNS, "important to safety and quality" means: an activity that if performed incorrectly, could have an adverse effect on employee, public safety, or the environment. As applied to an item, an item that if through failure or a non-conforming condition, could have an adverse effect on employee, public safety, or the environment. QMS implementation will consider the risks and complexity of the scope of work (SOW) and any special requirements imposed by our client. The application of a graded approach philosophy does not relieve PFNS of its responsibility to maintain compliance with federal, state, or local regulations. An initial set of items and services considered as "important to safety and quality" are identified in PF-Q-07, *Control of Purchased Items and Services*. The CQAM will maintain control of this list with consensus from the COO and SVP, and when required by contract, the client.

4.3. Training and Qualifications

Personnel involved with activities, services, or items considered "important to safety or quality" will be provided initial indoctrination and training based on their assigned responsibilities, required qualifications, and regulatory requirements. Indoctrination training may include general employee training, training on core project plans, and, on a graded approach, required reading of project specific plans and procedures.

PMs will assess the training needs of each employee assigned to a project and schedule training as necessary. Training needs will be based on critical and unique job functions, whether a level of competency must be demonstrated, or whether special certification is required. Demonstration of competency may include practical and/or written examination. When work activities include operation, maintenance, and technical support of DOE Hazard Category 1, 2, and 3 nuclear facilities, PFNS will operate in accordance with an approved training implementation plan

compliant with DOE O 5480.20A, *Personnel Selection, Qualification, and Training, Requirements for DOE Nuclear Facilities*. The plan will serve as the basis for scheduling, tracking training, and confirming qualification for all project personnel. For work activities conducted in DOE facilities less than a Category 3, PFNS will operate to a training matrix approved by the PM and maintained by the project coordinator or designee. The MP and TSM will ensure time is allotted to the employee to attend scheduled training, and the employee will be responsible for attending the training and satisfying required qualification requirements. Additional QA requirements for training are delineated in PF-Q-02, *Training and Qualifications*.

As part of continued improvement, additional and continuing training may be provided as follows:

- Training during the project Plan of the Day (POD) meeting,
- Training as a result of Lessons Learned briefings,
- Educational and/or professional training,
- Specialized training when performing tasks under a specific work order or plan,
- Training as a result of procedure changes,
- Training as a result of significant activity changes,
- Training as a result of operating experiences, and
- Training provided as a result of actions to prevent recurrence of adverse conditions.

4.4. Design Control

PFNS is not a design organization and therefore does not maintain a full design control program. However, PFNS does procure engineered items or engineering services. Procurement of these services or items is managed in accordance with PF-Q-04, *Procurement Control*. At a minimum, subcontractors providing these types of items or services may be evaluated in accordance with basic provisions described in Requirement 3, *Design Control*, of ASME NQA-1-2008 for DOE Hazard Category 1, 2 or 3 nuclear facilities, or per specific design control requirements established by PFNS or its customer. In these situations, design provisions will be identified in procurement documents. Design control requirements are delineated in PF-Q-03, *Design Control*.

Procurement of software used for design and safety analysis for DOE Hazard Category 1, 2, and 3 nuclear facilities will be controlled consistent with DOE G 414.1-4, *Safety Software Guide*, ASME NQA-1-2008 or IEEE 828-2005, the Institute of Electrical and Electronics Engineers *Standard for Software Configuration Management Plans*. Software QA requirements are delineated in PF-Q-20, *Safety Software*.

4.5. Procurement Control

PFNS has established administrative controls for procuring items and services in PF-P-001, *Purchasing Policies and Procedures*. In addition, PFNS flows down General and Special Conditions that address specific customer and quality provisions. These policies and procedures provide the administrative requirements for ensuring compliant procurement documentation.

In addition to PF-P-001, PF-Q-04, *Procurement Control*, establishes specific requirements for evaluating suppliers of services and items considered "important to safety and quality." To the extent necessary, the procurement process will require suppliers to employ a quality system consistent with the elements of the PFNS QMS and compliant with specific requirements mandated by customers or regulatory agencies. At a minimum, suppliers that do not maintain a compliant QA Program will be used only when they have been evaluated and approved by the CQAM and listed on the Perma-Fix Approved Supplier List (ASL). In these cases, the supplier will abide by the QMS on a graded approach or adhere to flow down QA requirements specified in procurement documents. The supplier may undergo specific inspections or assessments at the supplier's facility or when the items are received or services provided at the project site or facility.

4.6. Instructions, Procedures, and Drawings

PFNS will use approved work plans and/or SOPs for conducting work as dictated by the project work scope or as required by the customer. The SOP may consist only of a flow chart but should include or reference specific instructions and/or associated forms. Each SOP is reviewed periodically by the assigned SME or document sponsor to ensure content integrity. The nature of PFNS work activities does not typically result in PFNS generated engineering drawings. Engineering drawings are usually generated by the client or procured through approved service providers. In these cases, engineering drawings will be managed through the PFNS document control system, engineering, or submitted to the client under their required submittal process.

PFNS maintains a library of controlled SOPs in areas of H&S, Environmental Management, Instrument Calibration, Radiation Protection, Procurement, and QA. Each SOP is developed appropriately for each circumstance and work process area. They include requirements and/or acceptance criteria needed to provide specific direction or determine if an activity was satisfactorily accomplished. SOPs generated for projects will be identified in the PQAP, QAP, QCP, or work plan specifically developed for executing the project SOW. Requirements for SOPs or other documents that are generated for describing the work process are prescribed in PF-QA-05, *Instructions and Procedures*.

4.7. Document Control

The preparation, issue, and change of an SOP or work process document that specifies quality requirements for items or services considered "*important to safety or quality*," or ensures execution customer requirements will be controlled to ensure the required approvals are obtained and the current revision of the document is used. Controlled documents and their changes will be reviewed for adequacy and approved for release before being issued by the PFNS Document Center (DC) or project satellite document center.

Client issued documents will be managed as a controlled document when the document is issued as a controlled document to PFNS. PFNS will maintain satellite document centers which operate independently from the DC but under the equivalent document control provisions.

In general, immediate access to approved documents will be made available to project staff via the corporate Perma-Fix SharePoint® (SP) site, a SharePoint® set up for the project, a project network assisted system (NAS) or hard copies at the worksite. Documents printed from a SP site or NAS will be current the day they are printed and can continue to be used as long as the user confirms the proper version each time it is used. Specific requirements for document control are prescribed in PF-Q-06, *Document Control*.

4.8. Control of Purchased Material, Equipment, and Services

PFNS procurement controls include measures to ensure items and services considered "*important to safety and quality*" are procured through suppliers listed on the Perma-Fix ASL. Suppliers listed on the ASL are selected based on a documented evaluation of their past performance, objective evidence of an acceptable QA program or system, customer approval, approved by recognized independent auditing group, certified by an accredited entity, and/or other attributes deemed appropriate for the items or services being procured. Suppliers of items or services that may affect safety structures, systems, or components may undergo an additional site evaluation by a Perma-Fix NQA-1 lead auditor based on the complexity of the items or services provided.

Conformance to safety metrics requirements, training, certification, licensing, and other regulatory requirements are generally confirmed through a signed confirmation from the supplier or positively verified by the CQAM, Perma-Fix Contracts Administrator, or their authorized designee. PFNS procurement documents may include special provisions for receipt inspection, workmanship inspection, and right-of-access to the supplier's facility or place of business to confirm conformance to subcontract or purchase order specifications. Subcontractors performing work under the

provisions of project work plans or work orders will be suitably trained to the project H&S provisions.

Suppliers of services and items are also subject to provisions related to suspect/counterfeit items (S/CI). Suppliers are required to implement a program to preclude the introduction of potential S/CI at DOE worksites and are responsible to positively confirm items provided have been properly examined. The Perma-Fix purchasing agent and/or subcontract administrator are responsible for ensuring procurement documents clearly and adequately describe the items and services required and that suppliers of items and services considered "*important to safety and quality*" are listed on the Perma-Fix ASL. The specific requirements for control of purchased material, items, and services are described in PF-Q-07, *Control of Purchase Material, Items and Services,* PF-Q-19, *Suspect/Counterfeit Items*, and PF-P-001, *Purchasing Policies and Procedures*.

4.9. Identification and Control of Items

PFNS applies measures for the identification and control of safety and quality (SQ) items to ensure their proper usage, and to prevent the use of incorrect or defective items. Identification of an item will be maintained through unique marking, labeling, or tagging. When physical identification is impractical, acceptable items will be segregated from items found to be non-conforming or defective. Identification of items will be traceable to required certification documentation or known standards.

SQ items received at project worksites will be inspected and/or verified by the QAR, or by a designated competent person (DCP) designated and approved by the QAR or CQAM. Criteria for acceptance will be identified on PFNS generated checklists, inspection reports, or procurement documents. When required, these provisions will be described in the PQAP, QAP, QCP, or in project specific procedures. Specific requirements are described in PF-Q-08, *Identification and Control of Items*.

4.10. Control of Special Processes

Processes such as welding, heat treating, and Non-Destructive Examination that are highly dependent on the control of the process, the skill of the operator, or both, will be performed by qualified personnel using procedures approved by PFNS, a qualified third party, or the customer. These types of processes are typically procured through an approved supplier who has been evaluated in accordance with PF-Q-04, *Procurement Control*. Qualifications for personnel and procedures will be in accordance with specified requirements prescribed in a PQAP, QCP, QAP, or

associated procurement documents. Specific requirements are described in PF-Q-09, *Control of Special Processes*.

4.11. Inspection

PFNS will ensure items and services considered "*important to safety and quality*" conform to specified requirements through planned inspection activities. Inspections may consist of a visual examination, document verification, or traditional dimensional inspection. The majority of inspections will be performed by the assigned PQAR, FQAM, or their DCP. Inspections requiring certified or licensed inspectors will be identified as hold points in the work process to ensure appropriate time and resources are planned and scheduled. Acceptance criteria will be identified in the PQAP, QAP, QCP, associated procurement documents, or on inspection reports specifically developed for the item or service under review. Items or services found to be non-conforming or non-complying will be documented in accordance with PF-Q-15, *Issues Management*. Specific requirements for inspections will be performed in accordance with procedure PF-Q-10, *Inspection*.

4.12. Test Control

PFNS typically procures testing services to verify conformance of materials, components, or systems. These types of testing capabilities are procured though suppliers that have been evaluated and approved in accordance with PF-Q-04, *Procurement Control*. Testing criteria will be delineated in procurement documents as part of the overall procurement of services or described in separate project/facility work plans or orders. Typical tests may include DOP testing for high-efficiency particulate air (HEPA) filters; compression and slump testing of concrete; soil tests; load tests; testing of non-safety related software; and operational testing of heating, ventilation, air conditioning (HVAC), electrical systems, or waste treatment systems. Specific requirements for testing will be performed in accordance with procedure PF-Q-11, *Test Control*.

