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NITRIC ACID TANK CAR AND AREA REMOVAL ACTION WORK PLAN AND CLOSURE PLAN INFORMATION AND DATA PACKAGE DRAFT FINAL JANUARY 1993

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FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

Nitric Acid Tank Car and Area Removal Action Work Plan and Closure Plan Information and Data Package

DRAFT FINAL

January 1993

U.S. DEPARTMENT OF ENERGY

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NITRIC ACID TANK CAR AND AREA
Removal Action Work Plan and Closure Plan Information and Data Package

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Fernald Environmental Management Project

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ACRONYMS AND ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
AEA	Atomic Energy Act
ALARA	as low as reasonably achievable
ARAR	applicable or relevant and appropriate requirement
ASL	analytical support level
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
C.F.R.	Code of Federal Regulations
CPID	Closure Plan Information and Data Package
CRU3	CERCLA/RCRA Unit 3
DAC	Derived Air Concentration
DCG	Derived Concentration Guide
DOE	U.S. Department of Energy
DQO	Data Quality Objective
EDE	effective dose equivalent
EPA	U.S. Environmental Protection Agency
Fed. Reg.	Federal Register
FEMP	Fernald Environmental Management Project
FERMCO	Fernald Environmental Restoration Management Corporation
FID	flame ionization detector
FS	feasibility study
HASP	Health and Safety Plan
HWMU	hazardous waste management unit
LEL	lower exposure limit
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NESHAP	National Emission Standards for Hazardous Air Pollutants
NPL	National Priorities List
NRC	Nuclear Regulatory Commission
O.A.C.	Ohio Administrative Code
OEPA	Ohio Environmental Protection Agency
OSHA	Occupational Safety and Health Administration
OU	operable unit
OVA	organic vapor analyzer
PACD	Proposed Amended Consent Decree
PEL	permissible exposure limits
PID	photoionization detector
QA	quality assurance
RAWP	Removal Action Work Plan
RCRA	Resource Conservation and Recovery Act

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ACRONYMS AND ABBREVIATIONS (continued)

RI	remedial investigation
RSE	Removal Site Evaluation
SAP	Sampling and Analysis Plan
SCQ	Site-Wide CERCLA Quality Assurance Project Plan
SOP	Standard Operating Procedure
TCLP	Toxicity Characteristic Leaching Procedure
TLV	Threshold Limit Value
TSD	treatment, storage and disposal
U.S.C.	United States Code
WEMCO	Westinghouse Environmental Management Company of Ohio

EXECUTIVE SUMMARY

The Nitric Acid Tank Car and Area was declared to be a hazardous waste management unit (HWMU) since the discarded nitric acid contained in the Tank Car was stored in excess of 90 days and has the hazardous characteristic of corrosivity (EPA Hazardous Waste No. D002). The Tank Car and Area was included in the list of HWMUs in the RCRA Part A Permit Application submitted to the Ohio Environmental Protection Agency (OEPA) in June 1991 and the RCRA Part B Permit Application submitted in October 1991. In August 1991, the Tank Car and Area was identified as an HWMU in the RCRA compliance schedule submitted pursuant to the Consent Decree negotiated between the state of Ohio and the Department of Energy (DOE) (State of Ohio 1988).

This combined Removal Action Work Plan (RAWP) and Closure Plan Information and Data package (CPID) provides 1) a response to a Removal Site Evaluation (RSE) and DOE letter DOE-667-92, "Proposed Phase III Removal Actions," and 2) the data and information to comply with the provisions required for RCRA closure as specified in applicable RCRA Interim Status Closure requirements (40 C.F.R. Part 265, Subpart G) and the Ohio Administrative Code (O.A.C. 3745-66). Specific actions required to remove all hazardous materials and verify closure of the Nitric Acid Tank Car and Area are identified in this document. As detailed in Section 3.2.2, removal activities will include 1) survey and mark HWMU boundaries, 2) transport the Tank Car to the FEMP Main Tank Farm, 3) remove Tank Car contents, 4) decontaminate and dispose of the Tank Car, 5) collect and analyze soil samples; 6) determine the feasibility of achieving clean closure; and 7) remove soil to achieve clean closure and manage the soil and debris according to the criteria provided in Removal Action No. 17, Improved Storage of Soil and Debris.

Other information has been included in this plan, in addition to that required for closure, to comply with the requirements for a RAWP in accordance with the Amended Consent Agreement. Specifically, Sections 2.5, Removal Action Justification; 3.7, ARARs Analysis; and Attachments 1 through 5, provide the additional information associated with a RAWP. Section 2.5 discusses the basis and justification for a removal action, while Attachment 1 provides the full Removal Site Evaluation. Section 3.7 and Attachment 5 present and discuss the ARARs identified for this response action in

accordance with 40 C.F.R. 300.400[g]. Lastly, Attachments 2, 3, and 4 provide supporting information in the areas of the Analytical Support Levels, Health and Safety Plan, and Quality Assurance Plan respectively.

NITRIC ACID TANK CAR AND AREA
Removal Action Work Plan and
Closure Plan Information and Data Package

1.0 INTRODUCTION

The Nitric Acid Tank Car (identified as the Nitric Acid Tank Car and Area) was declared a hazardous waste management unit (HWMU) since the discarded nitric acid was stored in excess of 90 days and has the hazardous characteristic of corrosivity (EPA Hazardous Waste No. D002). The Tank Car and Area was included in the list of HWMUs in the Resource Conservation and Recovery Act (RCRA) Part A Permit Application submitted to the Ohio Environmental Protection Agency (OEPA) in June 1991 and RCRA Part B Permit Application submitted in October 1991. In August 1991, the Tank Car and Area was identified as an HWMU in the RCRA compliance schedule submitted pursuant to the Consent Decree negotiated between the state of Ohio and the Department of Energy (DOE) (State of Ohio, 1988). The RCRA compliance schedule requires that a Closure Plan Information and Data (CPID) Package be submitted for all newly identified HWMUs. The CPID is intended to provide information necessary to ensure all requirements for RCRA closure are met.

The Nitric Acid Tank Car and its contents are also identified as a removal action in the DOE letter DOE-667-92, "Proposed Phase III Removal Actions" (dated January 14, 1992) submitted to the Environmental Protection Agency (EPA) pursuant to the Amended Consent Agreement (EPA, 1991). Under this proposal, a Removal Action Work Plan (RAWP) must be submitted to the EPA by October 30, 1992. The RAWP is intended to detail the steps necessary to safely remove the Nitric Acid Tank Car and its contents from the Fernald Environmental Management Project (FEMP). The need for a removal action is documented in a removal site evaluation (Attachment 1).

1.1 BACKGROUND

The FEMP was designated a Superfund site and placed on the National Priorities List (NPL) in November 1989. A Consent Agreement was negotiated between DOE and EPA

in April 1990 to amend the provisions of the July 1986 Federal Facilities Compliance Agreement (FFCA). The amendments were necessary to meet the requirements of Section 120 of CERCLA applicable to NPL facilities. The Consent Agreement was further amended in September 1991. A key element of the FFCA and the subsequent Consent Agreements includes grouping the site into five operable units (OUs) for characterization and remediation. In accordance with 40 C.F.R. § 300.415, a number of removal actions have been identified to be implemented before final remediation. The Nitric Acid Tank Car and Area was proposed as a Phase III removal action in the DOE letter DOE-667-92, dated January 14 1992.

The FEMP is located in a rural area of southwestern Ohio, approximately 18 miles northwest of downtown Cincinnati, Ohio. The FEMP site comprises 1,050 acres bounded by State Highway 126 to the north, Willey Road to the south, Paddy's Run Road and the Chesapeake and Ohio Railroad to the west, and a power transmission line right-of-way to the east. Previous production facilities occupy approximately 136 acres in the center of the site. The Nitric Acid Tank Car and Area is located in OU-3 which encompasses the former production area. The Tank Car (No. DODX17135) is currently located on a railway siding in the northeast corner of OU-3 (Attachment 1, Figure 1-1). The Tank Car and that portion of the FEMP site interior track system on which the car currently resides (Attachment 1, Figure 1-2) constitute the HWMU.

When the Feed Materials Production Center (FMPC [now FEMP]) was producing uranium metal, nitric acid (HNO_3) was an important process chemical, and was a primary chemical used in the formation of uranyl nitrate hexahydrate (UNH) solution, subsequently chemically transformed into uranium tetrafluoride. Nitric acid was also used throughout the FMPC production area for acid cleaning and metal pickling operations. From 1975 until 1981 more than 56 million pounds of concentrated (55 to 60 percent) nitric acid had been purchased.

During peak production, Tank Car DODX17135 was used as an efficient means of temporary HNO_3 storage, providing 100,000 pounds of mobile storage capacity. The car was normally kept on a rail siding until either its contents or storage capacity were

needed elsewhere on site; following acid transfers, the car was returned to the siding. The Tank Car has been in its present location, unused, for approximately 6 years.

1.2 PURPOSE

This plan for the Nitric Acid Tank Car and Area is intended to provide data and information to comply with the provisions required for RCRA closure as specified in applicable RCRA Interim Status Closure requirements (40 C.F.R Part 265, Subpart G) and the Ohio Administrative Code (O.A.C 3745-66). These require owners and operators of hazardous waste treatment, storage, and disposal (TSD) facilities to submit a written closure plan to OEPA and EPA. Specific actions required to remove all hazardous materials and verify closure of the Nitric Acid Tank Car and Area are identified in this document. Other information is included, in addition to that required for closure (Sections 2.5, 3.7 and Attachments 1 through 5) to comply with the requirements for a RAWP in accordance with the Amended Consent Agreement.

1.3 EXCLUSIONS

1.3.1 Mixed Radioactive and Hazardous Wastes

The Nitric Acid Tank Car and its contents will be managed as mixed low level waste. Analysis of the Tank Car's contents has revealed that the contents are a hazardous waste due to the characteristic of corrosivity and concentrations of chromium in excess of the TCLP toxicity level, and a radioactive waste due to low levels of uranium.

The EPA and DOE jointly regulate mixed waste. The hazardous component of the waste is regulated under RCRA and the radioactive component of the waste is regulated under the AEA. The radioactive portion of mixed waste is exempt from RCRA regulation. Nevertheless, the hazardous waste component must be managed in accordance with RCRA. Therefore, prior to treatment, the Tank Car and its contents will be managed in accordance with RCRA regulations and DOE Orders.

1.3.2 CERCLA Remedial and Removal Action Requirements for FEMP RCRA Closures

On July 18, 1986, the EPA and the DOE entered into the FFCA that provides for the continuation and establishment of environmental programs to assure compliance with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), RCRA, the Clean Water Act, and Clean Air Act. In September 1991, the DOE and EPA negotiated an Amended Consent Agreement. Section IX.F.2 of the Amended Consent Agreement requires the DOE to submit a RAWP to support Phase II Removal Actions. The removal of the Nitric Acid Tank Car and its contents was identified in DOE letter DOE-667-92, "Proposed Phase III Removal Actions," dated January 14, 1992.

Because the Nitric Acid Tank Car has been determined to pose a potential threat of releasing hazardous constituents to the environment, CERCLA § 106 requires that an appropriate response action be taken. The Consent Agreement and CERCLA Regulations, 40 C.F.R. Part 300, establish the framework for determining the necessity for and development of removal actions at the FEMP. This plan satisfies the requirements for a RAWP and provides the information necessary to conduct the Nitric Acid Tank Car removal action in accordance with CERCLA, the Amended Consent Agreement and other appropriate regulations.

In addition, the closure of the Nitric Acid Tank Car is the subject of a Consent Decree between the DOE and the OEPA. The state of Ohio and the DOE entered into a Consent Decree on December 2, 1988 that requires abatement of water pollution and hazardous waste violations at the FMPC. A Proposed Amended Consent Decree (PACD) is currently being negotiated to reflect DOE's updated Consent Agreement with EPA. Pursuant to the Consent Decree, DOE submitted a RCRA compliance schedule that identifies response activities associated with newly identified HWMUs. The RCRA compliance schedule requires that a CPID be submitted for closure of an HWMU. The Nitric Acid Tank Car was identified as an HWMU in this RCRA compliance schedule and as such the DOE must submit a CPID to the OEPA. The submittal of this plan, which satisfies the substantive provisions of O.A.C. 3745-66-12 regarding written closure

plans, is also consistent with the intent of the Consent Decree that the DOE comply with federal and state RCRA regulations.

1.3.3 Financial and Liability Exemption

Pursuant to O.A.C. 3745-66-40, the federal government is exempt from the financial requirements for RCRA closure under O.A.C. 3745-66-40 through 3745-66-48. The federal RCRA regulations, 40 C.F.R. § 265.140(c), provide a similar exemption for federal facilities. Therefore, because the FEMP is a federal facility, the DOE is exempt from the financial requirements for RCRA closure.

2.0 FACILITY DESCRIPTION

2.1 HWMU DESCRIPTION

The Tank Car (No. DODX17135) is currently located on a railway siding in the northeast corner of OU-3 (Attachment 1, Figure 1-1). The Tank Car and that portion of the FEMP site interior track system on which the car currently resides (Attachment 1, Figure 1-2) constitute the HWMU. The boundary of the HWMU is 40 feet long by 14 feet wide, encompassing a total area of 560 sq. feet. The HWMU is level and easily accessed via an adjacent roadway.

The Tank Car is approximately 36 feet long and consists of a 100,000 pound capacity stainless steel tank mounted on a railway carriage. The tank is about 6 feet in diameter and is accessed by a 3 feet diameter manway located at the tank's midpoint. The manway is covered with a metal plate that is attached to the tank with bolts around its circumference. Tank contents were removed via a pipe in the metal plate by adding air pressure to the tank (also through a pipe penetrating the plate). Visual inspection of the Tank Car indicates that the removal pipe extends to the bottom of the tank to form a dip leg for more complete removal of the contents. A pressure relief valve is installed in the tank through the manway cover. There are no visible signs of deterioration of the tank or carriage, but wooden blocks on which the tank is resting are noticeably degraded. Daily inspections of the Tank Car and Area, in accordance with 40 C.F.R. § 265.195, have not revealed evidence of waste material leaking from the tank.

In addition to the Tank Car and its contents, the HWMU also contains steel railroad tracks, wooden railroad ties, track ballast (gravel), and soil. No visible evidence of environmental contamination has been observed on these components.

2.2 WASTE INVENTORY

Visual inspection of the Tank Car, conducted on February 15, 1991, indicates that there is a relatively small amount of liquid remaining in the tank, estimated at between 50 to

100 gallons. Though small, the volume is sufficient to preclude exemption from the hazardous waste classification under the "empty container rule" (40 C.F.R. § 261.7 and O.A.C. 3745-51-07), which states that a container of greater than 110 gallons can contain no more than 0.3 percent by weight of its capacity and still be considered "empty." The material in the Tank Car is not considered unused acid, nor is it intended for future use.

The Tank Car and surrounding area are inspected daily in compliance with inspection requirements for hazardous waste storage tanks (40 C.F.R. § 265.195). In addition, the contents have been sampled and analyzed for TCLP metals, total uranium, and acid normality. These analyses revealed that the liquid is approximately 3N HNO_3 with a pH less than 1, and contains about 2 ppm uranium and approximately 1,600 mg/l chromium (TCLP). As a result of the low pH and chromium concentration, the tank contents are considered a RCRA hazardous waste due to the characteristic of corrosivity and toxicity. The normality of the liquid differs substantially from that of the concentrated reagent used during production (12N). No information is currently available to explain this difference, although two possible explanations are that: 1) the liquid is a rinsate left after a limited decontamination effort, or 2) the acid contents may have been partially neutralized prior to moving the car to its current location.

The uranium concentration is very low, on the order of 1,400 pCi/l on a specific activity basis assuming natural uranium. This concentration is well below the 3,000 pCi/l permissible limit in both DOE Order 5400.5 and 10 C.F.R § 20.2003 for release of natural uranium to a sanitary sewer. The Tank Car waste also meets solubility and other criteria for release via this mechanism. For this reason, the tank contents would not require disposal as low-level radioactive waste. Sufficient characterization data and process knowledge are available to allow this action to proceed.

2.3 CURRENT USE

Discussions with site personnel indicate that the Nitric Acid Tank Car has resided at its present location for the past six years. No plans for restoring the equipment to operational status have been discovered.

2.4 SECURITY

Security for the Nitric Acid Tank Car and Area is provided in the course of maintaining the overall security of the FEMP Site. As with all DOE facilities, plant security at the FEMP is strict. The entire processing area, which includes this HWMU, is surrounded by chain link fencing and monitored by on-site security personnel on a 24-hour basis. Access to the site is controlled through designated entrances into the facility. In addition to physical security of the site, access to the HWMU is controlled through administrative procedures with specific requirements that must be met prior to accessing the HWMU.

2.5 REMOVAL ACTION JUSTIFICATION

The volume of liquid estimated to be contained in the Tank Car is too small to pose a threat to either groundwater or surface water. Although HNO_3 reacts aggressively with certain materials, under current storage conditions introduction of these materials is unlikely. However, a loss of tank integrity would result in contamination of the immediate environment (not outside the FEMP site). This release would pose a potential threat to unprotected workers, as well as members of hazardous material clean-up crews and various flora and fauna contacted by the corrosive liquid. These hazards form the basis for the removal action justification as described in the RSE (Attachment 1, Section 4).

3.0 CLOSURE AND REMOVAL ACTION INFORMATION

3.1 OBJECTIVES

This plan for the Nitric Acid Tank Car and Area is submitted in accordance with performance standards in O.A.C. 3745-66-11 (40 C.F.R. § 265.111). Applicable parts of these standards include:

1. Minimize the need for further maintenance (or inspection) by decontaminating and removing the Tank Car. Post-closure maintenance is not required where no hazardous wastes or unacceptable levels of contamination remain after closure (i.e., clean closure).

2. Controlling, minimizing, or eliminating, to the extent necessary to protect human health and the environment, the escape of hazardous waste or hazardous waste constituents.

3. Conducting closure actions in accordance with the provisions of an approved RCRA Closure Plan.

The steps necessary to remove the Nitric Acid Tank Car, its contents, and underlying soils as necessary to achieve clean closure in a manner that meets applicable regulatory criteria and minimizes the risk to human health and safety and the environment are specified in this document. In addition, information gathered during this action will provide input to planning for the final remediation of OU-5.

3.1.1 Scope

In accordance with this plan and to fulfill the requirements of the RAWP, the following actions will be taken during the Tank Car action: 1) survey and mark the HWMU boundaries; 2) transport Tank Car; 3) remove contents; 4) decontaminate and dispose of Tank Car; 5) collect and analyze soil samples; 6) evaluate the feasibility of

achieving clean closure; and 7) remove soil as necessary, according to applicable criteria (Section 4.1.1) to achieve clean closure. In the event that soil contamination is found beyond the boundaries of the HWMU, the soil sampling results will be evaluated when received per the schedule in Section 5.0 of this plan to determine whether soil removal should continue under this action or would be more effectively performed under an independent action guided by Removal Action No. 17, as discussed in Section 3.1.2 of this plan. The goal will be clean closure.

3.1.2 Related Actions

To the extent practicable, the Nitric Acid Tank Car activity will utilize existing procedures and protocols to maximize technical and cost effectiveness. These procedures and protocols have been developed for related actions, including Removal Action No. 12 - Safe Shutdown Procedures and Protocols; Removal Action No. 17 - Improved Storage of Soil and Debris; Removal Action No. 9 - Removal of Waste Inventories; Removal Action No. 20 - Uranyl Nitrate; and the FEMP Soils Background Study.

Removal Action No. 12, Safe Shutdown Program, was created to perform the safe shutdown of all process facilities in preparation of final remediation. Safe Shutdown essentially entails the engineering, planning, and scheduling for isolation of process equipment, piping systems, and associated utilities; and removing residual and excess materials, supplies, and combustibles to appropriate disposition and approved storage locations. Safe Shutdown activities include: develop appropriate safety documentation (Risk Assessment, Risk Management Plan, Health & Safety Plan); prepare Training Plan and Task-specific Lesson Plans; review Standard Operational Procedures (SOPs) and updates; perform preliminary assessment for all process buildings and process equipment; evaluate the preliminary assessment; prepare Task Orders to address equipment isolation and cleanout; continue efforts to dispose of the surplus equipment and materials; evaluate process buildings for future use or demolition; and initiate the development of engineering studies and packages to guide equipment isolation/de-energization activities.

Field work activities include: isolation of process equipment; removing excess equipment and materials, supplies, and combustibles; initiating the process of removing residual materials from process equipment; and initiating decontamination efforts. All buildings

are being inventoried for residual material and excess equipment. Necessary documentation is being processed to identify proper disposition of these materials.

It is anticipated that Safe Shutdown personnel will perform all activities necessary to complete the closure and removal of the Tank Car. The Safe Shutdown Removal Action Work Plan contains approved procedures for conducting safe shutdown operations. Specific procedures that may be applicable to the closure and removal of the Tank Car include the following:

PO-S-06-001, *Movement of Hazardous Waste*
SOP-20-C-605, *Establishment and Control of Satellite Accumulation Areas*
SOP-20-C-606, *Hazardous Material Spill Cleanup*
SSOP-0008, *Preparing and Transferring Uncharacterized Waste to the Controlled Holding Area*

Other applicable procedures may be identified subsequent to the sample analysis results.

Removal Action No. 17 provides for the improved management of soil and debris in two phases. Phase I encompasses soil and debris management during the design and construction of four proposed storage facilities. Phase II addresses soil and debris management from the time the facilities are constructed until final remedial alternatives for FEMP are selected. Removal Action No. 17 provides specific criteria for the management of soil and debris contamination and identifies options for its disposition including decontamination, disposal offsite, or storage in controlled stockpiles or an improved storage facility. There are three specific objectives identified in the work plan for Removal Action 17: 1) minimize the potential for contaminant release from soil and debris to the environment, 2) contribute to efficient performance of interim response actions and other FEMP activities, and 3) support the future implementation of the final remediation activities. Of these three, the first two are directly applicable to the disposition of soil waste generated during the Nitric Acid Tank Car activities. The sections of Removal Action 17 considered applicable to closure and removal of the Tank Car include:

Nitric Acid Tank Car and Area

Section 3.1.1 - Specifies 100 pCi/g as the specific activity guideline used to determine the final storage disposition of soil sampling waste from the Nitric Acid Tank Car Area.

Section 3.2.1 - Describes disposition alternatives for waste soil.

Section 3.3 - Describes the process of assessing contaminant levels in soil waste from the Nitric Acid Tank Car Area.

Section 3.4.2 - Describes disposition of soils less than 100 pCi/g specific activity that contain no hazardous waste components.

Section 3.4.3 - Describes the disposition of soils greater than 100 pCi/g specific activity that contain no hazardous waste components.

Section 3.4.4 - Describes the disposition of soils that contain hazardous waste components or mixed radioactive (> 100 pCi/g) and hazardous waste components.

Section 3.5 - Describes specific soil management procedures for types of soil expected to be encountered at the FEMP.

Removal Action No. 9 involves the packaging, shipment, and disposal of low-level radioactive wastes generated by production, maintenance, and construction activities at the FEMP. Primary activities associated with this removal action include the development and submittal of an initial compendium of operating procedures to the EPA and the yearly update of this compendium. The disposal of the Nitric Acid Tank Car may be governed by Removal Action 9 if decontamination efforts cannot remove this equipment from the low-level radioactive waste category.

In addition, soil sample results from the Nitric Acid Tank Car activity will be made available to the OU-5 remedial investigation.

Nitric Acid Tank Car and Area

The Uranyl Nitrate Removal Action No. 20 is an ongoing action involving the processing of material with characteristics similar to those of the Tank Car. Transfer of the Tank Car contents to the UNH system is discussed in Section 3.2 of this plan, and is consistent with the volume and toxicity reduction objectives discussed in the NCP. Uranyl Nitrate on site was declared a hazardous waste because of the characteristic of corrosivity and the presence of chromium and barium above the Toxicity Characteristic levels.

The existing process system will be used to concentrate the solutions of UNH into a stable filter cake. This existing system has been used off and on since 1972 but has not been in use since the operational curtailment in mid-1989.

The solution will be blended into a uniform mixture, pH adjusted and precipitated using magnesium hydroxide or lime. The above will be filtered through a rotary vacuum filter press. The semi-solid material from this process will be drummed. Recent testing has shown that all the metals of concern (uranium, barium and chromium) will precipitate out of the mixture and be contained in the drums with the other solids used in this removal. The liquid will be sampled and, if acceptable, discharged through the FEMP water treatment system if the levels of contamination are below the NPDES permit criteria. Additional processing will be accomplished as required to meet NPDES criteria.

The UNH system includes the following general process steps:

1. Transfer 226,000 gal (in batches) of UNH solution from 20 above-ground storage tanks in the refinery area to blend tanks.

2. Blend the UNH solution in the blend tanks to a uniform mix, adding water to create the optimum concentration for neutralization and subsequent uranium precipitation.

3. Transfer the blended UNH solution to receiving tanks in the refinery sump.

4. Precipitate the uranium content (100 metric tons nominal amount) from the UNH solution by the addition of magnesium hydroxide slurry and/or lime.

5. Transfer the precipitated uranium slurry to Plant 8 receiving tanks.

6. Filter the uranium slurry through the east and/or west Eimco water treatment process filters (in Component #8A).

7. Collect, sample, and drum the wet filter cake from the Eimco filters.

8. Store the drummed filter cake on the Plant 1 pad (Component #74T) until analysis of the filter cake is complete.

9. Transfer the drummed filter cake to the appropriate storage area based upon the analytical results.

In order to determine the effectiveness of soil removal actions at the FEMP, the background characteristics of soils must be established. The Background Soils Study was designed to provide a statistically valid characterization of the concentration of metals and radionuclides in background soil. Background areas have been identified and samples collected as described in the Work Plan Addendum, Background Characteristics of Soils at the Fernald Environmental Management Project.

3.2 CLOSURE METHODOLOGY

This plan presents the procedures that will be followed to accomplish closure of the Nitric Acid Tank Car and Area, and constitutes only a partial closure of the entire FEMP. The Nitric Acid Tank Car will be closed in accordance with this plan. The methodology used to achieve this closure is described below.

3.2.1 Support Activities

Activities undertaken before the actual site work begins are planning, training, designing, and management of the removal action preparatory efforts. These activities are required to render the work areas reasonably free of hazards to personnel and/or the environment.

3.2.1.1 Roles of Participants

The following organizations will be involved in various activities associated with this removal action and closure.

- **The DOE** is the owner of the FEMP, and is responsible for overseeing all site activities.

- **FERMCO** is the site integrator contracted to the DOE. FERMCO has operated the site since December 1992. WEMCO, the previous contractor, operated the site from 1986 until production ceased in 1989 and was then given the responsibility of managing the site during its restoration. WEMCO's responsibilities terminated December 1, 1992, when its transition with FERMCO was complete.

- The combined CPID and RAWP will be submitted to both **USEPA** and **OEPA**.

3.2.1.2 Project Management

The following project management activities will be performed before the implementation of this removal action.

Organization

The organizational structure for the personnel performing this removal action and closure shall be established to ensure that proper lines of authority and safety responsibilities are clearly identified. The organizational structure will contain the following communication links and job classifications. For the purpose of describing this organizational structure, it is assumed that the removal action and closure staff will consist of existing on-site personnel.