4.13. Control of Measuring and Test Equipment

PFNS uses Measuring and Test Equipment (M&TE) to confirm environmental, safety, and health; radiological; and quality compliance are achieved. Most radiological and industrial hygiene instruments are maintained by the Perma-Fix Instrument Services (IS) Group which operates in accordance with PF-IS-001, *Instrumentation Services Quality Assurance Plan*. Equipment requiring specialized calibration or repair is sent to the original equipment manufacturer (OEM), to an approved supplier qualified under PF-Q-04, *Procurement Control*, or to a supplier certified by the OEM to perform such services. Perma-Fix calibration of equipment incorporates the use of

standards traceable to the National Institute of Standards and Technology (NIST), technicians that are qualified under a rigorous job performance measure program and the use of a sophisticated calibration and recall system. Specific M&TE requirements are described in PF-Q-012, *Control of Measuring and Test Equipment*.

4.14. Handling, Storage, and Shipping

Construction equipment or materials considered critical, sensitive, perishable, or of high value to the customer and/or to PFNS are secured at approved lay-down areas located at each project or facility work site. Government furnished material or equipment are identified, documented, and tracked separately from PFNS inventory. Items such as calibration gases, radioactive sources, or NIST standards are handled, stored, packaged, and shipped in accordance with codes, standards, regulations, engineering specifications, or customer requirements. General requirements for implementing this provision are provided in PF-Q-13, *Handling, Storage, and Shipping*.

4.15. Inspection, Test, and Operating Status

The inspection status of PFNS and customer supplied equipment or material will be identified using markings, tags, and/or appropriate segregation. Items will maintain traceability while in storage, in-process, and at final installation or use. Status indicators will be sufficient to prevent inadvertent use or installation of nonconforming or defective material or operation of equipment determined to be unsafe or awaiting repair. Instrumentation used to monitor environmental, industrial hygiene, and quality compliance will be identified with the instrument model number, manufacturer, and calibration recall date. Status indicator requirements and guidance are provided by PF-Q-014, *Inspection, Test, and Operating Status*.

4.16. Nonconforming Materials, Parts, or Components

PFNS employs an Issue Reporting system that allows identification of conditions adverse to quality or safety, documentation of immediate actions, basic casual analysis, actions to prevent reoccurrence, assignment of actions, acknowledgement of action closure, and screening of potential Price-Anderson Amendments Act (PAAA) non-compliance (DOE only). The system includes reporting requirements for nonconforming materials, parts, or components and specifies control provisions for preventing unintentional installation or usage. Requirements and guidance for the reporting non-conforming items are provided within PF-Q-15, *Issues Management*.

4.17. Corrective Action

Once adverse conditions have been identified and reported, the QAR will investigate the circumstances, collect data, identify causal factors, and determine apparent causes using DOE G 231.1-2, *Occurrence Reporting Causal Analysis Guide*, or any other nationally recognized cause analysis methodology. Conditions may include non-conformances, non-compliance, safety related incidents, failures, malfunctions, deficiencies, and defective material. Significant conditions adverse to quality or safety may require a formal cause analysis performed by the CQAM assisted by a team of diverse disciplines trained in a more authoritative, root cause analysis methodology.

All reported issues will be screened for potential PAAA non-compliances (DOE only) in accordance with *Enforcement Process Overview* issued by the DOE Office of Enforcement, and also undergo an evaluation to determine if adverse conditions meet the threshold of a reportable occurrence (DOE only) in accordance DOE O 232.2, *Occurrence Reporting and Processing of Operations Information*. Requirements and guidance for the corrective action process is established within PF-Q-15, *Issues Management*.

4.18. Quality Assurance Records

In the conduct of work, PFNS generates many types of records. Records that furnish documentary evidence of quality or compliance to customer or regulatory requirements will be identified, prepared, and maintained in accordance with PF-Q-17, *Records Management*. PF-Q-17 addresses the protection, deterioration, distribution, retention, maintenance, and disposition of quality records. PFNS may maintain a satellite DC to acquire, secure, and store records as they are generated until they are no longer required to support ongoing activities or have met legal retention requirements. Hard copy records will be digitized and maintained in a separate storage medium to ensure dual repository management. When hard copy records are no longer required to support ongoing activities, PFNS will transfer them to long-term, secured storage as directed by the CQAM or its client. Requirements and guidance for the records management are established within PF-Q-17, *Records Management*.

4.19. Assessments

4.19.1. Independent Assessment

PFNS conducts compliance monitoring of project QAP/PQAP/QCP implementation and operational processes through independent assessments. Periodic assessments of project

activities ensure achievement of customer requirements and provide the project staff an opportunity to gauge the effectiveness of project work plans/orders and procedures. Independent assessments are generally performed by the Perma-Fix EHS&Q staff, but from time to time can be done by an approved subcontractor or SME. Specific requirements for conducting independent assessments are listed in PF-Q-18, *Assessments*.

4.19.2. Management Assessment

Management assessments are conducted primarily by project management or by a senior manager of the company. Management assessments focus on core management systems that support project or facility operations, such as procurement, contracts, proposal development, project controls, QA, and H&S. Project and facility line managers are responsible for conducting walk down assessments of their project/facility and reporting conditions adverse to quality or safety. Facility and project line managers are responsible for assessing their specific work process to identify opportunities for improvement. Upon request, the CQAM may conduct management assessments on behalf of the TSM or PM. In these situations, the requestor will retain overall responsibility for the planning and scheduling of the assessment, and ensuring adequate support is allocated to the CQAM to conduct an efficient, effective assessment. Specific requirements for conducting management assessments are listed in PF-Q-018, *Assessments*.

Independent and Management assessments, excluding those performed by project line management, are considered business sensitive documents and may require non-disclosure statements from non-PFNS personnel requesting copies. Line management assessment reports can be made accessible to clients through a project or facility specific SP site if approved by the CQAM and COO.

4.19.3. Quality Improvement

PFNS provides several avenues for quality improvements. In addition to Section 4.16, *Nonconforming Materials, Parts, or Components,* and Section 4.17, *Corrective Action,* PFNS periodically schedules management review meetings to discuss issues, concerns, lessons learned from industry and projects, and positive aspects observed during internal and external assessments/audits. The CQAM will provide an annual report to the SVP and COO to describe the status of observed issues and concerns that may require long term resolution to areas that might be beyond the area of responsibility of the MP or TSM. In this report, the CQAM will also discuss adverse trends and preventive actions to mitigate or eliminate

corporate and project risks and to clarify quality objectives and performance metrics across all projects and facilities. Report details are maintained on a database to focus priority, track preventive actions, and to evaluate timeliness and effectiveness of process improvements.

4.20. Suspect/Counterfeit Item Prevention

PFNS prevents introduction of S/CIs at DOE sites through procurement controls, inspection, and training. Suppliers are required to certify items provided to PFNS are screened or inspected for S/CI. Subcontractors are required to report any S/CI discovered before, during, or after the performance of their service. Procurement controls for subcontractors are implemented in accordance with PF-Q-04, *Procurement Document Control*.

PFNS inspects materials and equipment for S/CI as they arrive at the project site. Personnel performing inspections at DOE project sites will be suitably trained to DOE *S/CI Awareness Training Manual*. Inspections will be conducted on a graded approach but consistent with DOE G 414.1-3, *Suspect/Counterfeit Items Guide*. Specific requirements for inspection of potential S/CI are provided in PF-Q-10, *Inspection*, and PF-Q-19, *Suspect/Counterfeit Items*.

4.21. Safety Software Quality Requirements

PFNS does not currently design or operate safety software defined in Section 1.2 of DOE G 414.1-4, *Safety Software Guide for Use with 10 CFR 830 Subpart A, Quality Assurance Requirements*, and *DOE O 414.1D, Quality Assurance.* If such software is required as part of a DOE project deliverable, PFNS would procure this service from an approved supplier who maintains a design control program consistent with ASME NQA-1-2008, *QA Requirements for Nuclear Facility Applications*, DOE G 414.1-4, and DOE O 414.1D, *Quality Assurance*. Other requirements may be imposed on PFNS from other clients. These requirements would be specified in contract documents and addressed in procurement documents in accordance with PF-Q-04, *Procurement Control*. In the event PFNS is required to operate and manage safety software, PFNS will implement training requirements consistent with NQA-1-2008, DOE G 414.1-4, and DOE O 414.1D, or as required by the client. These training requirements would be specified in accordance with PF-Q-02, *Personnel Training and Qualifications* and PF-Q-20, *Safety Software*.

XXXXXX Laboratory
Facility Remedial Action
Work Plan Richmond,
California

NUMBER: **ERLP-P2-RAWP-2017**

TITLE: **Remedial Action**
Work Plan for
the XXXXXX Laboratory Facility
2030 Wright Avenue, Richmond, CA 94804

REVISION: **Rev. 0**

Approvals:

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Reviewed / Approved By: _____ _____
Eric Laning, Technical Manager Date

Reviewed / Approved By: _____ _____
Alex Lopez, CHP Date

TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS, ACRONYMS, AND SYMBOLS

ACM	Asbestos-containing Material
AHA	Activity Hazard Analysis
CA	California
CDPH	California Department of Public Health
CEO	California Executive Order
CCR	California Code of Regulations
ALARA	As Low As Reasonably Achievable
CFR	Code of Federal Regulations
CRZ	Contaminant Reduction Zone
CSP	Characterization Survey Plan
CSR	Characterization Survey Report
cm^2	square centimeter
CPR	Cardiopulmonary Resuscitation
CRZ	Contaminant Reduction Zone
DAC	Derived Air Concentration
D&D	decontamination and decommissioning
XXXXX	XXXXX Services, Inc.
E&M	Equipment and Materials
ERLP	XXXXX Richmond Laboratory Project
ES&H	Environmental, Safety and Health
EZ	Exclusion Zone
FSS	Final Status Survey
GFCI	Ground Fault Circuit Interrupter
HEPA	High-Efficiency Particulate Air
HSA	Historical Site Assessment
HSO	Health and Safety Officer
HASP	Health and Safety Plan
IFB	Indistinguishable from Background
LO/TO	Lockout/Tagout
LSA	Low Specific Activity
NAM	Negative Air Machine
OSHA	Occupational Safety and Health Administration
PM	Project Manager
POD	Plan of the Day
PPE	Personal Protective Equipment
RPP	Radiation Protection Program
QA	Quality Assurance
QAP	Quality Assurance Plan
QC	Quality Control
QCM	Quality Control Manager
QMS	Quality Management System
RAWP	Remedial Action Work Plan
RCT	Radiological Control Technician
RSO	Radiation Safety Officer
RWT	Radiation Worker Training
SCO	Surface Contaminated Object

SCP	Site Characterization Plan
SS	Site Superintendent
SZ	Support Zone
TLD	Thermoluminescent Dosimeter
VOC	Volatile Organic Compound
WAC	Waste Acceptance Criteria
WMP	Waste Management Plan

1.0 INTRODUCTION

Perma-Fix Environmental Services, Inc. (Perma-Fix) was contracted by XXXXX Services, Inc. (XXXXX) to perform characterization, remediation, and final status survey of the Property located at 2030 Wright Avenue, Richmond, California (CA) (hereafter referred to as the "Facility"). This task is being completed via a two-phased approach in accordance with guidance from the California Department of Public Health (CDPH) as presented in a letter dated June 24, 2016 (**Appendix A**). Phase I involved performing an historical site assessment (HSA) (Report No. *ERLP-P1-HSA-2016*) and a characterization survey of the Facility (as documented in the Phase II Characterization Survey Report ([CSR], Report No. *ERLP-P2-CSR-2017*) as well as providing a Health and Safety Plan (HASP) (Report No. *ERLP-P1-HASP-01*) and a Waste Management Plan (WMP) (Report No. *ERLP-P1-WMP-001*). Phase II began with the CSR and includes the remediation of radioactive material, which will be performed in accordance with this Remedial Action Work Plan (RAWP). Phase II will also include performing a Final Status Survey (FSS) of the Facility, which will be performed in accordance with a stand-alone FSS Plan. Utilizing the reports referenced above, this RAWP presents the technical approach for safely and efficiently performing the radiological remediation of the Facility.