Project Manager

The project manager is responsible for the overall operation of the Tank Car action, and will act as the point of contact with other site organizations.

Removal Site Supervisor

The removal site supervisor is responsible for the day-to-day safe operation of the removal action, and shall ensure that the health and safety officer is present during all activities indicated in Section 3.2.2. The removal site supervisor will interact with FEMP site organizations to coordinate the project and schedule.

Health and Safety Manager

The health and safety manager is responsible for completing and overseeing the implementation of the Health and Safety Plan (HASP). The health and safety manager is responsible for selecting the health and safety officer and overseeing that individual's site performance.

Health and Safety Officer

The health and safety officer is responsible for implementing the HASP. This individual is responsible for air monitoring of chemicals and dusts, radiation monitoring, frisking personnel and equipment out of the Contamination Reduction Zone, maintaining the Contamination Reduction Zone, overseeing construction safety, and conducting initial site safety training.

Training of Personnel

FEMP employees and identified subcontractors will receive training in accordance with the applicable FEMP policies and the requirements specified in 29 C.F.R. § 1910.120, 29 C.F.R. § 1926.21, and O.A.C. 3745-54-16A. Specific training requirements for this removal action shall be documented in a training plan, which will detail general training

requirements as well as job-specific training, and provide a schedule detailing when each type of training is required. At a minimum, all removal site staff shall be required to complete the OSHA 40-hour Hazardous Waste Site Worker Training and FEMP radiation worker training. In general, training will take place following the identification of the removal organization and prior to start of work.

3.2.1.3 Milestones

This plan will be submitted to the EPA and OEPA for review and approval. All subsequent activities and milestones are contingent upon this approval.

Identify and Train Removal Staff

Following work plan approval by EPA, FEMP CRU3 management will identify the organization and staff to perform the Nitric Acid Tank Car and Area removal action. It is anticipated that the removal will be performed by on-site staff. If the removal organization is a subcontractor, it will be selected in accordance with Federal Acquisition Regulations. All staff will receive training as specified above.

Perform Removal Preparations and Final Design

Following the selection of the removal organization, all removal site preparations will be completed. Concurrent with removal preparations, definitive design documents will be prepared as necessary before removal. This plan forms a strong basis for any such design documents. The estimated duration of removal preparations and design is one month.

Transfer to UNH System, Decontaminate Tank Car, Perform Soil Sampling

A four-month window from the time preparations are completed has been identified for this activity to ensure adequate time for analysis of soil samples and validation of laboratory data. All soil and soil sampling wastes will be managed in accordance with applicable sections of Removal Action No. 17 as described in Section 3.1.2 of this plan.

Final Report

A two month time window is allowed to complete a final report detailing the removal action. The report shall include the analytical results from all sampling activities and describe the final disposition of each waste category.

3.2.2 Field Activities

The goal of this action is to remove the Nitric Acid Tank Car contents; decontaminate and dispose of the Tank Car itself; characterize the contamination status of the soil underlying the Tank Car within the bounds of the Nitric Acid Tank Car and Area as described in Section 2.1; and remove soil as necessary to achieve clean closure. This procedure is intended to accomplish the work while maintaining worker exposure to chemical and radiological hazards as low as reasonably achievable (ALARA).

As shown in Figure 3-1, the action will include the following steps:

1) Survey and mark HWMU boundaries
2) Transport Tank Car to main tank farm
3) Remove Tank Car contents
4) Decontaminate and dispose of Tank Car
5) Collect and analyze soil samples
6) Evaluate the feasibility of achieving clean closure
7) Remove soil as necessary to achieve clean closure

During the execution of this procedure, it will be necessary to comply with industrial health and safety requirements, provide exclusion areas, instruct the workers involved, obtain necessary site work permits, and monitor the site for radiation and gases, among others. These requirements are detailed in the Health and Safety Plan (Attachment 3).

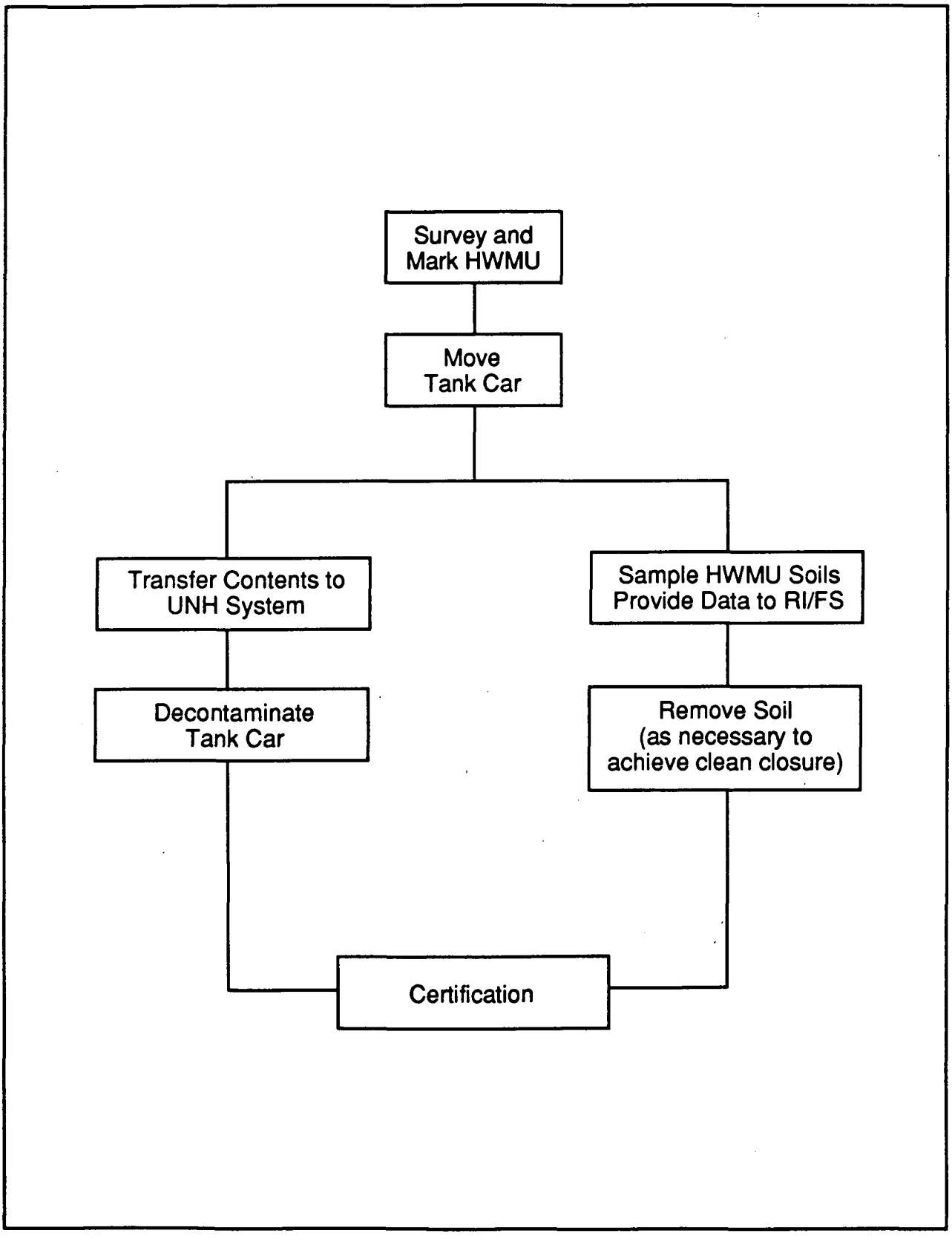

Figure 3-1. Sequence of activities.

3.2.2.1 Survey and Monument HWMU Boundaries

Access to the area and working space will be required for the following equipment:

1) Rail car track mover for movement of the Tank Car
2) Surveying equipment to establish HWMU boundaries
3) Truck to haul equipment and HWMU boundary markers

A radiological survey will be performed to determine and document the radiological status of the Tank Car and work area prior to the start of activities. Any control zones or access restrictions determined to be necessary based on the results of this survey will be established in accordance with the HASP (Attachment 3). Areas of surface radiological contamination on the Tank Car exterior will be noted for subsequent decontamination.

A survey crew will establish the boundaries of the HWMU area relative to established FEMP Site benchmarks. These formally established boundaries will be monumented to preserve the physical identity of the HWMU after the Tank Car is moved. Following completion of the radiological and boundary surveys, the Tank Car will be moved. Following completion of the radiological and boundary surveys, the Tank Car under-carriage will be inspected and lubricated as appropriate prior to attaching the rail car track mover and moving the Tank Car to the Main Tank Farm.

3.2.2.2 Transport Tank Car

The rail car track mover will be used to tow the Tank Car over existing onsite tracks to the Main Tank Farm. The Tank Car will be positioned over the tank farm concrete-lined dike pit to provide a stable working surface, access for the crane needed to remove the access plate on the top of the Tank Car, and a barrier between potential spills and the environment. In this location, the Tank Car will be within convenient working distance of tank farm utilities. These locations and the transport route are shown in Figure 3-2. The tank farm dike pit is a concrete-line sump which collects liquid wastes.

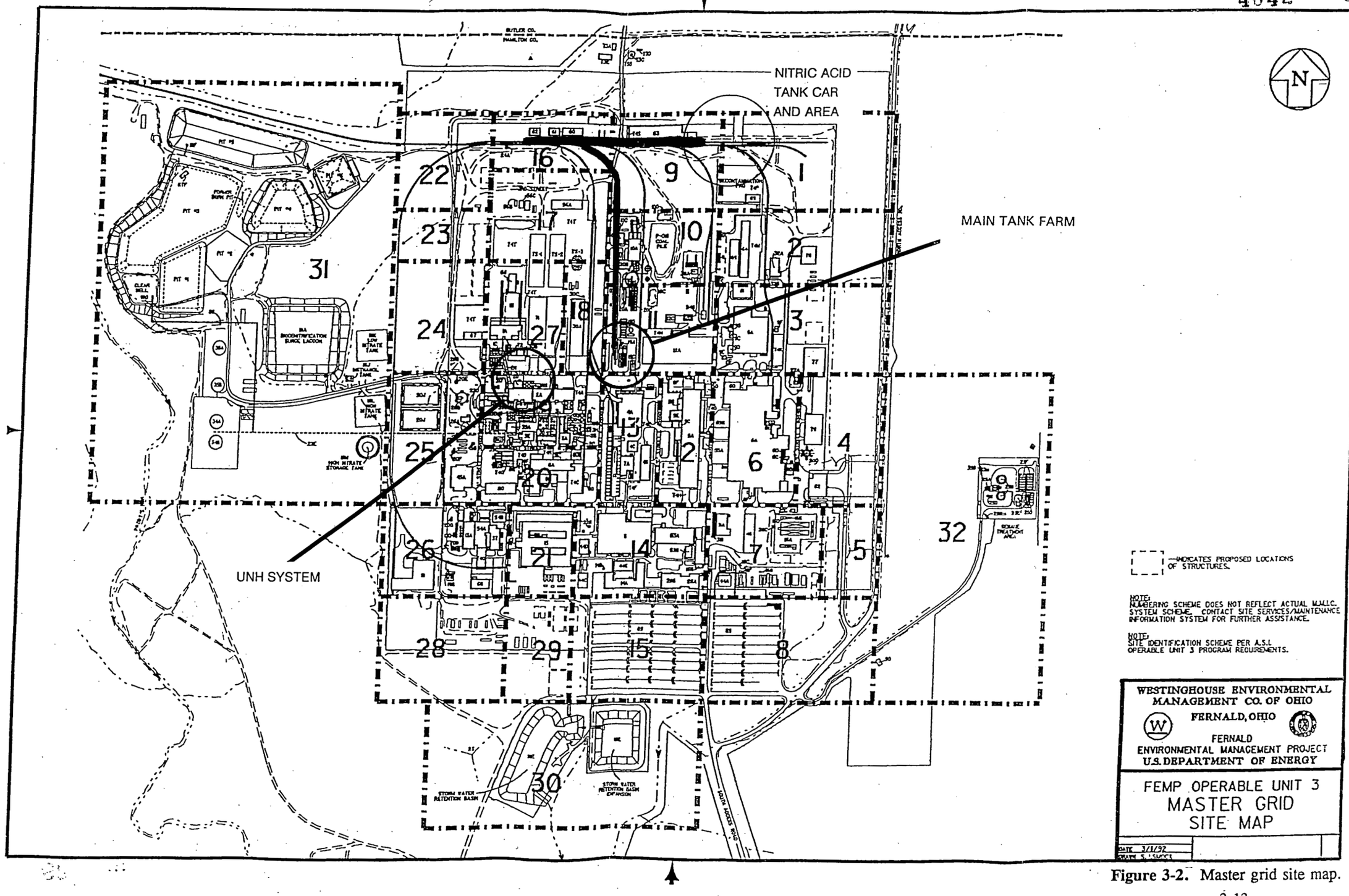

Figure 3-2. Master grid site map.

3.2.2.3 Contents Removal

All equipment possibly coming into contact with the Tank Car contents must be suitable for use in handling acids. The crane will be used to remove the access plate located on the top of the tank. Once it has placed the access plate and attached piping onto a prepared laydown pad, the crane can be removed from the area in order not to block access for other operations. The area immediately surrounding and above the Tank Car and Area is open and should not present any obstructions to the access or movement of equipment.

Equipment laydown and work areas will be prepared by spreading impermeable heavy duty acid-resistant ground coverings selected and deployed according to standard site management practices detailed in Removal Actions No. 12 and No. 17. The covered areas will include 1) an equipment laydown area where the access plate and attached piping will be placed following removal; and 2) the ground between the Tank Car and these areas over which contaminated material will be carried.