1.1 Facility Description and Background

The XXXXX Facility has a history that includes the use of radioactive materials dating back to 1954 as summarized in the HSA that was performed as part of the Perma-Fix phased decommissioning approach (Report No. *ERLP-P1-HSA-2016*). While in operation, the Facility received and analyzed samples for radioactivity from many diverse nuclear industries, manufactured radioactive sources, and manufactured radiation detection instrumentation. The Facility was closed for business in 2013. Perma-Fix performed a Facility-wide radiological characterization survey during December 2016 and January 2017.

1.2 Work Scope

This RAWP applies to radioactive material determined to be greater than the indistinguishable-from-background (IFB) clean up criterion within the boundaries of the Facility. The Facility includes a main slab-on-grade two-story office/laboratory building, a smaller slab-on-grade annex building, and the surrounding land areas within boundaries defined by a chain-link fence to the south and west, a masonry wall to the east, and by the sidewalk/roadway of Wright Avenue to the north.

Radioactive material determined to be greater than the IFB clean up criterion includes materials identified as greater than IFB during the Characterization Survey and any additional greater-than-IFB materials identified during Phase II activities (current data gaps include building annex roof, subterranean drain lines, interiors of fume hood exhaust systems, and building sub-structures beneath floor tiles and behind drywall).

1.2.1 Contaminated Surfaces and Systems

Remedial activities will include deactivation, decontamination, removal, packaging and disposition of radiologically impacted equipment, materials, components, systems, and building

surfaces which exceed the established IFB cleanup criterion for the Facility. Radiological materials identified above the cleanup criterion will be segregated, packaged in approved waste containers, and removed from the Facility via transportation and offsite disposal in accordance with this RAWP and the WMP. Above-criterion materials which have been identified at the Facility include the following:

- Fume hoods, including associated exhaust duct work and roof-top systems
- Laboratory cabinets, drawers, counter tops, and shelving units
- Sinks, including drains and traps, and associated piping
- Contaminated areas on floor surfaces
- Contaminated areas on wall surfaces
- Contaminated areas on ceiling surfaces
- Tools and equipment within the building annex shop room

1.2.2 Potentially Contaminated Areas

In addition to the known areas of contamination (which are well defined in the CSR and summarized below on **Table 1** and on **Figures 1** through **3**), it is important to note that due to safety concerns, the characterization survey was designed to be non-destructive. Therefore, the CSR recommends several areas of the buildings where floor, wall, and ceiling surfaces should be removed to investigate the substrate. Additionally, the CSR also recommends further investigation into exhaust systems associated with contaminated fume hoods, drain lines associated with contaminated sinks, the roof of the Annex, and areas of the attic where insulation and exposed utility lines prevented the safe collection of data. This RAWP applies to known areas of contamination and as well as potential areas of contamination.

1.2.3 Exterior Land Areas

The identified materials exceeding the above-criterion were located within specific rooms and systems of the Facility (including the roof); no above-criterion contamination was identified on the exterior grounds of the Facility. However, several drain lines between the building and sewer main are scheduled to be replaced by the City of Richmond. These drain lines are potentially impacted with radioactive material; therefore, coordination with the City of Richmond is required to address these drain lines. The replacement of these drain lines is addressed in this RAWP (however, depending on the City of Richmond's schedule, these drain lines may or may not be addressed contemporaneously with the bulk of remedial activities).

1.2.4 Furniture, Tools, and Equipment

As part of the Characterization Survey, a vast amount of non-fixed items were surveyed, such as office desks, chairs, and filing cabinets (a complete list of surveyed items is available in the CSR). The surveyed items were visibly marked for future identification. Additional items not captured during the characterization survey will be surveyed, documented, and dispositioned in accordance with this RAWP. Items which satisfy the IFB criterion are scheduled to be removed from the facility for transportation and disposal in accordance with this RAWP and the WMP.

Items which are contaminated (e.g., tools) will be decontaminated and/or added to the radioactive waste stream for offsite disposal in accordance with this RAWP and the WMP.

1.2.5 Non-Radiological Hazards

In regards to non-radiological hazards, the Facility is known to have asbestos-containing-material (ACM) and is suspected of having lead-based paint on various surfaces. These items will be addressed in this RAWP as required to support remediation (i.e., Facility-wide asbestos abatement is beyond the scope of this RAWP; only radioactively-contaminated ACM will be addressed).

A small amount of safely-contained mercury, and some lead sheeting were also found at the Facility and will be disposed in accordance with this RAWP at the discretion of XXXXX.

1.3 Areas of Concern

Table 1 provides a summary of the characterization findings and indicates areas of concern at the Facility. **Figures 1-1** through **1-3** summarize the areas of concern for radioactive contamination at the Facility (note that no figure was required for exterior ground surfaces because, with the exception of the potentially impacted drain lines, the grounds were found to be non-impacted. The potentially impacted drain lines are addressed in **Section 3.5**). **Appendix B** includes larger figures along with supporting photographs.

Table 1: Summary of Areas of Concern

SU ID	Location	Survey Unit Status			Notes
		Ready for FSS	Investigate Further	Remediation Required	
L1	SW Exterior Land	X			No measurements exceed IFB criteria. FSS should include additional measurements in area west of the Annex.
L2	NW Exterior Land	X			No measurements exceed IFB criteria. FSS should include additional measurements in area south of the building.
R1	Hot Lab Roof		X		One Beta measurement slightly exceeded IFB criteria; However, the absolute result is in line with other readings within the survey unit; it is possible that the material background applied is incorrect. Interiors of hood exhaust systems (33, 34, and 35) should be investigated.
R2	Hot Lab Roof			X	Roof itself appears IFB, but some exhaust systems associated with hoods exhibit gross contamination. Interiors of hood exhaust systems (36, 37, and 38) should be investigated.
R3	Intermediate Lab Roof		X		No measurements exceed IFB criteria. Interiors of hood exhaust systems (hoods 39, 40, 41, and 42) should be investigated.
R4	Roof			X	Roof itself appears IFB, but some exhaust systems associated with hoods exhibit gross contamination. Interiors of exhaust systems associated with hoods 15, 18, 27, 30, 31, 32, 43, and 44 should be investigated.
R5	Roof			X	Roof itself appears IFB, but exhaust systems associated with hoods 1, 2, 3, 4, 5, 6 and large walk-in hood (west side of High Bay) exhibit gross contamination..
R6	BA Roof	X			No characterization data collected, but roof believed to be ready for FSS based on HSA. Collect data during remediation phase in case remediation is required.

SU ID	Location	Survey Unit Status			Notes
		Ready for FSS	Investigate Further	Remediation Required	
BA1	Building Annex Floors			X	One small floor area in Sample Control room exceeded criteria. Additionally, tools and equipment within Shop room known to be contaminated.
BA2	Building Annex Walls and Ceiling	X			No measurements exceed IFB criteria.
IL1	Intermediate Lab Area Floor			X	Fume Hood 40, cabinets below Fume Hood 41, Floor areas in Room 122, 123, and 124, and counter top in Room 123 exhibit gross contamination. Flooring surface at Bias Location #16 should be removed to investigate substrate.
IL2	Intermediate Lab Area Lower Walls		X		No measurements exceed IFB criteria. Surfaces are ready for FSS, but sections of drywall and wood should be removed to investigate substrate.
IL3	Intermediate Lab Area Upper Walls and Ceiling		X		No measurements exceed IFB criteria. Surfaces are ready for FSS, but sections of drywall and wood should be removed to investigate substrate.
HL1	Hot Lab Floor (Room 119 & 120)			X	Gross contamination identified in fume hoods 36, 37, and 38; floor areas in rooms 120 and 121; counters/cabinets in rooms 119 and 120; and the sink in room 119. Sections of flooring should be removed to investigate substrate; subsurface sink drain lines need to be investigated.
HL2	Hot Lab Lower Walls (Room 119 & 120)			X	Gross contamination identified on walls of room 119 and 120. Sections of drywall/wood should be removed to investigate substrate in rooms 119 and 120.
HL3	Hot Lab Upper Walls and Ceiling (Room 119 & 120)			X	Gross contamination identified on upper wall and ceiling in room 121. Sections of ceiling should be removed to investigate substrate in rooms 119, 120, and 121.
HL4	Hot Lab Area Floor (Room 118)			X	Gross contamination identified in fume hoods 33, 34, and 35; sinks in rooms 117, 118, and wash room; cabinets in room 118, and shelves in room 117.
HL5	Hot Lab Area Lower Walls (Room 118)			X	Gross contamination identified on walls and in cabinets in room 118. Sections of wall surface should be removed to investigate substrate.
HL6	Hot Lab Area Upper Walls and Ceiling (Room 118)	X			No measurements exceed IFB criteria.
LL1	Low Level Lab Floors			X	Gross contamination identified in fume hoods 15, 18, 27, 30, 31, 32, 43, and 44; in cabinets in room 127; on a shelf in room 126; and on floor in room 127. Rooms 129, 130, 140, and 143 ready for FSS. Recommend investigating Hood 45 further.
LL2	Low Level Lab Lower Walls			X	Gross contamination found on walls in room 126. Remaining rooms appear ready for FSS.
LL3	Low Level Lab Upper Walls and Ceiling			X	Gross contamination found on ceiling in room 127. One spot on ceiling of room 128 should be further investigated as it slightly exceeded beta IFB criterion. Remaining rooms appear ready for FSS.
LO1	Lower (1st floor) Office and Hallway Floors	X			No measurements exceed IFB criteria. FSS needs to account for unique tiles found in rest rooms.
LO2	Lower (1st floor) Office / Hallway Walls and Ceiling	X			No measurements exceed IFB criteria.

SU ID	Location	Survey Unit Status			Notes
		Ready for FSS	Investigate Further	Remediation Required	
RL1	Radiometrics Lab Area Floors		X		One measurement slightly exceeded beta IFB criterion. This measurement should be further investigated as it is on a lunch room counter and is in line with other background measurements (i.e., BRA may not be representative).
RL2	Radiometrics Lab Area Walls and Ceiling	X			No measurements exceed IFB criteria. Slightly elevated gamma measurements attributed to geometry (locations in corners of wall and ceiling) and/or concrete in this section of the building (i.e., BRA may not be representative).
WS1	Western Storage Area Floors		X		One measurement in Room 162 fume hood, and one measurement Room 162 sink slightly exceed beta IFB criterion. The absolute value of these measurements are in line with other background measurements (i.e., BRA may not be representative).
WS2	Western Storage Area Walls and Ceiling	X			No measurements exceed IFB criteria. Slightly elevated gamma measurements attributed to geometry (locations in corners of wall and ceiling) and/or concrete in this section of the building (i.e., BRA may not be representative).
HB1	High Bay Lab Floors	X			No measurements exceed IFB criteria.
HB2	High Bay Lab Walls and Ceiling	X			No measurements exceed IFB criteria.
DO1	Distillation Ops (2nd floor) Area Floors			X	Fume hoods 1, 2, 3, 4, 5, and 6 exhibit small areas of elevated activity. Aside from these fume hoods, no measurements exceed IFB criteria.
DO2	Distillation Ops (2nd floor) Area Walls and Ceiling	X			No measurements exceed IFB criteria.
SO1	Southern Office Area (2nd floor) Floors	X			No measurements exceed IFB criteria.
SO2	Southern Office Area (2nd floor) Walls and Ceilings	X			No measurements exceed IFB criteria.
AO1	Attic and Loft Floors		X		Measurements associated with three ducts slightly exceed beta IFB criterion. The absolute values of the measurements are in line with other background measurements and should be investigated.
AO2	Attic and Loft Walls and Ceilings	X			No measurements exceed IFB criteria.
UO1	Upper (2nd floor) Office Area Floors			X	Gross contamination identified on shelf in room 209, and on floor and duct work in room 210. Aside from these small areas the remainder of the survey unit is ready for FSS.
UO2	Upper (2nd floor) Office Area Walls and Ceilings	X			No measurements exceed IFB criteria.