As mentioned above, the crane will lift the access plate, along with attached piping. Based on the tank diameter (approximately 6 feet) and the additional combined 4-foot height of the access way and surrounding guard railing, this lift will be approximately 10 feet above the top of the Tank Car, 13 feet above ground. The estimated weight of the plate and attached piping is approximately 500 pounds. Free liquids, if any, will be allowed to drain back into the tank from the exterior surfaces of the piping as it is lifted from the tank. A water spray will be used to decontaminate the piping. The spray will be directed over the piping into the tank. The plate and attached piping will be moved to the prepared laydown area and lowered to a horizontal position. Personnel working around the tank opening and laydown area will wear personal protective equipment (PPE) as described in the HASP. Air monitoring for nitric acid using a calorimetric tube will be performed at the tank opening following removal of the access plate.

Visual inspections of the tank interior and tank contents will be performed from outside the tank via the access opening. Personnel will not enter the tank, and close inspections around the opening will be conducted in accordance with requirements of the HASP.

Through visual inspection and performance of a depth measurement, the volume of liquid contents will be established. Depth measurements will be performed using a dip-stick constructed of materials compatible with the acid (e.g., plexiglass or hard plastic-based material).

Samples collected to date from the Tank Car contents have been analyzed for acid normality, TCLP metals, and total uranium (Attachment 1). Results of these analyses have revealed 3N HNO_3 with a pH less than 1, the presence of TCLP chromium in excess of the Toxicity Characteristic level, and low levels of uranium. Based on these contaminants and the material's corrosivity, the Tank Car contents will be transferred to the existing UNH processing system. As discussed in Section 3.2 of this plan, the UNH processing system is part of ongoing Removal Action No. 20, and is used to process material with characteristics similar to those of the Tank Car contents.

The Tank Car contents will be transferred to a mobile stainless steel "dumpster" tank using SOP 20-C-916. The dumpster tank will remain near the Tank Car to receive initial rinse waters, as described in Section 3.2.2.4, before being transported to the Plant 2/3 digestion area. SOP 20-C-916 will be used to transfer the dumpster contents into the Plant 2/3 sump from which it will be introduced to the UNH processing system.

3.2.2.4 Decontamination and Disposal

Following initial removal of the Tank Car contents, the Tank Car's internal surfaces will be flushed with water sprays to remove residual traces of nitric acid. Flushing the Tank Car will be conducted in two stages to remove residual acid and any solids that may be present. In the first stage, three separate rinses will be performed and the rinseate (approximately 60 - 100 gal.) will be combined with the Tank Car contents in the dumpster tank for transfer to the UNH system. A fourth rinse will then be performed and the rinseate (approximately 40 - 60 gal.) will be collected in a separate clean/unused approved storage container. The rinseate from this fourth rinse will be sampled and analyzed for TCLP metals (total), uranium, and pH. If the result of the total metals analyses indicates that TCLP limits will not be exceeded, the rinseate will be transferred to the Plant 8 waste water treatment system (via Tank 17) for final processing and

discharge. If the total results indicate that the action levels may be exceeded, a TCLP extraction will be performed and a second metals analysis performed. If this TCLP metals analysis exceeds the TCLP limits, or the pH is less than 2, additional rinse cycles will be performed until the results are reduced below these limits.

The Tank Car's external surfaces, and as necessary the internal surfaces, will also be decontaminated in the event that surveys (Section 3.2.2.1) identify radiological surface contamination. Methods used to decontaminate the Tank Car external surfaces will consist of dry or wet wipe-downs, simple two-stage soap and water decontamination, or high or low pressure water/detergent spray, as necessary. In the event that spray decontamination is necessary on the Tank Car's external surfaces, the resulting waste decontamination solution will be collected in the dike pit and then pumped into Tank 17.

Surface contamination criteria contained in the DOE Radiological Control Manual (DOE/EH-0256T) and FEMP Radiological Control Manual (RM-0009I) will be applied in determining the final disposition of the Tank Car. Once decontaminated, the Tank Car will be disposed of as conventional waste material.

3.2.2.5 Collection and Analysis of Soil Samples

Following removal of the Tank Car from the designated HWMU location, the soil within the HWMU area will be sampled and analyzed for the presence of contaminants potentially attributable to the Tank Car. The Sampling and Analyses Plan, Section 3.3 of this plan, details the collection and analysis of soil samples.

3.2.2.6 Soil Removal

Analysis of the Nitric Acid Tank Car's contents has indicated the presence of uranium and nonradioactive chromium at low concentrations within the small volume of residual nitric acid. Although there is currently no evidence of leakage or spills from the Tank Car at this location, in the event that spills did occur, the nitric acid will have been neutralized and diluted, resulting in levels of nitrate within the underlying soils. As a highly mobile soil nutrient, any such localized levels of nitrate would be short lived. The

chromium and uranium would be expected to deposit within the underlying track ballast and soil following neutralization of the acid.

As discussed in Section 3.3 of this work plan, underlying soil and track ballast will be analyzed for nitrates, metals, pH, and uranium isotopes. In the event that contaminated soil is found with concentrations in excess of applicable criteria, the affected soil will be removed as an element of this action in order to achieve clean closure. In the event that soil contamination is found beyond the boundaries of the HWMU, the soil sampling results will be evaluated when received per the schedule in Section 5.0 of this plan to determine whether soil removal should continue under this action or would be more effectively performed under an independent action guided by Removal Action No. 17, as discussed in Section 3.1.2 of this plan. The goal will be clean closure.

3.2.2.7 Certification Inspections

Certification inspections shall be conducted to ensure that the Nitric Acid Tank Car and Area action is completed in accordance with this plan. The inspections will ensure the following:

- Sample collection techniques described in Section 3.0 are used;
- Nitric Acid Tank Car is properly cleaned and decontaminated;
- All rinsate water is properly dispositioned.
- All soil contaminants attributable to the Nitric Acid Tank Car are removed and dispositioned in accordance with Removal Action No. 17.

3.3 SAMPLING AND ANALYSIS

A number of direct measurement and sampling and analysis activities will be required as part of the Nitric Acid Tank Car action. The primary requirements for measurements and analytical data are associated with worker health and safety monitoring, tank contents

characterization, and demonstration of compliance with regulatory criteria (CPID and RCRA). Worker health and safety, contents characterization, and applicable or relevant and appropriate requirements (ARARs) are discussed in detail in Sections 3.5, 3.3.1.2, and 3.7 of this plan, respectively.

To ensure that the data needs of worker health and safety monitoring, contents characterization, and ARARs compliance are adequately addressed during the Nitric Acid Tank Car removal action, and that the data is sufficient in terms of both quantity and quality, a Sampling and Analysis Plan (SAP) has been prepared in accordance with applicable requirements of the FEMP Site-Wide CERCLA Quality Assurance Project Plan (SCQ). The SCQ is currently undergoing EPA review and is used here in lieu of the currently approved Quality Assurance Project Plan, which is to be replaced by the SCQ. Specific portions of the SCQ that are applicable to this removal action are discussed in Section 3.6 of this plan.

3.3.1 Sampling and Analysis Objectives

The objective of sampling and analysis efforts is to provide information on chemical and radiological contamination levels consistent with requirements of the identified data uses. The two identified data uses associated with the Tank Car removal action are: 1) monitoring for health and safety support, and 2) demonstrating compliance with the ARARs. In addition, the soil characterization will meet the objectives of clean closure. This section discusses each data use within the context of its specific data needs. The DQOs necessary to ensure that the data is of sufficient quantity and quality are also identified.

A review of existing data from special sampling programs was conducted to define the extent of additional sampling required to meet the data needs, and to identify potential target analytes. Analytical results from samples of the residual liquid contents and historical information and process knowledge concerning chemicals involved in Tank Car operations were used to further identify contaminants of potential concern. Existing analytical data are shown in the RSE (Attachment 1). The data needs described in this

section are comprised of information that is required but not included in the existing sources listed above.

3.3.1.1 Health and Safety Support

For this action, monitoring for health and safety is required in order to detect radiological or chemical contamination in the area surrounding the Tank Car, on equipment and personnel, or in the air. The number and frequency of contamination measurements will be determined by specific site conditions as assessed by the health and safety officer, but at a minimum will include the surveys specified in Table 3-1.

Survey methods include direct reading survey instruments equipped with detectors specific for alpha or beta/gamma-emitting radionuclides, acid vapors, or nitrogen oxides. Air samples are obtained with either grab sampling methods or continuous air samplers. Due to the nonspecific nature of survey instrumentation, health and safety survey data are to be considered semiquantitative, at best. All health and safety monitoring will be performed in compliance with the HASP (Attachment 3) and FEMP SCQ Appendix K, Section 6.4, Monitoring for Organic and Inorganic Contaminants. Calibration of organic vapor, explosimeters, and hand-held radiological survey instruments will be performed in accordance with FEMP SCQ Appendix I (Field Calibration Requirement), Section I.4, Calibration Procedures. Monitoring for organic vapors will be conducted as a screening technique only on soil samples in accordance with OU-3 requirements.

3.3.1.2 ARARs

The ARARs include specific performance criteria the action must meet from the standpoint of worker health and safety, waste disposal, or protection of the environment. The ARARs for the Nitric Acid Tank Car action are detailed in Section 3.7 and Attachment 5 of this work plan.

Data required to demonstrate compliance with the ARARs include data from the Tank Car internal and external surfaces, and soil samples taken from within and near the

Table 3-1. Minimum requirements for health and safety monitoring.

Item/Area	Frequency	Analytes
Site surface areas	Prior to work and at completion each day	Alpha, Beta/Gamma
Work area	Prior to work and at completion each day	Gamma dose rate
	Prior to cutting	Explosivity
Fixed equipment	Prior to work and at completion each day	Alpha, Beta/Gamma
Access/egress	Prior to work and at completion each day	Alpha, Beta/Gamma
Equipment transfer	Prior to removal from exclusion zone	Alpha, Beta/Gamma
Personnel	On exit from exclusion zone	Alpha, Beta/Gamma
Air	During pumping and neutralization operations	Acid Vapor Monitoring
Tank car opening (manway)	Prior to work and at completion each day	Alpha, Beta/Gamma, Acid Vapor Monitoring, Explosivity

boundaries of the HWMU. Rinsate grab samples will be analyzed for pH, and the final rinsate grab sample (collected from residual liquid in the Tank Car) will also be analyzed for pH, nitrate, gross alpha and beta emitters, uranium isotopes, and TCLP metals (total analysis). Soil samples will be analyzed for pH, nitrate, uranium isotopes, and a total metals analysis for the TCLP metals. If the results of the total metals analyses indicate that TCLP limits may be exceeded, a TCLP extraction will be performed and a second metals analysis performed for direct comparison to the limit. Ballast (gravel) samples will undergo a TCLP-type extraction and the extract will be analyzed for uranium isotopes and TCLP metals. Chemical contaminants identified in the Tank Car contents include nitric acid and chromium.

The chemical analytes are as follows:

Inorganics:	Nitrates
TCLP Metals:	Arsenic, Lead, Barium, Mercury, Cadmium, Selenium, Chromium, Silver
Characteristics:	pH

The number of each type of sample is discussed in Section 3.3.2, Sampling Procedures. Additional waste characterization sampling and analyses may be required in support of final waste disposal.

3.3.1.3 Data Quality Objectives

All sampling and analysis activities must be conducted and documented in a manner ensuring that sufficient data of known quality are collected to support the end use of the data. The DQOs specified for each data collection activity are qualitative and quantitative statements specifying the quality of the data required to support decisions during remedial response activities.

The FEMP SCQ defines as major component of DQOs as analytical support level (ASL) A, B, C, D, or E. The ASL levels are described in Attachment 2.

Health and Safety Support. The monitoring data required to support the health and safety program for the removal action must be of sufficient quality to assure that risks to employees are minimized. The ASLs necessary to achieve the required data quality are Level A for radiological and chemical survey results.

ARARs. The data required to assure compliance with ARARs must be of sufficient quality to determine the type and amount of contaminants in and around the Nitric Acid Tank Car. Based on the information provided in Attachment 2, the ASLs necessary to achieve the required data quality will consist of Levels C and D for characterization, confirmation, and compliance analyses. Furthermore, Level D analyses will only be performed on a fraction of these samples to provide a confirmation of the lower level analyses.

The Tank Car final rinsate is considered to be a critical sample. The soil and gravel samples to be collected directly beneath the Tank Car are also considered to be critical because they will be the basis for the decision to proceed with soil removal.

3.3.2 Sampling Procedures

This section identifies specific sampling procedures required to meet the data needs described above. Tables 3-2 and 3-3 identify, by ASL, the type of samples, number of samples, and analytical procedure for all media to be sampled. Table 3-4 summarizes the sampling and analyses. The following sections discuss the health and safety, and ARARs sampling.

3.3.2.1 Health and Safety Monitoring

Monitoring to assure the health and safety of workers typically employs data from hand-held survey instruments to detect contamination on surfaces, equipment, and personnel;

Table 3-2. Analytical procedures for rinsate and soil analyses (ASL D).

Analytes	Media	FEMP SCQ Procedure	SCQ Volume No.
Arsenic	Rinsates/Extracts, Sludge, Soil	FM-INO-0010	III
Barium	Rinsates/Extracts, Sludge, Soil	FM-INO-0030	III
Cadmium	Rinsates/Extracts, Sludge, Soil	FM-INO-0010	III
Chromium	Rinsates/Extracts, Sludge, Soil	FM-INO-0010	III
Lead	Rinsates/Extracts, Sludge, Soil	FM-INO-0010	III
Mercury	Rinsates/Extracts, Sludge, Soil	FM-INO-0040	III
Selenium	Rinsates/Extracts, Sludge, Soil	FM-INO-0010	III
Silver	Rinsates/Extracts, Sludge, Soil	FM-INO-0010	III
Isotopic Uranium	Rinsate/Extracts	FM-RAD-0100	V
Isotopic Uranium	Soil, Sludge	FM-RAD-0110	V
Gross Alpha and Beta	Rinsate	FM-RAD-0130	V
Gamma Spectroscopy	Rinsate	FM-RAD-0140	V

Note: Method detection limits and related analytical performance parameters are specified in the referenced SCQ procedure.

Table 3-3. Analytical procedures for rinsates and soil analyses (ASL C).

Analytes	Media	FEMP SCQ Procedure	SCQ Volume No.
Isotopic uranium	Soil	FM-RAD-0110	V
Isotopic uranium	Extracts	FM-RAD-0100	V
Nitrate	Rinsate	FM-CON-0030	IV
Nitrate	Soil	To be determined	-
pH	Rinsates, Extracts	FM-CON-0110	IV
pH	Soil	FM-CON-0020	III
Arsenic	Soil, Extracts	FM-INO-0010	III
Barium	Soil, Extracts	FM-INO-0010	III
Cadmium	Soil, Extracts	FM-INO-0010	III
Chromium	Soil, Extracts	FM-INO-0010	III
Lead	Soil, Extracts	FM-INO-0010	III
Mercury	Soil, Extracts	FM-INO-0040	III
Selenium	Soil, Extracts	FM-INO-0010	III
Silver	Soil, Extracts	FM-INO-0010	III

Note: Method detection limits and related analytical performance parameters are specified in the referenced SCQ procedure.

Table 3-4. Summary of sampling and analyses.

Sample ID	Media	Location	Type	Sampling Procedure[a]	Analytical Procedure[b]	ASL Level	Comments[c,f,g]
Tank-1	Rinsate	Tank Car	Grab	K.5.5[c]	Table 3-2	ASL D	All rinsates checked for pH; final rinsate undergoes radiological and chemical analyses also.
Soil-1a	Gravel	Center underneath Tank Car	Core - surface to soil	K.5.3.1[d]	Table 3-2	ASL D	Sample will be collected following removal of the tank car.
Soil-1b	Soil	Center underneath tank car, below ballast (gravel)	Soil core - to 12 in depth	"	Table 3-2	ASL D	Sample will be collected following removal of the tank car.
Soil-2a	Gravel	Underneath tank car, about 9 ft in from east end	Core - surface to soil	"	Table 3-3	ASL C	See comment for sample Soil-1a, above.
Soil-2b	Soil	Underneath tank car, about 9 ft in from east end, and below ballast (gravel)	Soil core - to 12 in depth	"	Table 3-3	ASL C	See comment for sample Soil-1b, above.
Soil-3a	Gravel	Underneath tank car, about 9 ft in from west end	Core - surface to soil	"	Table 3-3	ASL C	See comment for sample Soil-1a, above.

Table 3-4. Summary of sampling and analyses.

Sample ID	Media	Location	Type	Sampling Procedure[a]	Analytical Procedure[b]	ASL Level	Comments[c,f,g]
Soil-3b	Soil	Underneath tank car, about 9 ft in from west end and below ballast (gravel)	Soil core - to 12 in depth	"	Table 3-3	ASL C	See comment for sample Soil-1b, above.
Soil-4		Northeast corner of HWMU	Soil core - to 12 in depth	"	Table 3-3	ASL C	See comment for sample Soil-1b, above.
Soil-5		Southwest corner of HWMU	Soil core - to 12 in depth	"	Table 3-3	ASL C	See comment for sample Soil-1b, above.
Soil-6		Outside of HWMU, about 10 ft south of Soil-1a and b.	Soil core - to 12 in depth	"	Table 3-3	ASL C	See comment for sample Soil-1b, above.

a - FEMP Site-Wide CERCLA Quality Assurance Project Plan, FD-1000
b - All analyses specified in referenced table will be run.
c - FD-1000, Volume 2, Appendix K, Section K.5.5, Drum Sampling
d - FD-1000, Volume 2, Appendix K, Section K.5.3, Subsurface Soil Sampling
e - A duplicate sample will be collected for liquid, rinsate and soil matrices.
f - Field blanks will be collected for each matrix (liquid, rinsate, soil) for each sampling event.
g - Equipment rinsate blanks will be collected for each matrix (liquid, rinsate, soil) for each sampling event.

external radiation exposure; or in the case of acid vapors, air contamination. Grab or continuous air samplers are used to collect samples to determine airborne contaminants. Other survey methods include "sniffer" tubes for toxic vapors and gases.

Radiological surveys during the removal action must be capable of detecting alpha, beta, and gamma emitting radionuclides on work area surfaces, equipment, and personnel. Specific detector types useful for these purposes are:

Alpha Particles	Proportional
Beta Particles	Geiger-Mueller
Gamma Rays	Geiger-Mueller
Dose Rate	Sodium Iodide

Surveys for acid vapor typically employ a detector tube. Detection is based on a chemical reaction between the acid species and the material in the tube. Sensitivity is strongly dependent upon the target analytes as related to that of the substance used in the detector tube.

Specific procedures for performing acid vapor or radiological surveys are normally included within the scope of the qualification program for the individuals responsible for performing them. Additional requirements for performing radiological and chemical contamination surveys are found in Section 5 of the FEMP SCQ. The frequency of collecting survey data during the removal action will be determined by the professional judgment of the environmental or radiological technicians within the limitations specified in Section 3.3.1.1 above.

3.3.2.2 ARARs Related Sampling

Soil samples will be taken and analyzed to determine if contaminants associated with the Tank Car contents can be found in the ground immediately underneath and surrounding the Tank Car. A judgmental approach to select the sampling sites was used given that the known potential source, i.e., the Tank Car (and contents) has been in one location for several years. In addition the most probable potential leak paths are few in number and

localized, i.e., the lowest part of the tank bottom and the area in proximity to the load in/out ports. Three locations underneath the Tank Car spaced equally apart on the centerline of the Tank Car will be sampled. Both the ballast (gravel) and the soil underneath the ballast will be collected. Soil samples will be analyzed for pH, nitrate, uranium isotopes, and a total metals analysis for the TCLP metals. If the results of the total metals analyses indicates that TCLP limits may be exceeded, a TCLP extraction will be performed and a second metals analysis performed for direct comparison to the limit. Ballast (gravel) samples will undergo a TCLP-type extraction and the extract will be analyzed for uranium isotopes and TCLP metals.Two other locations will be sampled adjacent to the Tank Car and one outside the HWMU. See Figure 3-3 for sample locations and Table 3-4 for descriptions of the locations. The precise sample locations will have to be determined by the sampling crew to avoid the rails, other hardware such as spikes, and sleepers (ties).

A radiation walkover survey will be conducted in the area prior to soil sampling activities following removal of the Tank Car. Soil samples will be collected from below the ballast (0 in) to a depth of 12 inches with trowels or hand augers using procedure 5.3.1 in the FEMP SCQ, Appendix K. Samples will undergo the characteristic, chemical, and radiological analyses listed in Tables 3-2 and 3-3. Radiological contamination surveys will also be conducted on the exterior of the Tank Car before moving the Tank Car. If contamination is detected on the Tank Car exterior, three additional ballast and surface soil samples will be collected at equally spaced locations around the perimeter of the Tank Car. These samples will be analyzed for isotopic uranium.

3.3.2.3 Chain of Custody

An essential component of sampling and analysis is ensuring the integrity of the sample from collection to analysis. The chain-of-custody procedure defined in the SCQ (Section 7.0) will be utilized so that the samples are traceable.

3.3.2.4 Waste Management

Sampling activities will generate small quantities of solid and liquid wastes containing radioactive materials, hazardous substances, or both. All sampling wastes will be handled in accordance with Section 3.4 of this plan.

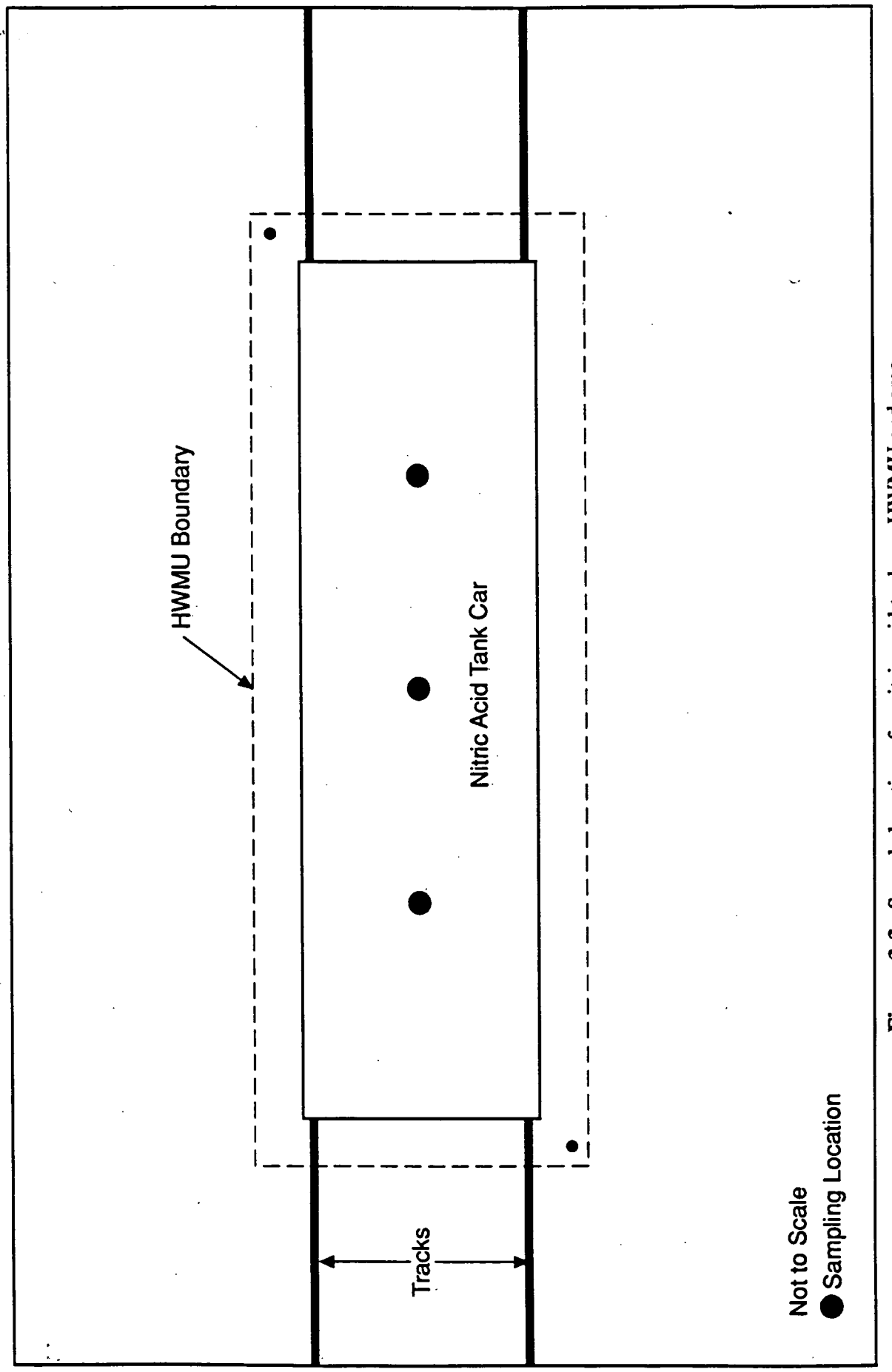

Figure 3-3. Sample locations for nitric acid tank car HWMU and area.

3.3.3 Analytical Procedures

This section defines the analytical procedures to be employed for analysis of target analytes. All procedures listed either currently exist in Volumes III, IV, or V of the SCQ or are in the process of being finalized for inclusion into that document. A summary of required analyses is presented in Tables 3-2 and 3-3. The listed methods are consistent with those required or prescribed by EPA. Analyses with "to be determined" methods will be performed by accepted and validated methods derived from standard sources, such as the EPA's SW-846, DOE Environmental Measurement Laboratory HASL/300, or American Society for Testing and Materials standard methods. A laboratory qualified to perform work under the EPA's Contract Laboratory Program will be used.

3.3.4 Quality Assurance

The quality assurance program for sampling and analysis is described in detail in the SCQ. The Nitric Acid Tank Car action will comply with all aspects of the program.

3.4 WASTE DISPOSAL AND MANAGEMENT

This section discusses the methods that will be used for this plan to minimize and manage waste generated during the course of the Nitric Acid Tank Car and Area action and closure. The areas covered are: waste minimization and management responsibility (Section 3.4.1); a review of existing FEMP waste minimization and management programs (Section 3.4.2); the specific work activities that will produce waste (Section 3.4.3); assumptions made regarding the waste (Section 3.4.4); and categories of waste produced and information regarding these categories (Section 3.4.5). The categories of waste produced are sampling waste, Tank Car content waste, soil sampling and removal waste, Tank Car hardware waste, protective clothing waste, and decontamination waste. For each of these categories, the waste sources, waste characteristics, estimated volumes, and waste reduction and waste control methods will be described. The descriptions of soil wastes do not currently include potential contributions from soil removal. In the

event that soil contamination is found during the course of sampling and analysis described in Section 3.3 of this plan, estimates of soil volumes will be developed and incorporated in a revision to this plan. All materials originating within the OU-3 process area, which encompasses the Nitric Acid Tank Car and Area, are presumed to be radiologically contaminated until surveys demonstrate otherwise.

Contaminated soil, liquids, and components will all be generated and require some form of management during this removal operation. Liquids from the Tank Car were tested and found to contain nitric acid and chromium at concentrations sufficient to be considered a hazardous (corrosive and toxic, respectively) waste requiring appropriate management. Uranium in low concentrations is also present. As a result, the Tank Car liquid is considered mixed waste.