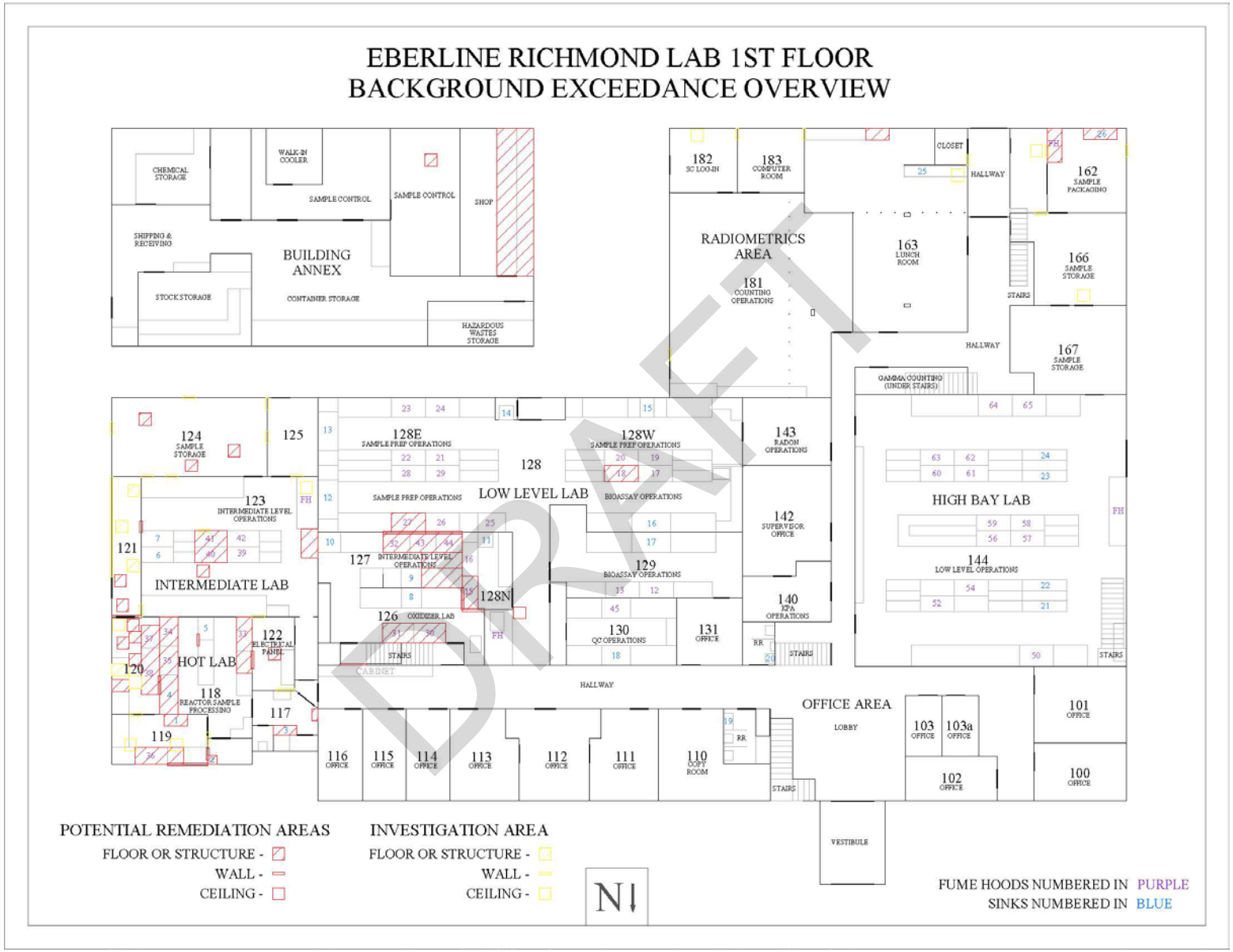

Figure 1: First Floor – Areas of Concern

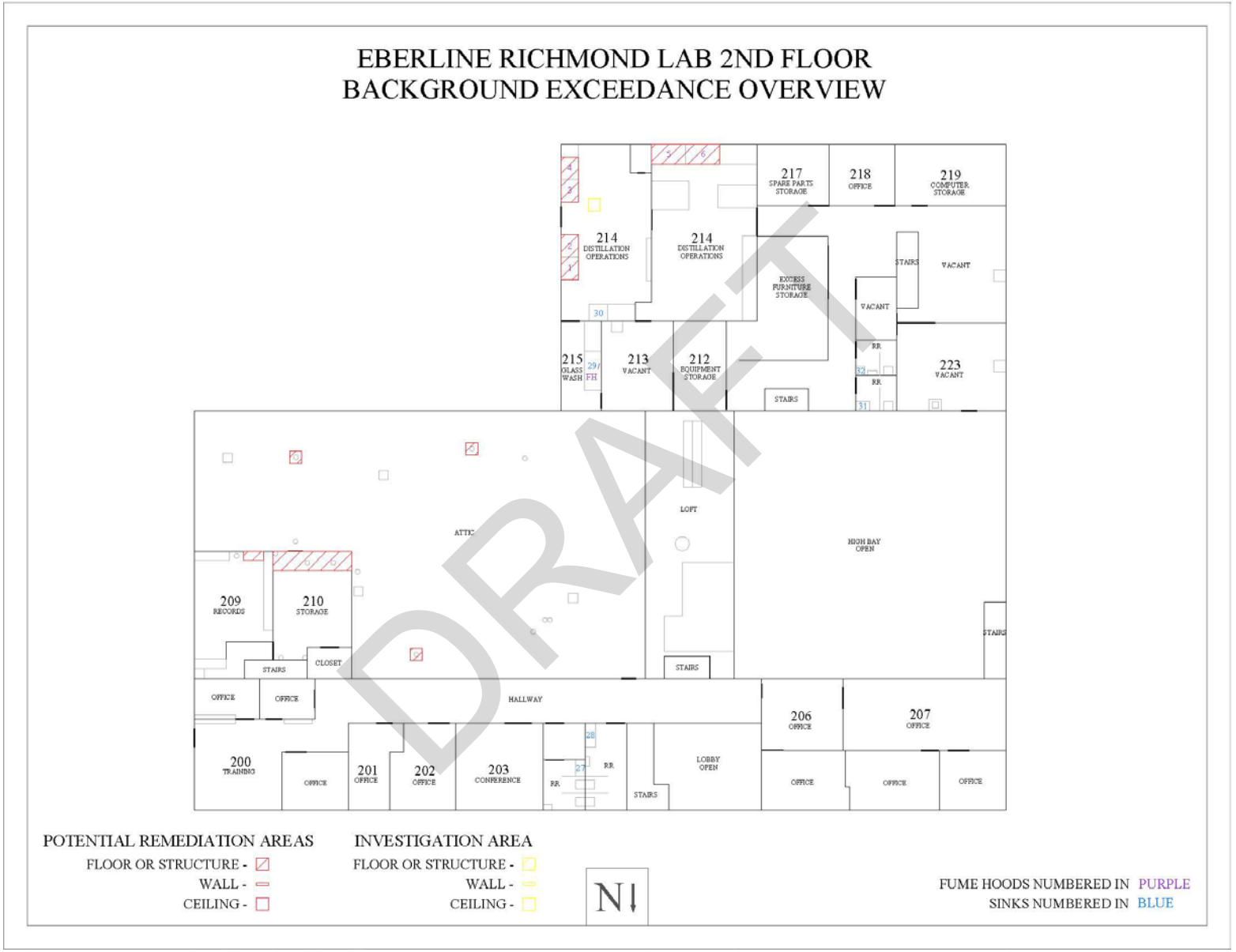

Figure 2: Second Floor – Areas of Concern

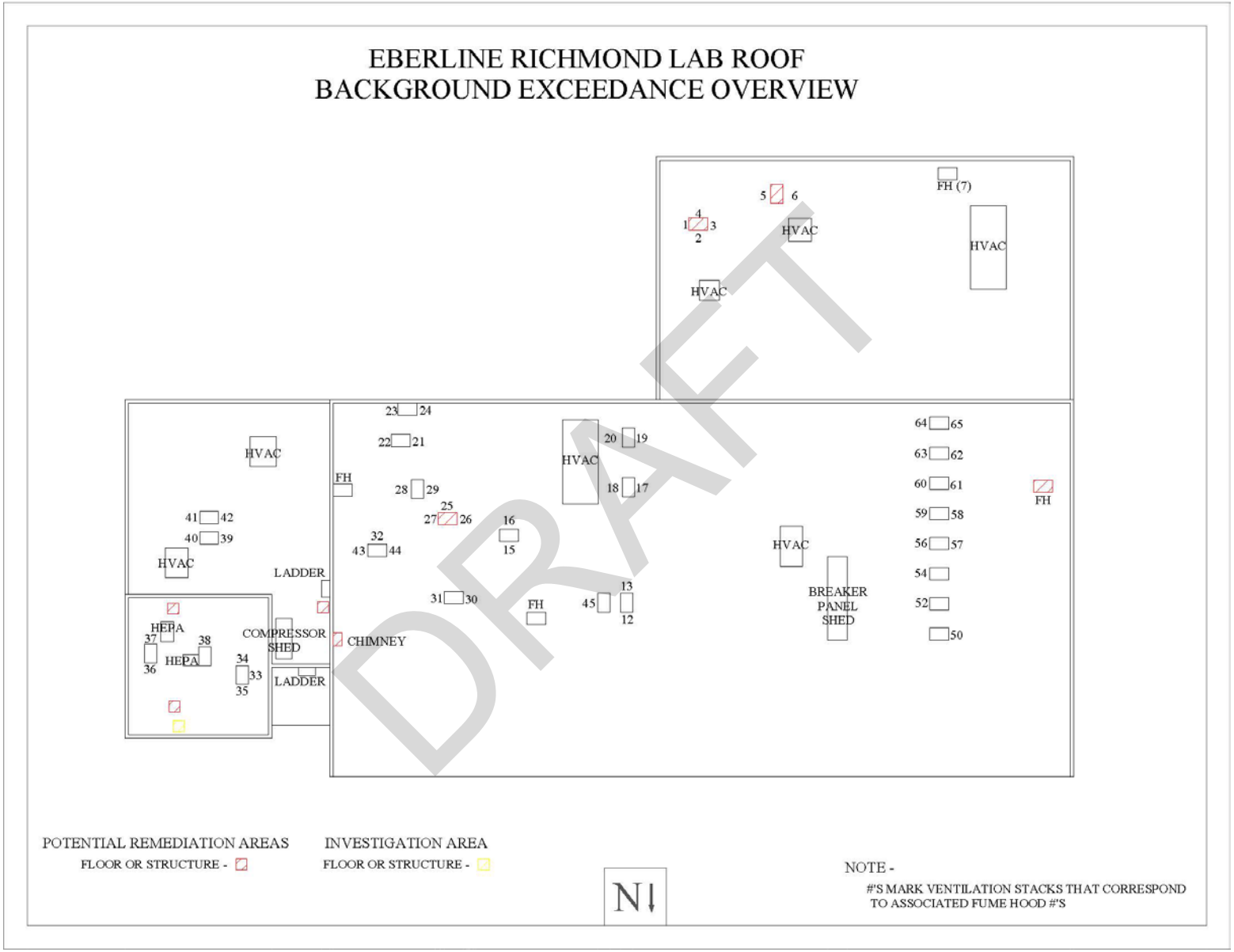

Figure 3: Roof – Areas of Concern

1.4 Key Personnel

Project Manager (PM): The PM is responsible for the overall performance and execution of the project. As the project leader, he will manage the technical and field performance and be the primary point of contact. The PM will have sole responsibility and accountability for the work execution and cost decisions for the contract. The PM is not required to be on-site at all times but will be available full time to XXXXX, CDPH, and project personnel. Additionally, the PM will routinely visit the site during the morning briefings, during inspections, assessments, during critical activities, and as deemed necessary to actively support and monitor field progress. The PM is the only authorized point of contact for interfacing and interacting with non-project related personnel, and any and all outside personnel who inquire about the project should respectfully be directed to communicate with the PM.

Site Superintendent (SS): The SS is responsible for the physical execution of on-site work, to include direct labor and subcontracted work activities and will lead the plan of the day (POD), pre-job briefings, and provide daily safety, quality, and work direction to the work crew(s) and subcontractors. He/she will be the primary point of contact in the absence of the PM.

Radiation Safety Officer (RSO): The RSO is responsible for the implementation of the Radiation Protection Plan (RPP) and the Final Status Survey Plan. The RSO will conduct radiological training for personnel requiring this qualification. The RSO will manage and supervise work involving radiological hazards including waste packaging, shipping and transportation surveys. The RSO or his designee will be on site any time work is ongoing with radiological materials.

Health and Safety Officer (HSO): Responsible for ensuring the environmental and safety/industrial hygiene (IH) controls are implemented and personnel are trained and qualified to perform the assigned work. He performs daily safety audits of on-going work activities and daily safety briefings. The HSO monitors work activities to ensure controls are adequate and maintained. He is also the primary point of contact for emergencies and response actions involving project personnel. The HSO will lead safety topics, discussions, and lessons learned, and ensure accident incident investigations are completed in a timely and compliant manner. Facility access control and accountability is also a primary function of the HSO. Personnel assigned to the project will be cleared through the HSO. Escorted entry for untrained visitors will be facilitated on a case-by-case basis and as needed. Site specific training will be provided and performed by the HSO with the exception of radiological training.

Quality Control Manager (QCM): The QCM is responsible for assisting with quality inspections and participating in the readiness review. The QCM will also ensure the required submittals and project related documents are completed accurately and maintained in accordance with federal, state, local, and corporate policy.

1.3.1 Subcontractors

Subcontractors are expected to be used during remediation as follows:

- To provide abatement of radiologically-contaminated ACM
- To provide fire watch if the Facility's fire suppression system must be deactivated (note that deactivation is not anticipated).
- To provide security if the Facility's alarm system must remain deactivated during off-shift hours (note that overnight deactivation is not anticipated).
- To provide safety inspections of natural gas and electrical systems if those systems are altered during remedial activities.
- To provide general labor support, if necessary.
- To provide heavy equipment operation, if necessary.
- To provide offsite transportation of radiological and non-radiological waste.

All subcontractors performing work at the Facility will meet State of California requirements for performing their assigned task. Additionally, subcontractors who may potentially handle radioactive material will be given site-specific radiation worker training. Subcontractor flow-down requirements per contract requirements will be incorporated and implemented.

2.0 REGULATORY AND PROJECT REQUIREMENTS

Remedial activities will be performed in accordance with federal, state, local, and Perma-Fix requirements, plans, and/or procedures.

2.1 Regulatory Requirements

Table 2 lists Federal and State regulations applicable to this remedial action.

Table 2: List of Applicable Regulations

Reference	Title
17 CCR 30253	Standards for Protection Against Radiation
8 CCR 1500-1962	Construction Safety Orders
29 CFR 1910.134	Decontamination Enclosure Systems
29 CFR Part 1926	Safety and Health Regulations for Construction
29 CFR Part 1910.1001	Toxic and Hazardous Substances; Asbestos
17 CCR 36050	Lead-Safe Work Practices
49 CFR Subchapter C 17 CCR 30373 CEO D-62-02	Transportation; Hazardous Materials Regulations. Refer to the WMP (Report No. *ERLP-P1-WMP-001*) for a complete list of applicable T&D regulations.
Bay Area Air Quality Management District - Regulation 11 Rule 2	Hazardous Pollutants: Asbestos

CCR denotes California Code of Regulations
CFR denotes Code of Federal Regulations
CEO denotes California Executive Order

2.2 Perma-Fix Requirements

Requirement documents include this RAWP and the following additional plans and procedures:

- Site-specific HASP (**Appendix C**)
- Perma-Fix Corporate ES&H Program Plan (**Appendix D**)
- PF-INS-16: Lock-Out/Tag-Out Program Procedure (**Appendix E**)
- PH-IH-04: Respiratory Protection (**Appendix F**)
- Radiation Protection Program (RPP) (**Appendix G**)
- Site-specific Waste Management Plan (WMP) (**Appendix H**)
- Perma-Fix Corporate Quality Management System Plan (**Appendix I**)

This RAWP incorporates site-specific requirements and, where necessary, provides clear reference to procedures or plans required for execution of work.

2.3 Safety Requirements

Perma-Fix is committed to the establishment and maintenance of safe and healthy work conditions and practices at each job location. The concerted effort of management, and affording the workers the opportunity to contribute, is required to ensure success in this endeavor. Perma-Fix is fully committed to the achievement of ZERO ACCIDENT PERFORMANCE through:

- Worker involvement during all stages of project planning and execution,
- Continual improvement of training for Perma-Fix supervisors and managers in driving the ZERO ACCIDENT PERFORMANCE PHILOSOPHY down to the worker,
- The establishment of clear roles and responsibilities for all levels of project execution.

Compliance with the Site-specific HASP (**Appendix C**) and the Corporate EH&S program (**Appendix D**) and items contained therein is mandatory for Perma-Fix employees on this Project. The responsibility for enforcement of the safety policies is delegated to everyone at the work site. Perma-Fix management has primary responsibility and is accountable for its personnel and sub-subcontractors to establish and enforce the safety procedures and to promote safe working conditions on the project. Following are specific elements that pertain to this project.

Perma-Fix has developed Activity Hazard Analyses (AHAs) (see **Appendix J**), which will be amended from time to time as needed, that describe the process of identifying hazards before commencing work at the site. The analyses will also describe the plans and assign responsibility for hazard prevention or control of identified hazards.

2.4.1 Fire Protection and Prevention

Perma-Fix personnel will ensure the necessary and appropriate precautions to prevent fires are taken. UL-listed portable fire extinguishers shall be provided and identified for work activities. Fire extinguishers shall be placed as required by Occupational Safety and Health Administration (OSHA) in facilities, storage areas, vehicles, and equipment. The HSO will inspect project site fire extinguishers on a monthly basis. Existing fire extinguishers will be left in the Facility and will be included in the inventory and inspection process. The HSO will conduct daily combustible material inspections to ensure materials are properly stored, disposed of, and inventoried. Internal combustion engines shall not be permitted to operate in buildings.

In the event that remedial activities require temporary shutdown of the Facility's fire suppression system, appropriate contingency actions will be taken in accordance with state and local ordinances and building codes and a fire watch will be established. Based on characterization results, shutdown of the fire suppression system is not anticipated for this remedial action.

The Facility does have a second floor fire escape located in southwest corner of the southern building addition; additionally, both areas of the second floor have multiple stairwells that are sufficiently spaced to allow escape from localized fires. A secondary means of egress from the roof of the Facility will be evaluated and established prior to work commencing on the roof. Escape routes will be provided during site-specific training.

2.4.2 Illumination

Adequate illumination intensity shall be provided in active work areas and access ways in accordance with OSHA Standard 29 CFR 1926.56. Permanent or portable ground fault circuit interrupter (GFCI) protection is required in accordance with 29 CFR 1910 and 29 CFR 1926. Temporary lighting fixtures must be connected to a GFCI unless the electrical connections are

different from all other electrical hookups and cannot be mistakenly exchanged. Lights must be equipped with protective, nonconductive covers, and light bulbs in light stringers must be shatterproof. Exposed, empty light sockets or broken bulbs are not permitted. Burned-out bulbs should be replaced as identified. Portable lighting used in wet or in other conductive locations shall be operated at 12-volts or less.

2.4.3 Spill Prevention, Control, and Countermeasures

Spill prevention will primarily be achieved through the minimization of any contaminated liquid handling. The only identified potential for contaminated liquids at the Facility are rainwater accumulated in contaminated exhaust systems and tap water accumulated in sink traps. Liquid transfer and collection shall be performed within a contained area, so the potential for environmental releases is minimized. Containers shall be properly labeled and maintained in a designated storage area until disposition. The small amount of anticipated liquid waste that is generated during decontamination and decommissioning (D&D) activities will be solidified via absorbent material and disposed of as solid waste. Spill kits will be placed in the area where any liquid handling is being performed. Any spillage shall be immediately reported to the HSO. The source of the spill shall be secured, spills shall be contained from further migration, and trained personnel with appropriate personal protective equipment (PPE) shall either absorb or clean the spill using appropriate decontamination methods. Material and/or equipment that cannot be decontaminated will be properly stored in approved containers.

The SS shall perform daily leak inspections of equipment and material affected by D&D activities. These inspections should be documented in the SS's logbook and/or equipment inspection checklist and any significant findings shall be reported to the HSO and PM. If a leak is found, the equipment shall be placed in a safe condition, absorbent material shall be placed under the equipment, and the leak shall be repaired, if possible. If the leak cannot be adequately repaired, the equipment shall be removed from the site as soon as possible. The equipment shall not be used again until the SS can verify that the leak has been adequately fixed. If the leak resulted in any spilled material, the PM shall be notified immediately.

Decontamination of equipment or materials utilizing liquids and/or solutions shall be performed over a decontamination pad constructed of impermeable material with a bermed perimeter, minimizing the potential for any release of liquids or contaminants.

2.4.4 Lock-Out/Tag-Out

Natural gas and electrical supplies lines run throughout the Facility and are components of many Fume hoods scheduled for remediation. Prior to performing intrusive work in an area of the facility, lock-out / tag-out procedure PF-INS-16 must be implemented for both electrical systems and natural gas systems (for natural gas, it is recommended that the local utility company be involved [see below]). Following completion of remedial activities the lock-out/tag-out may only be removed after a safety inspection of any system impacted by remedial activities determines that the integrity of the system is intact. Verification of utility safety, especially for natural gas

systems, should involve the assistance of the local utility company (Pacific Gas & Electric: 510-231-2939).

2.4.5 Air Monitoring and Respiratory Protection

General work area and/or breathing zone air sampling for gross alpha/gross beta activity will be performed during demolition activities in accordance with the Radiation Protection Plan (Procedures RP-107 and RP-110 [**Appendix G**]). Derived Air Concentration (DAC) values should be based on the most limiting alpha and beta emitter (smear samples collected during the characterization survey indicated Cs-137 and Sr-90 as the most prevalent beta emitters and Am-241 and Ra-226 as the most prevalent alpha emitters).

Respiratory protection is not anticipated to be required during the remedial action based on the implementation of remediation methods which will reduce and/or eliminate the potential for airborne contamination and the magnitude of the risk (i.e., the activity levels are relatively low and the extents of contamination are relatively small). However, the need for respiratory protection will be evaluated for each task by the HSO and/or the RSO and air monitoring results will be evaluated daily. If it is determined that respiratory protection is warranted (e.g., if there is a potential to exceed 10% of a DAC value), then it will be implemented in accordance with procedure PH-IH-04.

The HSO and/or the RSO will determine when respiratory protection is required. Site personnel required to use respiratory protection devices will have received equipment-specific training and satisfactorily completed a qualitative fit test for the model to be worn, in accordance with 29 CFR 1910.134. This training covers the use, limitations, inspection, maintenance, and cleaning of respiratory protection devices required for use under the conditions of the HASP. Site remediation personnel will also have an up-to-date medical clearance to qualify for work requiring respiratory protection.

2.4.6 Personal Protective Equipment

The use of PPE shall be commensurate with the level of hazard as detailed in the HASP (**Appendix C**) and the task-specific AHAs (**Appendix J**).

PPE will be provided, used, and maintained in a sanitary and reliable condition on-site in accordance with 29 CFR 1910, Subpart I. PPE will be of design, construction, and materials suitable to protect workers against known or anticipated hazards. PPE will be selected which properly and appropriately fits the employee. Site personnel will be provided with training on the selection, use, and limitations of PPE in accordance with the above-referenced standard. Any concerns regarding the use of appropriate PPE will be brought to the attention of the HSO and PM.

2.4.7 Working from Heights

Workers who could potentially be exposed to fall hazards will receive training in accordance with 29 CFR 1926.503. To the extent practical, employees shall remain a minimum of 6 feet from roof edges. Otherwise, temporary guide rails and/or the use of fall restraint systems will be

implemented. Work from scissor lifts and or boom lifts will require adherence to the applicable safety standards.

2.4.8 Stop Work Authority

All workers have the authority to stop work if conditions are unsafe. A stop work order should immediately be reported to project management, who has the responsibility to evaluate conditions and modify protocols and/or equipment if necessary to ensure safety. Following a stop work order, work shall not resume without HSO authorization.

3.0 PROJECT PHASES

The project will consist of several identifiable phases of work as detailed in the following sections. The general planning items addressed include:

1. Plan preparation including developing RAWP and AHA's
2. Means and methods to perform remedial activities
3. Mobilization & site setup
4. Utility isolation and verification
5. Establish temporary power (i.e., lighting, HEPA vacuums, and instruments)
6. Area setup and preparations for intrusive work activities
7. Removal of non-fixed equipment, materials, and furniture to reduce hazards and perform hazardous controls
8. Utilize proven remedial strategies for decontamination including; HEPA vacuum, wet-wipe, localized and point-source ventilation, stabilization, PPE, monitoring,
9. Sequence and work flow
10. Work your way into and out of your highest hazard areas.
11. Top-down decontamination strategies (roof to the floor).
12. No cutting or welding - use nibblers, band saws, and reciprocating saws.
13. Stabilization for removal activities

3.1 Pre-Mobilization

3.1.1 Readiness Assessment

Prior to mobilization, an internal review of final project plans will be conducted to ensure they reflect site conditions, are complete, and adequately address Environmental Safety and Health, Quality Control/Quality Assurance, and Radiation Protection. The selection of the field team will also be reviewed to ensure personnel have the required skill and experience for their assigned task. The PM will schedule the review and coordinate any recovery activities emanating from the review.

3.1.2 Medical Screening and Training

Perma-Fix and its subcontractors will utilize personnel who have been medically screened and whose physicals are current. Project workers will comply with company testing policies for drug and alcohol screening. Personnel assigned to or regularly entering the work site will have received the required minimum hazardous waste site training required in 29 CFR 1910.120(e). Other specific training will be implemented as required by applicable sections of 29 CFR 1910 and 1926 will be performed prior to commencement of the applicable project work activities. Specifics of radiation worker training (RWT) are discussed further in this section.

At least two on-site workers will have current certification in first aid and cardiopulmonary resuscitation (CPR). The training will be equivalent to that provided by the American Red Cross.

These individuals will be on-site while active field mobilization, surveys/sampling, and site restoration are in progress.

Site-specific health and safety training will be conducted prior to mobilization, if possible (as for Perma-Fix personnel), otherwise training (for subcontractors) will be given upon mobilization to the Site and prior to work activities. The HSO and/or RSO will review the HASP, project plans, and other associated responsibilities with the field personnel, including subcontractors, and afford them the opportunity to ask questions. A record of this training will be maintained by the HSO.

In conjunction with site-specific training, Perma-Fix and subcontractor personnel will complete a HSE Orientation to include, as a minimum:

- PermaFix's ES&H philosophy,
- Project and company ES&H rules,
- Site-specific ES&H rules and procedures,
- Location and availability of first aid and medical facilities,
- Method of reporting incidents, and
- Emergency procedure and muster points.

Project personnel will also undergo Radiation Worker Training (RWT) commensurate with the anticipated radiological hazards. The RWT will consist of classroom lecture and a practical factors review covering the following topics at a minimum:

- Radiation fundamentals,
- Biological effects of radiation,
- As low as reasonably achievable (ALARA) and dose limits,
- Personnel monitoring programs,
- Prenatal exposure risks,
- Radiological postings and limits,
- Contamination control,
- Thermoluminescent dosimeters (TLDs), and
- Radiological emergencies.

RWT will be performed in accordance with RPP procedure RP-115. RWT training will be conducted on-site for employees and subcontractors. Workers who can provide prior evidence of RWT from a similar project (within the past 2 years) will not be required to attend RWT. Workers whose primary function is radiation protection and who have been actively employed as radiation protection technicians and/or radiation control technicians are exempt for RWT training in accordance with RP-115.

Note that the characterization survey did not identify external radiation hazards that would create a potential for delivering doses approaching 10% of the applicable limit; therefore, TLDs are not a pre-requisite for site workers. The external radiation hazards will continually be evaluated during work activities and if conditions change which create a potential for delivering doses

approaching 10% of the applicable limit, work will be stopped and TLDs will be issued prior to resuming work activities.

In regards to asbestos, the demolition subcontractor is expected to provide a trained and qualified supervisor and appropriately trained asbestos workers certified in the State of California. The subcontractor will train other project personnel as required to support implementation of associated safety disciplines (e.g., radiation protection).

3.2 Mobilization and Site Setup

Mobilization includes movement of personnel, equipment, and materials onto the site; establishing an administration function/presence; setting up material storage and controlled areas; and conducting any required training which was not completed during pre-mobilization.

The names and telephone numbers for key personnel will be posted in a conspicuous area of the site and will be available to site workers. Additionally, information will be conspicuously posted as required by the applicable D&D License (or reciprocal license) conditions.

3.2.1 Mobilization of Equipment and Materials

Equipment and materials mobilized to the site will undergo a receipt inspection baseline contamination survey consisting of direct scans, statics, and smear samples. No equipment or materials are expected to be brought to the site which pose a risk of being contaminated, but if items are discovered to have radioactivity in excess of site release criteria (i.e., above background), they will be rejected.

3.2.2 Site Setup

A command center will be set up within the facility in a non-impacted office section of the facility. The command center will serve as a break area and as our base of operations where daily Plan of the Day (POD) meetings will be held. A separate office in the same immediate area will be used as the radiological counting laboratory where smears and air samples will be screened on-site using table top sample counters such as the Ludlum Model 3030 or equivalent. In addition to the sample counting area, radiological and IH instruments and calibration check sources will also be stored in this area. Waste containers and other equipment will be staged in a secure area of the facility. The facility will be secured when not occupied or in use. Specifically, facility doors and other accessible entry points will be locked and the facility's alarm system will be activated at the end of the work day during. A security guard will be present during off-shift hours if the alarm system is deactivated. Small tools, portable equipment, and other support items will be stored within the facility or outdoors utilizing secure gang boxes or the equivalent, as appropriate. Heavy equipment will be locked or otherwise rendered inoperable at the end of the work day.

A first aid center will be provided and identified to site personnel. This center will be maintained and operated by the HSO to address immediate first aid type evaluation or treatments. Only trained and qualified personnel shall utilize the center.

Waste containers will be stored in a secured area of the site, either inside the building or in an on-site temporary secured fencing area.

Site personnel will have designated parking areas for personal and company vehicles. The primary parking lot is in the front of the building; overflow parking is in the rear of the building. Personnel must observe normal traffic laws and drive responsibly on site.

3.2.3 Site Security

Site security and management of personnel is an important factor which will be managed to account for personnel and equipment/facilities. Project Personnel will be required to wear high visibility vests for safety and as a means for easily identifying protect personnel. Personnel who enter and exit the building (including the backyard) will be required to sign in at the main lobby desk such that the locations of personnel are known. The PM will have the responsibility of ensuring workers are accountable. During adverse weather conditions or other external influences (e.g., active shooter, vehicle accidents), personnel will stay inside the facility. If an evacuation is required (due to a fire or an earthquake for example), **Appendix K** shows the routes for exiting the facility and the assembly points for personnel.