Samples of the soil beneath the Tank Car are required and will be collected as described in Section 3.3 of this plan. Sampling and analysis of waste (rinseates) generated by this removal action and closure are also addressed in Section 3.3.

3.4.1 Waste Minimization and Management Responsibility

Waste minimization is the responsibility of each individual working at the FEMP. The principal responsibility for implementing and enforcing waste management during this removal action and closure resides with the removal site supervisor and the health and safety officer.

The removal site supervisor shall also be responsible for the project-specific training of involved personnel in the relevant waste management practices and for the procurement of appropriate tools and equipment.

3.4.2 Existing Programs

A major element of the FEMP waste minimization program incorporated into this plan is the prevention of any unnecessary additional contaminated components, soils, or water. Specific actions designed to minimize additional wastes include strict limitations on any

additional liquids or components added to the Tank Car, and the covering of noncontaminated areas to prevent contamination through spills or releases.

Due to the significant volume of soil and debris to be handled, moved, stored, and treated at the FEMP, an aggressive soil and debris waste management program has been initiated. The Work Plan for Improved Storage of Soil and Debris (Removal Action No. 17), as currently proposed, has been prepared and specifically addresses this issue (WEMCO 1992). The primary criteria for reuse of the soils are: 1) the soil has a maximum limit of total uranium of less than or equal to 100 pCi/g; and 2) the soil is not contaminated with nonradiological regulated waste materials. A more thorough discussion of Removal Action 17 and how this plan interfaces with it is contained in Section 3.1.2.

3.4.3 Work Activities Producing Waste

Several work activities associated with this plan will produce waste of differing composition, contamination and disposal requirements; the specific waste produced is dependent upon the activity.

The personnel involved in the site preparation phase of the field activities, as discussed in Section 3.2.2, will perform all setups for the action. These preparations include removing all noncontaminated items that may interfere with the Tank Car removal. This phase in the removal process is anticipated to generate very small quantities of waste.

The removal phase, also described in Section 3.2.2, includes pumping the contents of the Tank Car to a dumpster tank for transfer to the UNH system and decontaminating and disposing of the Tank Car and hardware. This phase also includes taking post-removal soil samples to determine the condition of soil beneath the Tank Car. This phase will generate the majority of the waste associated with the closure and removal of the Tank Car.

During all phases, personnel protective equipment (e.g., gloves, booties, and respirators) and noncontaminated wastes will be generated.

3.4.4 Assumptions Made Regarding the Waste

The following assumptions regarding the waste are made to provide the basis for waste minimization and management decisions in this plan.

- This plan covers transferring the Tank Car liquid to the UNH system. The plan does not cover actions to be taken with the liquid once it is contained in the UNH system.

- This plan covers waste minimization and management activities based upon category of waste (e.g., Tank Car contents, Tank Car samples, rinseates, and soil samples).

- Tank Car contents will be treated as a mixed waste.

- External components and surfaces of the Tank Car that have not come in contact with the contents will be treated as radiologically contaminated until determined otherwise.

- Soil and soil samples will be treated as radiologically contaminated until determined otherwise. Soil removed to achieve clean closure will be managed in accordance with Removal Action No. 17.

- Decontamination wastes shall be treated in a manner consistent with the item being decontaminated.

- Disposable personnel protective equipment used in the radiologically controlled area will be treated as potentially radiologically contaminated waste. Nondisposable personnel protective equipment will be cleaned and surveyed for reuse.

- Equipment to be stored for reuse is not considered waste.

- Maintaining radiological and hazardous exposures ALARA is a consideration in making all waste management decisions.

3.4.5 Categories of Waste

This action will produce several types of waste. Categories will provide a logical means for identifying waste minimization and management methods. The categories of waste produced in this removal action are: 1) Tank Car contents; 2) Tank Car hardware; 3) soil and soil sampling waste; 4) protective clothing waste; and 5) decontamination wastes. Table 3-5 provides a list of these categories, the initial waste classification, volumes, waste minimization techniques, and disposition of the materials. The estimated volume of soil wastes listed in Table 3-5 does not currently include potential contributions from soil removal. Based on existing knowledge of the Tank Car and Area, it is not anticipated that soil contamination attributable to the Tank Car will be found that requires soil removal. In the event that soil contamination is found during the course of the sampling and analysis described in Section 3.3 of this plan, estimates of soil removal waste volumes will be developed and incorporated in a revision to this plan.

3.4.5.1 Tank Car Contents

Based on previous sampling, the Tank Car is expected to contain approximately 3 normal nitric acid (pH < 1), approximately 1,600 ppm chromium (TCLP), with low concentrations of uranium (Attachment 1). These results are consistent with knowledge of the Tank Car operating history. The measured uranium concentration of 0.002 g/l converts to an activity concentration of approximately 1,400 pCi/l based on a natural uranium specific activity of 7E-07 Ci/g. Consistent with NRC requirements in 10 C.F.R. Part 20 Appendices B and C, and DOE criteria in DOE Order 5400.5, liquids containing this concentration of uranium (equivalent to about 0.5 μCi, based on an estimated 100 gallon volume) may be disposed of via existing sanitary sewer systems.

This plan covers the pumping of the contents of the Nitric Acid Tank Car to a dumpster tank for transfer to the UNH system (Section 3.1.2). The Tank Car contents, with a pH of less than 1, are classified as a hazardous waste due to corrosivity as well as toxicity

Table 3-5. Summary of waste minimization activities.

CATEGORY OF WASTE	INITIAL CLASS.	VOLUME ESTIMATED	WASTE MINIMIZATION TECHNIQUES	DISPOSITION
Tank Car Contents	Mixed Waste	100 gallons	1) Prevent spills 2) Review system 3) Brief personnel involved	Send to UNH system.
Tank Car Hardware	Mixed Waste	Not Evaluated	1) Decontaminate and dispose as scrap	Decontaminated and disposed of as scrap metal
Soil Sampling Waste	Radiologically contaminated	1 ft^3	1) Minimum number of samples 2) Clean outside of container	If returned from lab, handled in accordance with Rem. Action 17.
Protective Clothing Waste	Radiologically contaminated unless in contact with mixed waste.	15 ft^3 maximum	1) Identify zones 2) Cover Tank Car openings 3) Cover and seal contam. components 4) Control entry	In accordance with FEMP standard procedures.
Decontamination Wastes	Dependent upon source	160 gallons mixed waste, 5 gallons and 0.5 ft^3 radiologically contaminated	1) High pressure spray where possible 2) Decon. into Tank Car 3) Re-use of equipment 4) Aggressive surveys 5) Proper selection of decon. equipment.	Send to UNH system.

based on the chromium concentrations. Based upon this classification and the measured radionuclide concentration, the Tank Car contents will be treated as mixed waste for the purposes of this plan.

Waste minimization activities that will be performed for pumping the contents of the Tank Car to the UNH system will include covering the ground around potential spill locations to minimize the potential for soil contamination, and a system review prior to startup to evaluate and correct potentially flawed elements.

In addition, all personnel involved with connecting and transferring these contents will receive a documented review of the transfer operation including proper transfer techniques and emergency actions.

3.4.5.2 Tank Car Hardware

The Tank Car hardware includes the stainless steel tank with attached piping and the rail car carriage. External components and surfaces of the Tank Car that have not come in contact with the contents are assumed to be radiologically contaminated until monitoring indicates acceptable levels. In the event that external surface contamination is present on the Tank Car, it will be decontaminated until acceptable levels are reached (Tables 5-1 and 5-2 in Attachment 5).

It is anticipated that the internal and external surfaces of the Tank Car will be readily decontaminated such that the Tank Car can be managed as nonradioactive and nonhazardous. Once decontaminated, the Tank Car will be disposed of as conventional scrap material (e.g., disposition to a scrap metal vendor). If the Tank Car can not be released as nonradioactive and nonhazardous, the FEMP decontamination facility staff will make recycle and decontamination decisions in accordance with Removal Action No. 9.

3.4.5.3 Soil Sampling Waste

Soil sampling waste consists of excess material retrieved from each sample that will not be used for chemical and radiological characterization analyses. This waste will be generated from free liquids clinging to the sampling equipment as it is retracted from the soil, and from characterized sample remains returned from the laboratory.

It is difficult to quantify the sampling waste that will be generated during soil sampling. However, due to the relatively small quantities of samples required, the total volume of waste is not expected to exceed 1 ft^3. Waste volumes will be reduced by: 1) obtaining the minimum number of samples necessary for proper characterization, 2) obtaining samples in a manner that allows residual materials clinging to the sample container to fall back into the casing or be collected on the plastic sheeting surrounding the sampling apparatus, and 3) wiping the outside of the sample container to minimize the potential for spreading contamination. The Sampling and Analysis Plan, described in Section 3.3 of this plan, identifies the number of samples required.

Each sample taken will initially be screened with appropriate radiological and organic vapor survey instrumentation. For the radiological screening, a NaI Gamma Scintillation Radiation monitoring instrument will be used as a minimum. For the organic vapor survey, a flame ionization detector (FID) or photoionization detector (PID) with the highest level lamp (typically 10.9 eV) will be used. The FID and PID screening techniques are included because the Nitric Acid Tank Car is within the larger area of OU-3 and organic contaminants may be present. All instrumentation will be calibrated and approved for use in this work area

All sample waste will be labeled and stored in approved containers as radioactive waste until characterization is complete. Sample waste as a result of characterization will be handled in accordance with Removal Action 17.

3.4.5.4 Protective Clothing Waste

The use, handling, storage and disposal of contaminated protective clothing is a routine function of FEMP addressed in the existing Standard Operations Procedures

(FMPC-0515, FMPC-2128, RM-0009I, FMPC-2152). Protective clothing is divided into two categories: disposable and reusable. Examples of disposable protective clothing are paper coveralls and surgeon's gloves. Examples of clothing that can be decontaminated and reused are booties and respirators. For the purposes of this plan, all protective clothing used in the identified radiologically controlled area are considered radioactively contaminated until monitored.

It is difficult to estimate the total volume of contaminated protective clothing from this operation. Based upon the activities described in this section and in Section 4.0, it is estimated that no more than 150 individuals will enter the radiologically controlled area during the course of this operation. Assuming an average of 0.1 ft^3 in each of the categories of disposable and reusable clothing, this equates to approximately 15 ft^3 of waste that must be disposed (after monitoring, if considered necessary by health physics personnel) and the same amount that must be surveyed and decontaminated as necessary. These estimates are considered high. Protective clothing will be controlled and disposed of using FEMP standard procedures.

Methods that will be used to reduce this volume are to: 1) identify zones of increasing levels of protective clothing; 2) cover openings to the Tank Car when feasible to allow work in the area using reduced levels of clothing; 3) cover and seal contaminated components that may cause spread of contamination to the soil; and 4) minimize personnel entering the area to those with a demonstrated need for the particular action.

3.4.5.5 Decontamination Wastes

Decontamination wastes will be generated primarily by the decontamination of the Tank Car internal and external surfaces and by the decontamination of equipment and protective clothing. Decontamination methods will include water sprays for the Tank Car internal surfaces and water and/or water-detergent spray for the external surfaces, equipment and protective clothing. The external surfaces, equipment, and protective clothing may also be decontaminated using dry or wet wipe downs. Decontamination wastes generated from the inside of the Tank Car are assumed to be mixed waste until

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demonstrated otherwise (Section 3.2.2.4). Decontamination waste generated outside will be considered radiologically contaminated until demonstrated otherwise.

Rinsate characterization will be performed on internal tank decontamination water in order to identify the point at which no further rinsing is necessary. As discussed in Section 3.2.2.4 of this plan, the decontamination water from the first three rinses will be transferred to the UNH system in the same manner as the Tank Car contents. It is conservatively estimated that 100 gallons of water will be needed to perform this function. The main waste minimization technique will be the use of a spray nozzles to maximize the water coverage inside the tank. Another method that may be used depending upon the effectiveness of the pumping operation is maintaining a level inside the tank as low as possible. This technique will result in an overall more efficient dilution.

The fourth and final rinse will be collected separately, and analyzed for metals, uranium, and pH. This rinse water, estimated to be 60 gallons, will be pumped to the waste water treatment system via Tank 17.

External decontamination volumes are highly dependent upon the levels of radiologically contaminated materials in the area and the tenacity of this material, which clings to the surfaces. In addition, equipment coming out of the Tank Car must be decontaminated and monitored for pH. It is estimated that decontamination of Tank Car external surfaces will result in 15 gallons of total liquid and 3 ft^3 of solid materials. The liquid material will be put in Tank 17. Solid material is expected to be classified as potentially radiologically contaminated and handled in the same manner as disposable protective clothing.

Methods that will be used to reduce the volumes of waste generated outside the Tank Car will be through the use of aggressive surveys and segregation to reduce the areas requiring decontamination, proper selection of decontamination equipment to maximize use and minimize volumes, and re-use of equipment without decontamination for an extended period during this project if determined feasible without a significant risk of contamination spread.

Most of the decontamination of hardware coming out of the Tank Car will be done as the equipment is removed. The 160 gallons of decontamination waste estimated for the internal decontamination of the Tank Car includes this stage of the hardware decontamination. It is estimated that an additional 5 gallons of liquid and 0.5 ft^3 of solids will be generated during the course of hardware decontamination after it is removed from the Tank Car. The liquid material will be put in the UNH system. Solid material is expected to be classified as potentially radiologically contaminated and handled in the same manner as disposable protective clothing.

3.5 HEALTH AND SAFETY

The Nitric Acid Tank Car and Area action will be conducted in accordance with the provisions of the FEMP site-wide health and safety program (WEMCO 1990). The removal actions will also be performed consistent with the task-specific HASP prepared for this removal action (provided as Attachment 3 of this plan). The HASP identifies, evaluates, and controls all safety and health hazards. In addition, it provides for emergency response for hazardous operations. The plan is consistent with 29 C.F.R. § 1910.120 and the FEMP Site HASP.