The area has a reputation for cars being broken into; workers will be advised to lock car doors and more importantly, leave nothing of value inside their vehicles. Work is expected to be completed during daylight hours; however, any after-hours work will require the implementation of the buddy-system.

Workers shall ensure they represent themselves and perform all work activities in a professional manner. Communications with non-project personnel (local residents, news media, company and vendor representatives, etc.) will be conducted by the PM. If approached or questioned, workers shall respectfully and kindly direct them to the PM without further comment.

3.3 Site Characterization Plan

3.3.1 Establishing Baseline Conditions

Baseline conditions were established during the Facility-wide characterization survey. However, due to the definition of the IFB cleanup criteria and its uniqueness to the specific meters used, Perma-Fix will collect reference background area data prior to the start of remedial activities; this will ensure that background reference area data are not impacted by potential cross contamination during remediation, and that meters used to support remedial efforts have a well-defined set of criteria (refer to **Appendix B** for proposed locations of background reference areas). Additionally, data gaps on the building annex roof and in the main building attic will be

addressed to ensure that any contamination requiring remediation is identified while crews and equipment necessary to perform remediation are on-site.

Historical asbestos surveys will be reviewed, if available, and evaluated to determine if additional asbestos surveys are required. This review should be performed prior to mobilization, if possible.

3.3.2 Characterization Surveys

As noted above, radiological characterization of the Facility has been recently performed. Any additional characterization for radiation, if required, shall be performed in accordance with the approved Characterization Survey Plan (CSP) (Document No. *ERLP-P1-CSP-2016*). Aside from the above mentioned data gaps that may be addressed prior to the commencement of remedial activities, there were several localized areas for which the CSR recommends further investigation (areas where gross gamma activity exceeded the investigation level, and areas where gross beta activity exceedances are questionable). Some characterization activities will need to be performed during or after remediation (e.g., sink drain lines, exhaust systems, beneath floor coverings and behind wall coverings); characterization of these systems and structures will also be performed in accordance with the CSP.

Asbestos surveys will be performed only if historical survey information is incomplete or insufficient for use. Asbestos surveys will be performed by the licensed asbestos subcontractor. Asbestos surveys will be performed in coordination with radiation protection personnel to ensure safety. When possible, clean areas of the facility will used to collect asbestos data (since no wide-spread contamination exists, each room contains clean areas of potential ACM).

3.4 Contaminated Equipment Removal

Once characterization has been completed, Perma-Fix will commence with contaminated equipment removal activities. At this point, the specific areas of the Facility will have required utilities safely isolated in accordance with Lock-out/Tag-out Procedure PF-INS-16. Temporary power will be from a source either inside the building or outside the building depending on the location and the extent of system isolation. Individual systems/process lines will be mechanically and electrically de-energized prior to destructive access and removal of components/lines involved. Perma-Fix will verify isolation and ensure the systems are isolated, vented, drained, and de-energized. Work zones will be established as described below. Indoor facility floor drains will be plugged to prevent materials from entering and migrating to unwanted locations. If radiological postings are required during the equipment removal activities, areas will be posted and controlled in accordance with the requirements of 17 CCR.

3.4.1 Work Zones

Site work zones with definitive boundaries will be established to prevent or minimize exposure to project hazards and reduce the potential for migration of contaminants from contaminated areas. Three primary work zones will be established and maintained. These zones will be identified during safety briefings and will be clearly marked with safety tape or equivalent. The three zones will be designated as the Support Zone (SZ), the Contaminant Reduction Zone (CRZ), and the Exclusion Zone (EZ) as discussed below.

Support Zone. The SZ is the uncontaminated (clean) area where personnel can freely access the area with limited PPE. Inside the SZ, the following resources will be available: an effective means of communication, first-aid supplies, fire extinguisher, drinking water, and other required support equipment.

Contaminant Reduction Zone. The CRZ is the area between the contaminated area and the clean area, where equipment and personnel are decontaminated after leaving the EZ. The CRZ will be where gross decontamination of equipment is performed and where personnel will remove and/or decontaminate PPE. The CRZ may contain personnel and equipment decontamination areas; waste containers for liquids, solids, and PPE; first-aid supplies; an eyewash/emergency shower; and a fire extinguisher – depending on overall location configuration and hazards.

Exclusion Zone. The EZ includes the areas to be opened or cut that provide a potential exposure pathway for contamination. The EZ will be established and approved by the Perma-Fix ESH&Q Manager and RSO, or their designees, prior to any intrusive activities. The area will be clearly marked with safety tape or other barriers to limit access.

3.4.2 Electrical and Mechanical Isolation

Identified electrical/mechanical isolations that may be needed include:

- Natural Gas,
- Exhaust system(s),
- Blowers/fans,
- Electrical lockout/tagout (LO/TO) for power,
- Telephone lines,
- Water supply cutoff,
- Sewer line isolation, and
- Fire suppression.

Perma-Fix will review blue prints and physically trace system lines to the extent practical to identify all isolation points. Natural gas lines will be vented following isolation. Electrical and natural gas lines will be tested to ensure isolation prior to demolition activities (coordination with Pacific Gas & Electric is recommended).

3.4.3 Fume Hoods, Ductwork, and Filter Houses Removal

During segmentation and removals Perma-Fix will conduct in-process characterization, checking the radiation levels with survey meters at selected points on the item exterior and at the cut points (through the plastic packaging) to confirm the inventory on a piece by piece basis. This characterization process will allow us to categorize waste (e.g., as SCO1 or SCO2, LSA1, etc.). This information, along with the process knowledge and radiological characterization on a unit-by-unit and item-by-item basis, will follow that item to its waste container, thus assuring a complete and traceable container inventory to support waste disposition requirements. Note that the duct work associated between a contaminated fume hood and a HEPA filtration unit will be removed.

3.4.4 Establish Containment and Encapsulate Ductwork, Hoods, Blowers, and Segmentation

While it is expected that contamination levels will be easily manageable, there are several engineering controls that may be utilized to enhance containment and encapsulate ductwork and associated equipment/material:

- Utilize glove bags around cut areas;
- Fog cut locations and ductwork with a glycerin/water mixture;
- Foam ductwork or equipment (e.g., Great Stuff ™);
- Create a containment "tent" and/or provide area negative pressure using a HEPA vacuum;
- Have localized negative pressure using a HEPA vacuum;
- Place plastic on floor and locations that may become contaminated during removal process;
- Seal open ends and cut locations prior to removal from CRZ; and
- Other methods that may be used upon approval of the RSO, or designee.

Where possible, the radiological control technicians (RCTs) will perform surveys of ducting prior to cutting operations (e.g., at locations where items can be disassembled at flanges). This will enable the HSO and RSO to determine if the controls are to remain as planned or should be upgraded or downgraded. The removal of equipment and material will be done to ensure radiological materials and items posing safety hazards are removed.

Our approach for removing equipment will be to disassemble by item. Our segmentation approach is based on using super-sacks as our primary form of waste packaging. Larger containers may be used to allow for minimize cutting and the potential for contamination migration based principally on our need to handle and maneuver the waste items in the work areas.

Based on the contamination levels, plastic sheeting may be used to provide secondary containment for cutting activities. Cutting or disassembly areas will be immediately decontaminated after cutting work is completed.

3.4.5 Transfer to Appropriate Staging Area

Waste transfer will typically commence immediately upon removal. After the RCT has determined that the external surface of an item is not contaminated, the item will be transferred to the waste staging area.

3.5 Remedial Action Areas

Prior to understanding the full flow-through of the remedial sequence, areas identified for further investigation in the CSR and in **Section 1.3** of this RAWP. The basic sequence is discussed below for areas of known contamination; any additional areas identified through further investigation will be addressed as practical and as logical within the established sequence.

Perma-Fix personnel have developed a technical approach for the deactivation and decontamination activities. The first step will be to start with the removal or decontamination of equipment or materials that is in the Annex tool room and sample storage room first. This will allow for storage space for equipment and materials, to include PPE supplies, and D&D equipment and materials (E&M). The next area would be the roof of the Laboratory to include removal of ductwork, HEPA filters, and any roofing material identified as above release criteria. From this point, work would flow through the hoods in the Distillation Operations room 214 and then into Sample storage room 124 and Low Level Lab. This area would include the removal of an isolated contamination source on the floor and one counter top on the west side of the room.

The areas identified during the characterization with the largest amount of contamination are the Hot Lab, the Intermediate Lab, and the Oxidizer Lab. These rooms will also require radiological control containments be created to control the potential migration of any contamination during intrusive decontamination activities. Size reduction and removal of any large pieces of equipment will be performed, including: 2 each Packard model 307 sample oxidizers and 5 hoods in rooms 126 and 127. Rooms 126 and 127 will also need remedial activities performed on floor surfaces, sink removal, and isolated counter top and drawer removal. The Hot Lab and the associated rooms, 118, 119, and 120, will require very similar remediation activities, such as the removal of fume hoods, counter tops, drawers, sinks, sink traps, and hot spot removal of wall surfaces. Using proven decontamination methodologies of working our way from the top down, at the point when fume hoods, ducting, wall surfaces, drawers, counter tops and sinks are fully remediated, the removal of the concrete around the drain lines, post utility location, isolation and deactivation will commence. This process is detailed in the pipe removal section.

In regards to asbestos, areas of the Facility scheduled for radiological remediation which also require asbestos safe guards will be remediated last in sequence and through a cooperative effort with the license asbestos subcontractor. ACM will be segregated into its own waste stream to ensure proper disposal in accordance with this RAWP and the WMP.

3.5.1 Annex Tool Room

The Characterization surveys have identified removable and fixed contamination on flooring surfaces and miscellaneous tools and equipment (e.g., large bench mounted drill press, a bench

mounted vise, and concrete flooring). The rooms in the Annex will not require utility isolation or deactivation prior to performing any decontamination work activities. Remediation for the floor surfaces may be performed using concrete scabbling equipment equipped with HEPA ventilation. The miscellaneous tools and equipment located in the annex tool room will be decontaminated using a wipe method or disposed of in accordance with the Waste Management Plan (WMP).

3.5.2 Annex Sample Control Floor

The floor in the sample storage room of the Annex has an area of approximately 2'x 2' that is impacted with removable and fixed contamination. This room will not require utility isolation or deactivation prior to performing decontamination work activities. Remediation for the floor surface may be performed using concrete scabbling equipment equipped with HEPA ventilation.

3.5.3 Roof

The roof of the facility will require removal of the HEPA filters, and characterization of the filtration units (two each) located above the Hot Lab. This process will include the use of glovebags as our primary containment during filter removal, with the use of additional engineering controls as deemed appropriate. Upon removal and packaging of the filters, direct readings and smear samples will be taken in both upstream and downstream directions. The HEPA filtration units will be surveyed and released or disposed as appropriate. The upstream duct is presumably contaminated and will be removed.

Due to process knowledge and accessibly issues to properly characterize the ductwork, duct will have to be removed where contamination has been identified within that system. When ductwork is removed, any penetrations (e.g., holes, breaches, vents, covers) will be covered. There is a potential for roof surface removal above the hot lab, which will require the application of a fixative and removing and packaging any radiologically impacted waste. The newly exposed roof surface will be covered with a tarp or other effective means to ensure there is no migration of water into the rest of the building through the roof.

3.5.4 Distillation Operations Room 214

The Distillation operations room (room 214) contains six hoods having contamination levels exceeding the release criteria. This area of the hood will be removed using basic hand tools and packaged in an approved waste container for shipment in accordance with the WMP.

3.5.5 Low-Level Lab/Oxidizer Lab

Due to the levels of both fixed contamination and removable contamination present in the Intermediate and Oxidizer labs, these rooms will be sealed off using poly sheeting, spray glue and duct tape. These containments will be adequately ventilated using approved HEPA filtered, Negative Air Machines. Once the room is sealed, we will begin stabilizing any loose contaminants. These rooms will require any potential sources of energy be locked and tagged out (LOTO), and verified to be de-energized. Following the LOTO, contaminated process equipment will be removed and size reduced, as necessary, for packaging. The next remedial activity will be the size reduction, packaging and removal of the five fume hoods located in both conjoined rooms. This activity will expose surfaces which had not been previously accessed and

which had not yet been fully characterized. Following this supplemental characterization, newly discovered radiologically contaminated areas will need to be decontaminated. Next, the contaminated areas of counter tops and drawer surfaces will be removed and size reduced. Utilizing proven decontamination methodologies of working from the top down, removal of the impacted flooring can commence. After sections of wall and floor are removed, characterization of the sub-structures will be performed and any contamination will be remediated even it additional cover materials must be removed. This zone will remain sealed until the final activities of pipe removal are completed.

3.5.6 Hot Lab

Due to the levels of both fixed contamination and removable contamination present in the Hot labs, the room will be sealed using poly sheeting, spray glue and duct tape. Containment will be adequately ventilated using approved HEPA filtered, negative-pressure air machines. Once the room is sealed, loose contaminants will be stabilized. These rooms will require any potential sources of energy be locked and tagged out and verified to be deenergized. Contaminated process equipment will be removed and size reduced if necessary for shipment. The next remedial activity will include the size reduction, packaging and removal of the fume hoods located in both conjoined rooms. This activity will expose surfaces that are now available for survey. After survey, areas of loose contamination will be stabilized if discovered. Next, the counter tops and drawer surfaces will be removed and size reduced. Utilizing proven decontamination methodologies of working from the top down, removal of the impacted flooring can commence. After sections of wall and floor are removed, characterization of the sub-structures will be performed and any contamination will be remediated even it additional cover materials must be removed. This zone will remain sealed until the final activities of pipe removal are completed.

3.5.7 Intermediate Lab/Sample Storage

In the Intermediate Lab room 123, characterization surveys have identified two areas of contamination. One area with fixed contamination was present on the floor of the Lab and will require stabilization and removal using basic hand tools. The area identified on the counter top on the east side of the room has removable contamination. This area will either be decontaminated or removed using mechanical means. The sample storage room (room 124) has several areas of fixed contamination identified on the concrete floors and walls and will require the use of a concrete scabbler with HEPA filtration to remove. There was also a counter top not affixed to the structure present in the room with a sink. This component will be size reduced and packaged for waste shipment in accordance to the WMP.

3.5.8 Records Room 209 and Storage Room 210

In room 209 (the records room), there was one spot identified on a wooden shelf that has very high levels of both removable and fixed contamination. A fixative to the shelf may be applied and mechanical means will be used to cut the contaminated section out. After careful removal of the contaminated wood, it will be packaged in an approved waste shipment container in accordance with the WMP.

Storage room 210 contains duct work which transfers air from the room 127 hoods numbered 32, 43, and 44. This duct work and possibly a small floor area beneath each duct has both fixed and removable contamination. Once the duct work is removed, it will be packaged for waste shipment. A fixative will be applied to the contaminated flooring and the flooring will be removed using basic hand tools. Upon removal, the flooring will be packaged in approved waste containers in accordance with the WMP.

3.5.9 Pipe Removal

The characterization report prepared by Perma-Fix identifies areas in room (118,119,120,126,127) in which the sinks and drain traps are showing elevated activity levels which exceed the release criteria. These areas will require remedial activities to include removal of sinks and associated drain traps, as well as, the removal of drain lines below the concrete surface. Prior to the removal of any pipe work, the utilities in this area must be located, isolated and deactivated. These activities will require the use of a utility locator, concrete wet saw, and basic tools. When the concrete cut is made, the piping will be inspected for any breaks, fractures, joint separations or leaks. If any of these conditions are found, the extent of conditions will be determined and documented. If none of these conditions are present, the newly exposed soil area will be surveyed for any elevated radioactivity. The removal of this pipe will require manual hand digging and excavation to ensure areas of the pipe are visible and accessible. A catch system will be placed to ensure that during the cut and removal process, no potentially impacted material is cross contaminated with the newly exposed soil surface area. During the pipe removal process, a gas detection system will be utilized to monitor for VOC's. The removed pipe will be packaged and shipped in accordance with the WMP.

3.6 Equipment and Materials

The following list includes the anticipated equipment and materials needed to complete the remedial action. Additional equipment and/or materials may be necessary.

- Concrete saw
- Pipe and Cable locator device
- Reciprocating saw and band saw
- Electric Metal shear (nibbler)
- Concrete Scabbler with vacuum attachment shrouds
- Concrete Core drill
- Shovels and picks
- Socket set, screw drivers, various hand tools
- Two Negative Air Machines (NAM)
- 6' Ladder/8' ladder
- Spray glue
- Poly sheeting
- Hammer drill/various bits for chipping and drilling
- Fire Extinguishers
- Herculite
- Duct Tape

- Various work gloves (leather/Kevlar)
- Pullman Holt HEPA vacuums
- Face shields
- Various decontamination tools to include wire brushes, scrubbing pads, scrubbing bubbles, simple green and sandpaper.
- Rad Rope and Rad signs
- Rad Bags (48” x 60” and 18” x 24”)
- Super sacks
- Super sack loading frame
- Forklift to move super sacks
- Extension Cords
- GFCI splitters
- Utility knives
- Bag stands (x-racks)
- Radiological PPE (RSO. to determine)
- Jerome Monitor
- MultiRae (4 gas w/PID)
- Pallet jack to move heavy objects
- Respirators

4.0 FINAL STATUS SURVEYS

Once equipment removal is completed in a given laboratory, post remediation surveys will be performed over accessible surfaces to demonstrate that the end state meets the indistinguishable from background criteria**.** The details of the final status survey are provided in the XXXXX Richmond Laboratory Project Final Status Survey Plan (Document No. *ERLP-P2-FSSP-2017*).

5.0 WASTE MANAGEMENT, TRANSPORT, AND DISPOSAL

The general guidelines for waste management, transport, and disposal are provided in the approved WMP (**Appendix H**). Additional details and specification are provided in this section.

5.1 Non-radioactive Waste

Waste that is determined to be indistinguishable from background will be disposed in accordance with the WMP and will be sent to an accepting Region 5 Water Quality Control Board Landfill. **Appendix L** provides a list of potential landfills and their general waste acceptance guidelines. Note that the use of a Class III landfill will require concurrence from the CDPH-Radiologic Health Branch.

5.2 Radioactive Waste

Radioactive waste will be characterized during remediation through sampling and analysis for radionuclides, asbestos, and TCLP contaminants. Based on the results of waste characterization, the following disposal facilities may be used:

- US Ecology – Idaho: US Ecology Idaho is a Title C landfill permitted to accept radioactive waste that meets its Waste Acceptance Criteria (WAC).

Provided XXXXX waste meets the WAC, US Ecology Idaho is the preferred disposal facility. If XXXXX waste does not meet US Ecology's WAC, then one of the following two facilities will be selected based on their WACs and relative costs:

- WCS – Texas: WCS Texas is a licensed low-level radioactive waste/mixed waste facility.
- Energy Solutions – Utah: Energy Solutions Utah is a license Class A waste disposal facility.

Regardless of the selected facility, waste will be handled in accordance with the WMP. Radioactive waste will be packaged and transported to the appropriate facilities for final disposition. Radioactive shipments will have appropriate placarding as required. Pre-transport surveys will consist of smears and exposure rate measurements and evaluated against appropriate regulations. This protocol will ensure compliant shipments are sent and received without incurring undue costs or delays for further re-packaging and transportation.

6.0 RESTORATION

Once an area of the site is beyond impact from further remedial activities and/or FSS, Perma-Fix will commence restoration activities. In general, Facility systems and structures will be inspected to verified/ensure that they are left in a safe and functional state. These activities may include capping roof openings where duct work has been removed, ensuring that natural gas and electrical systems are returned to a safe operational state, capping interior opened drain lines (e.g., sink drains), ensuring that floor drains covered for contamination control are re-opened, and coordinating with the City of Richmond to ensure that the parking lot is repaired following exterior drain line replacement. Note that the installation of new floors, walls, sinks, hoods etc. are beyond the scope of this RAWP. Orphaned natural gas supply lines for removed fume hoods will be left in a secured state.

7.0 DEMOBILIZATION

Demobilization from the site will include final surveys and release of equipment, materials, storage containers, and other remaining project items. A final site walk down and a review of the project completion punch list will be completed with XXXXX and CDPH personnel.

7.1 Records of Completion

At the conclusion of on-site work, Perma-Fix will provide XXXXX and CDPH the necessary documentation to support License termination, including results of the final status survey and certificates of disposal for all regulated waste.

APPENDIX A

CDPH Letter Describing Phased Decommissioning Approach

APPENDIX B

Full-sized Areas-of-Concern Maps

APPENDIX C

Site-Specific Health and Safety Plan

APPENDIX D

Perma-Fix Corporate Environmental Safety and Health Program Plan

APPENDIX E

Perma-Fix Lock-Out / Tag-Out Procedure PF-INS-16

APPENDIX F

Perma-Fix Respiratory Protection Procedure PH-IH-04

APPENDIX G

Radiation Protection Plan Procedures

APPENDIX H

Site-Specific Waste Management Plan

APPENDIX I

Perma-Fix Corporate Quality Management System Plan

APPENDIX J

Activity Hazard Analysis Forms

APPENDIX K

Evacuation Routes and Assembly Points

APPENDIX L

California Water Boards Region 5 Landfill List

Table 1. Radioactive Material Quantity Limits

Nuclide	Chemical Form	Quantity
Any radioactive material subject to NRC licensing, except tritium, source material, special nuclear material, and sealed sources	Any, as potentially contaminated materials	10 Ci
H-3 (tritium)	Any, as potentially contaminated materials	100 Ci
Source Material	Any, as potentially contaminated materials	Not to exceed 10,000 kg
Special Nuclear Material (SNM)	Any, as potentially contaminated materials	350 grams uranium-235, 200 grams Uranium-233, or 200 grams plutonium; or any combination of these provided the sum of the rations of the quantities does not exceed unity

Perma-Fix will track radionuclide quantities in possession for each specific project. Records related to radioactive material inventories will be maintained at the job site during project execution and transferred to the corporate operations office for archival after each project completion. Additionally, records will be available to the NRC electronically upon request.