Additional safety documentation will be prepared as necessary according to FMPC-2116 topical manual "Implementing FMPC Policies and Procedures for System Safety Analysis." FMPC-2116 has been prepared to implement DOE Order 5481.1B, "Safety Analysis and Review System," and DOE Order 901, "Guidance for Preparation of Safety Analysis Reports."

3.6 QUALITY ASSURANCE

This action and closure will be conducted according to the overall quality assurance program at the FEMP as described in the FEMP SCQ (FD-1000, March 4, 1992). The SCQ is currently undergoing EPA review and is used here in lieu of the currently approved Quality Assurance Project Plan which the SCQ will replace. The Quality Assurance Project Plan is based on the criteria specified in American Society of Mechanical Engineers NQA-1, federal EPA guideline QAMS-005/80, and DOE Orders

5700.6 and 5400.1. Detailed requirements are implemented by the FEMP Site Policies and Procedures Manual, FMPC-2054, and FEMP departmental procedures and topical manuals. Specific quality assurance requirements will be incorporated into written and approved procedures and covered during personnel training. The Site Quality Department will conduct periodic surveillances to verify compliance with the Quality Assurance Project Plan (Attachment 4).

3.7 ARARs ANALYSIS

The removal of the Nitric Acid Tank Car is required under CERCLA Section 106 and NCP, 40 C.F.R. § 300.415. The NCP requires that all ARARs be identified for releases of hazardous substances and for the corresponding response action (40 C.F.R. § 300.400[g]). The following ARARs matrix identifies the laws and regulations which should be considered during the Nitric Acid Tank Car and Area closure and removal action. Attachment 5 provides a discussion and interpretation of these laws and regulations as they specifically apply to the removal of the Nitric Acid Tank Car.

Table 3-6. Regulatory requirements for the removal and closure of the Nitric Acid Tank Car.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
10 C.F.R. §§ 20.1201 to .1205	Relevant and Appropriate	Chemical	NRC	Occupational Dose Limits for Adults	Control occupational dose to individual adults to certain limits.	NRC occupational dose rates are relevant to worker safety during the removal action.
10 C.F.R. §§ 20.1301 to .1302	Relevant and Appropriate	Chemical	NRC	Dose Limits for Individual Members of Public	Conduct operations to limit dose exposure.	NRC public dose rates are relevant to the operation of activities during the removal action.
10 C.F.R. §§ 20.1501 to .1502	Relevant and Appropriate	Action	NRC	Surveys and Monitoring	Provides requirements for surveys and monitoring of radiation at NRC facility.	NRC requirements may be relevant to monitoring radiation during removal activity.
10 C.F.R. §§ 20.1701 to .1704	Relevant and Appropriate	Action	NRC	Respiratory Protection and Controls to Restrict Internal Exposure in Restricted Areas	Provides requirements to prevent internal exposure to radiation in restricted areas.	NRC requirements may be relevant to assess preventative measures to limit radiation exposure during removal activity.
10 C.F.R. § 20.1901	Relevant and Appropriate	Action	NRC	Caution Signs	Provides requirements for signs and labels for radioactive material.	Tank Car should be properly labeled during the removal action.
10 C.F.R. § 20.1902	Relevant and Appropriate	Action	NRC	Posting Requirements	Provides requirements for posting radioactive areas.	NRC posting requirements for radioactive areas should be considered to secure area during removal activities.
10 C.F.R. § 20.1904 to .1905	Relevant and Appropriate	Action	NRC	Labeling	Requires labeling of containers storing radioactive waste.	Tank Car may be radioactive.
10 C.F.R. § 830.340	To Be Considered[1/]	Action	DOE	Maintenance Agreement	Requires DOE contractors to develop, implement and conduct operations in accordance with a facility maintenance program.	Removal activity planning should consider DOE operations requirements.

Table 3-6. Regulatory requirements for the removal and closure of the Nitric Acid Tank Car.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
10 C.F.R. § 835.101	To Be Considered[1/]	Action	DOE	Radiation Protection Programs	DOE activities must comply with RPP. RPP contents must be equivalent in nature with activities performed.	Removal activity planning should consider the Fernald Radiation Protection Program.
10 C.F.R. § 835.202	To Be Considered[1/]	Chemical	DOE	Limits for Occupational Workers	Specifies exposure limits by an occupational worker to radiation resulting from routine DOE nuclear and radiation activities. Sets forth stochastic and nonstochastic annual limits. Exceptions: background and therapeutic and diagnostic exposures.	Removal activities will require compliance with radiation protection standards.
10 C.F.R. § 835.203	To Be Considered[1/]	Action	DOE	Internal and External Dose Equivalents Resulting from DOE Activities	Specifies how the EDE is determined.	Removal activities will require compliance with radiation protection standards.
10 C.F.R. § 835.204	To Be Considered[1/]	Action	DOE	Planned Special Exposures	Specifies that when planned special exposures resulting in individuals exceeding EDE are permitted, prior written approval from DOE documentation must be obtained.	Removal activities will require compliance with radiation protection standards.
10 C.F.R. § 835.205	To Be Considered[1/]	Action	DOE	Determination of Compliance for Nonuniform Exposure of the Skin	Provides for the assessment of nonuniform skin exposures from x-rays, beta radiation, and/or radioactive materials.	Removal activities will require compliance with radiation protection standards.

Table 3-6. Regulatory requirements for the removal and closure of the Nitric Acid Tank Car.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
10 C.F.R. § 835.209	To Be Considered[1/]	Action	DOE	Concentrations of Radioactive Material in Workplace Air and Water	Establishes DAC values in Appendices A and C of 10 C.F.R. Part 835 to be used to control airborne radioactive material exposures. Standard for concentrations of radionuclides in drinking water in controlled areas.	DAC values and water concentration levels may be considered in determining radiation exposure levels.
10 C.F.R. § 835.401	To Be Considered[1/]	Action	DOE	General Requirements (for Monitoring in the Workplace)	Requires workplace area to be routinely monitored as necessary to identify and control potential sources of occupational exposure. Establishes standards for instruments used for monitoring and contamination control.	10 C.F.R. § 835.401 monitoring requirements may be considered to plan removal action.
10 C.F.R. § 835.402	To Be Considered[1/]	Action	DOE	Individual Monitoring	Provides monitoring requirements for external radiation and internal radiation exposure.	Workers may be subject to radiation exposure during removal activities. Monitoring may be required.
10 C.F.R. § 835.403	To Be Considered[1/]	Action	DOE	Area Monitoring	Provides procedure for measuring radioactivity concentrations in workplace and ambient air.	Workers may be subject to radiation exposure during removal activities. Monitoring may be required.
10 C.F.R. § 835.404	To Be Considered[1/]	Action	DOE	Surface Radioactive Contamination Control and Monitoring	Provides controls capable of preventing transfer of removable surface contamination to areas outside radiological areas.	In removing materials contaminated with surface radioactivity, may consider these regulations in determining transportation of materials within the facility.

Table 3-6. Regulatory requirements for the removal and closure of the Nitric Acid Tank Car.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
10 C.F.R. § 835.501	To Be Considered[1/]	Action	DOE	Radiological Areas	Personnel entry control shall be maintained for each radiological area. The degree of control shall be commensurate with existing and potential radiation hazards within the area.	Tank Car is located in a radiological area.
10 C.F.R. § 835.601	To Be Considered[1/]	Location	DOE	General Requirements (Posting and Labeling)	Work areas that require posting because of the presence, or potential presence, of radiation are set forth. Individual labeling of radioactive items or containers of radioactive materials when adequate warning unavailable.	Tank Car is located in a radiological area.
10 C.F.R. § 835.602	To Be Considered[1/]	Location	DOE	Controlled Area	Each access point to a controlled area must be posted as a controlled area, whenever radiation other than natural background may be present. Contractor may select the required signs with approval of the head of the appropriate DOE field organization.	Tank Car is located in a radiological area.
10 C.F.R. § 835.603	To Be Considered[1/]	Location	DOE	Radiological Area	Requires posting of each access point to a radiological area. Specific postings are mandated to reflect different dose ranges.	Tank Car is located in a radiological area.

Table 3-6. Regulatory requirements for the removal and closure of the Nitric Acid Tank Car.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
10 C.F.R. § 835.901	To Be Considered[1/]	Action	DOE	Occupational Workers	All occupational workers entering a controlled area at a DOE facility must receive orientation in radiation safety at that facility prior to admission. Retraining required when there is a significant change to radiation protection policies and procedures affecting occupational workers.	Removal action will occur in a controlled area.
10 C.F.R. § 835.902	To Be Considered[1/]	Action	DOE	Radiation Workers	Radiation worker training program and retraining shall be established and conducted at a sufficient frequency to familiarize the worker with the fundamentals of radiation protection and the ALARA process. Generic radiation worker training may be substituted.	Removal action will occur in a controlled area.
10 C.F.R. § 835.1001	To Be Considered[1/]	Action	DOE	Design and Control of Workplace	Radiation exposure in controlled workplace areas shall be ALARA through facility design and control.	Workplace for removal action should attempt to maintain radiation exposure ALARA.

Table 3-6. Regulatory requirements for the removal and closure of the Nitric Acid Tank Car.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
10 C.F.R. § 835.1003	To Be Considered[1/]	Action	DOE	Control Procedures	Provides that during routine operations, the combination of design and control procedures must provide set levels for the anticipated magnitude of the committed EDE and any EDE from external exposure, and maintain exposure levels ALARA.	Removal activity planning should consider the DOE control procedures.
10 C.F.R. § 835.1101	To Be Considered[1/]	Chemical	DOE	Releases of Materials and Equipment from Radiological Areas	Sets forth requirements regarding release of materials and equipment from radiological areas for use in controlled areas.	Equipment and materials used during the remedial action may be removed after the activity is completed.
10 C.F.R. § 835.1202	To Be Considered[1/]	Action	DOE	General Considerations	Minimization of the risk of injury to persons involved in rescue and recovery. One or more designated individuals have authority to make decisions and direct action. Records must be maintained to help identify the Emergency Director(s). Emergency workers must be advised beforehand of hazards.	General worker safety requirements should be considered prior to commencing the removal activity.
29 C.F.R. § 1910.120	Applicable	Action	OSHA	Hazardous Waste Operations and Emergency Response	Provides detailed definitions pertaining to hazardous waste operations. Provides framework for HASP, PPE, etc.	Removal action must comply with OSHA requirements.
29 C.F.R. Part 1910, Subpart D	Applicable	Action	OSHA	Walking-Working Surfaces	Provides safety requirement for walking-working surfaces.	Removal action must comply with OSHA requirements.

Table 3-6. Regulatory requirements for the removal and closure of the Nitric Acid Tank Car.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
29 C.F.R. Part 1910, Subpart G	Applicable	Action	OSHA	Occupational Health and Environmental Control	Provides safety requirements for ventilation, noise exposure and ionizing radiation.	Removal action must comply with OSHA requirements.
29 C.F.R. Part 1910, Subpart H	Applicable	Action	OSHA	Hazardous Material	Provides safety requirements for the handling of hazardous materials.	Removal action must comply with OSHA requirements.
29 C.F.R. Part 1910, Subpart I	Applicable	Action	OSHA	Personal Protective Equipment	Provides requirements for personal protective equipment to be worn by employees during activity.	Removal action must comply with OSHA requirements.
29 C.F.R. Part 1910, Subpart L	Applicable	Action	OSHA	Fire Protection	Provides requirements for fire protection in workplace.	Removal action must comply with OSHA requirements.
29 C.F.R. Part 1910, Subpart N	Applicable	Action	OSHA	Materials Handling and Storage	Provides requirements for material handling and storage, i.e., powered industrial trucks.	Removal action must comply with OSHA requirements.
29 C.F.R. Part 1910, Subpart P	Applicable	Action	OSHA	Hand and Portable Power Tools and Other Hand-held Equipment	Provides safety requirements for the operation and handling of power tools.	Removal action must comply with OSHA requirements.
29 C.F.R. Part 1910, Subpart Z	Applicable	Chemical	OSHA	Toxic and Hazardous Substances	Provides exposure limits for employee exposure to toxic or hazardous substances.	Removal action must comply with OSHA requirements.
40 C.F.R. § 61.92	Applicable	Chemical	EPA	NESHAP for Radionuclide Emissions other than Radon from DOE Facilities	Limits emissions of radionuclides to the atmosphere.	Radionuclide air emission during remediation must meet NESHAP standard.
40 C.F.R. § 260.10 (O.A.C. 3745-50-10[46])	Applicable	Action	EPA	Hazardous Waste Management Unit	Defines hazardous waste management unit.	Tank Car and Area is a hazardous waste management unit.

Table 3-6. Regulatory requirements for the removal and closure of the Nitric Acid Tank Car.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
40 C.F.R. § 261.2 (O.A.C. 3745-51-02)	Applicable	Chemical	EPA	Definition of Waste	Defines wastes.	Tank Car and Area contains wastes.
40 C.F.R. § 261.3 (O.A.C. 3745-51-03)	Applicable	Chemical	EPA	Definition of Hazardous Waste	Defines hazardous waste.	Tank Car and Area contains hazardous wastes.
40 C.F.R. § 261.4 (O.A.C. 3745-51-04)	Applicable	Chemical	EPA	Exclusions from Definition of Hazardous Waste	Exclusions from definitions of a waste.	Wastes in the Tank Car and Area are not excluded from being hazardous.
40 C.F.R. § 261.7 (O.A.C. 3745-51-07)	Applicable	Action	EPA	Exemption from Hazardous Waste	Provides definition for "empty" container.	Tank Car is not an empty container and is therefore not exempt from regulation.
40 C.F.R. Part 261, Appendix II	Applicable	Action	EPA	Chemical Analysis Test Method	Provides analytical procedures, method 1311, for determining TCLP levels.	Procedures relevant to analysis of hazardous waste and soils at Tank Car removal area.
40 C.F.R. Part 261, Appendix III	Applicable	Action	EPA	Chemical Analysis Test Method	Provides analytical procedures to determine whether a waste sample contains hazardous constituents.	Procedures relevant to analysis of hazardous wastes at Tank Car removal area.
40 C.F.R. Part 261, Appendix VIII	Applicable	Chemical	EPA	Hazardous Constituents	Provides a listing of hazardous constituents regulated under RCRA.	Relevant to determining hazardous waste designations at Tank Car removal area
40 C.F.R. § 261.20 (O.A.C. 3745-51-20)	Applicable	Chemical	EPA	Characteristics of Hazardous Waste - General	Provides general definitions for characteristic hazardous waste.	Wastes contained at Tank Car are characteristic wastes.
40 C.F.R. § 261.22 (O.A.C. 3745-51-22)	Applicable	Chemical	EPA	Characteristics of Corrosivity	Provides definition of corrosivity characteristic for hazardous waste determination.	Wastes at Tank Car are corrosive.

Table 3-6. Regulatory requirements for the removal and closure of the Nitric Acid Tank Car.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
40 C.F.R. § 261.24 (O.A.C. 3745-51-24)	Applicable	Chemical	EPA	Toxicity Characteristic	Provides definition of toxicity characteristic for hazardous waste determination based on the TCLP test.	Wastes contained in Tank Car or soils may meet TCLP designations.
40 C.F.R. § 264.600 to 264.602	Relevant and Appropriate	Action	EPA	Miscellaneous Units	Establishes standards for the design, construction, operation, maintenance, and closure of miscellaneous units.	The UNH treatment system is a miscellaneous unit and must comply with the substantive requirements.
40 C.F.R. § 265.13 (O.A.C. 3745-65-13)	Applicable	Action	EPA	General Waste Analysis	Requires that waste be analyzed before treatment, storage, or disposal.	During the removal action, the Tank Car waste and soils will need to be sampled and analyzed.
40 C.F.R. § 265.14 (O.A.C. 3745-65-14)	Applicable	Action	EPA	Security	Requires security for the hazardous waste management facility.	Security measures need to be complied with at the FEMP TSDF.
40 C.F.R. § 265.15 (O.A.C. 3745-65-15)	Applicable	Action	EPA	General Inspection Requirements	Requires that the TSDF perform routine inspections.	Hazardous waste from the Tank Car will be stored at an on-site TSDF.
40 C.F.R. § 265.16 (O.A.C. 3745-65-16)	Applicable	Action	EPA	Personnel Training	Requires that personnel at the TSDF be trained.	Hazardous waste from the Tank Car will be stored at an on-site TSDF.
40 C.F.R. § 265.17 (O.A.C. 3745-65-17)	Applicable	Action	EPA	General Requirements for Ignitable, Reactive, or Incompatible Wastes	Requires that precautions be taken to prevent accidental ignition or reaction of ignitable, reactive, or incompatible waste.	The Tank Car contents are a corrosive waste.

Table 3-6. Regulatory requirements for the removal and closure of the Nitric Acid Tank Car.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
40 C.F.R. §§ 265.30 to 265.37 (O.A.C. 3745-65-30 to 3745-65-37)	Applicable	Action	EPA	Operation Standards for Treatment, Storage and Disposal Facilities	Requires proper design and operation of the facility, proper equipment, testing and maintenance, access to communications or alarm systems, and required aisle space to allow unobstructed movement to protect personnel.	Any waste stored at on-site TSDF will need to comply with these requirements.
40 C.F.R. §§ 265.50 to 265.56 (O.A.C. 3745-65-50 to 3745-65-56)	Applicable	Action	EPA	Contingency Plans	Requires that TSD facilities have contingency plans designed to minimize hazards to human health and the environment.	Hazardous waste from Tank Car may be stored at FEMP TSDF.
40 C.F.R. §§ 265.70 to 265.77 (O.A.C. 3745-65-70 to 3745-65-77)	Applicable	Action	EPA	Recordkeeping and Reporting	Requires owners/operators of hazardous waste TSD facilities to keep operating records and waste reports.	Hazardous waste from Tank Car may be stored at FEMP TSDF.
40 C.F.R. §§ 265.91 to 265.96 (O.A.C. 3745-66-91 to O.A.C. 3745-66-96)	Applicable	Action	EPA	Releases from Solid Waste Management Units	Requires owners/operators of hazardous waste TSD facilities to conduct monitoring and response programs concerning releases from waste management units.	Hazardous waste from Tank Car may be stored at FEMP TSDF.
40 C.F.R. § 265.111 (O.A.C. 3745-66-11)	Applicable	Action	EPA	Closure Performance Standards	Requires the closure of an interim status hazardous waste disposal facility.	Tank Car and Area must comply with the closure requirements because the Tank Car and Area is a HWMU.
40 C.F.R. § 265.112 (O.A.C. 3745-66-12)	Applicable	Action	EPA	Closure Plan	Requires drafting of closure plan for hazardous waste management unit.	Tank Car and Area is hazardous waste management unit.

Table 3-6. Regulatory requirements for the removal and closure of the Nitric Acid Tank Car.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
40 C.F.R. § 265.114 (O.A.C. 3745-66-14)	Applicable	Action	EPA	Disposal or Decontamination of Equipment, Structures and Soils	Requires that contaminated equipment, structures and soils be disposed of or decontaminated prior to closure.	The contaminated equipment at the Tank Car must be decontaminated prior to closure.
40 C.F.R. § 265.115 (O.A.C. 3745-66-15)	Applicable	Action	EPA	Certification of Closure	Requires that owner/operator submit certification of registered PE that closure performed in accordance with closure plan.	Tank Car will be closed in accordance with CPID.
40 C.F.R. § 265.191 (O.A.C. 3745-66-91)	Applicable	Action	EPA	Assessment of Existing Tank System's Integrity	Provides requirements for assessing the integrity of tank systems which do not have secondary containment.	Hazardous waste from Tank Car will be stored in tanks.
40 C.F.R. § 265.192 (O.A.C. 3745-66-92)	Applicable	Action	EPA	Design and Installation of New Tank Systems or Components	Provides design requirements for installation for new hazardous waste tank system and components.	Hazardous waste from Tank Car will be stored in tanks.
40 C.F.R. § 265.193 (O.A.C. 3745-66-93)	Applicable	Action	EPA	Containment and Detection of Releases	Provides requirements for containment systems associated with hazardous waste storage tanks.	Hazardous waste from Tank Car will be stored in tanks.
40 C.F.R. § 265.194 (O.A.C. 3745-66-94)	Applicable	Action	EPA	General Operating Requirements	Provides operating requirements for hazardous waste disposal facilities that store hazardous waste in tank systems.	Hazardous waste from Tank Car will be stored in tanks.

Table 3-6. Regulatory requirements for the removal and closure of the Nitric Acid Tank Car. Page 12 of 14

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
40 C.F.R. § 265.195 (O.A.C. 3745-66-95)	Applicable	Action	EPA	Inspections	Requires owner/operator of hazardous waste disposal facility storing waste in tank systems to develop a schedule and procedures for inspecting overfill controls, tank and containment condition and tank pressure.	Hazardous waste from Tank Car will be stored in tanks.
40 C.F.R. § 270.70	Applicable	Action	EPA	Qualifying for Interim Status	Establishes the requirements for qualifying as an interim status facility	The FEMP is an interim status facility.
40 C.F.R. § 300.415	Applicable	Action	EPA	National Contingency Plan	Establishes the requirements for selecting an appropriate removal action and for complying with ARARs.	Tank Car and Area removal action is subject to this regulation and plan should comply with the requirements.
40 C.F.R. Part 302	Relevant and Appropriate	Action	EPA	CERCLA Reportable Quantities	Provides notification requirements for the release of reportable quantities of hazardous substances.	The Tank Car may be determined to have released hazardous substances in reportable quantities and therefore, the notification requirements will need to be met.
40 C.F.R. Part 268	Relevant and Appropriate	Chemical	EPA	Land Disposal Restrictions	Provides technology treatment requirements for hazardous constituents of concern which must be met prior to land disposal	The Tank Car liquid may be land disposed. Treatment technology standards will need to be met.
DOE Order 5000.3A	To Be Considered	Action	DOE	Occurrence Reporting and Processing of Operations Information	Establishes the requirements for reporting and processing of occurrences related to the operations of DOE facilities.	All operations, including the removal action, must comply with these requirements.

Table 3-6. Regulatory requirements for the removal and closure of the Nitric Acid Tank Car.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
DOE Order 5400.1	To Be Considered	Action	DOE	General Environmental Protection Program	Establishes environmental protection program requirements for DOE facilities.	Environmental protection program to be considered in planning removal action.
DOE Order 5400.5	To Be Considered	Chemical	DOE	Requirement for Radiation Protection of the Public and the Environment	Limit effective dose equivalent to the public and limit airborne radionuclides from DOE facilities.	Removal action will require compliance with radiation protection standards.
DOE Order 5480.11	To Be Considered	Chemical	DOE	Radiation Protection for Occupational Workers	Sets radiation exposure standards for occupational workers. Provides procedure for determining dose. Establishes DAC values for airborne radionuclide exposure and concentrations of radionuclides in drinking water in controlled areas.	Removal action will require compliance with radiation protection standards.
DOE Order 5480.23	To Be Considered	Action	DOE	Nuclear Facility Safety Analysis Reports	Provides requirements and guidelines for performing SAR.	Safety Analysis Plan is required as part of the work plan for the removal action.
DOE Order 5483.1A	To Be Considered	Action	DOE	OSHA Program for DOE Contractor Employees at Government Owned Contractor Facilities	Applies OSHA requirements to DOE facilities.	Removal action will need to comply with OSHA requirement to protect occupational workers.
DOE Order 5820.2A	To Be Considered	Action	DOE	Radioactive Waste Management of Low-Level Waste	Establishes policies, requirements and guidelines for managing DOE solid low-level waste.	Tank Car may be low-level waste subject to DOE requirements.

Table 3-6. Regulatory requirements for the removal and closure of the Nitric Acid Tank Car.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
O.A.C. 3701-38	Relevant and Appropriate	Chemical	Ohio Dept. of Health	Radiation Protection Standards	Establishes radiation protection standards for workers and the public. Establishes labeling requirements for containers storing radioactive wastes and materials.	Tank Car and Area removal action should consider radiation standards.
Guidance (May 28, 1991)	Applicable	Action	OEPA	Closure Plan Review Guidance	Provides description of process OEPA employs to determine closure.	Tank Car and Area is subject to OEPA closure requirements.
42 USC § 2011 et seq.	Applicable	Action	DOE	Atomic Energy Act	Provides the framework for managing radioactive waste.	Tank Car removal action may require management of radioactive waste.
42 USC § 4901 et seq.	Relevant and Appropriate	Action	EPA	Noise Control Act	Requires noise levels to be within limits that protect the health of the nation.	Noise controls should be considered in operating equipment during removal action.
42 USC § 6901 et seq.	Applicable	Action	EPA	Resource Conservation and Recovery Act	Required "cradle-to-grave" management of hazardous waste.	Compliance with RCRA is required under Compliance Agreement and Consent Decree.
42 USC § 9601 et seq.	Applicable	Action	EPA	Comprehensive Environmental Response, Compensation and Liability Act	Provides the framework for conducting removal actions.	CERCLA § 106 requires that the removal action be performed.

1/ This statute is proposed and therefore is To Be Considered.

4.0 CLOSURE CERTIFICATION

Pursuant to O.A.C. 3745-66-15 (40 C.F.R. § 265.115), upon closure of an HWMU, the owner or operator and a qualified, independent registered professional engineer (PE) licensed in Ohio must certify that the HWMU was closed in accordance with an approved written closure plan. The FEMP has agreed to provide certification that the Nitric Acid Tank Car was closed in accordance with this plan. Radiological issues as identified in this plan will be addressed in accordance with the FEMP Radiological Control Manual and associated standard operating procedures and policies.

The removal action discussed in this plan will be performed in accordance with the Amended Consent Decree, RCRA regulations, and all other applicable or relevant and appropriate requirements and guidance discussed in this document.

4.1 RCRA CLOSURE STANDARDS

4.1.1 Standard of Clean for Soil Verification Samples

Soil samples will be collected and analyzed for the Nitric Acid Tank Car's contaminants of concern (Section 3.3). The soil will be considered clean if none of the samples exceeds applicable standards. For pH and nitrates, these standards are provided by the Ohio EPA Closure Guidance Document. For TCLP metals, the standard of clean will be based on comparison to FEMP background metals concentrations as determined by the FEMP soil background study (Section 3.1.2). The soil will be considered clean if none of the samples exceeds the mean background concentration (based on total metals analysis) plus two standard deviations. For uranium, the soil will be considered clean if none of the samples exceeds 100 pCi/g, the level established by Removal Action No. 17 as the point at which contaminated soils require controlled storage.

4.1.2 Decontamination Verification of Tank Car

Decontamination will be verified based on samples from final rinseate of the Tank Car. Decontamination will be complete when the final rinseate samples contain concentrations of analytes at levels below the Decontamination Action Levels in Table 4-1. Uranium action levels will be based on the limits in 10 C.F.R. § 20.2003 and DOE Order 5400.5.

The Decontamination Action Levels enumerated in Table 4-1 have been established based upon OEPA guidance (OEPA 1991). The OEPA guidance requires that decontamination rinsates meet the following clean levels.

(1) Fifteen times the public drinking water maximum contaminant level for hazardous waste constituents as promulgated in 40 C.F.R. § 141.11 and O.A.C. 3745-81-11 for organics;

(2) If an MCL is not available for a particular contaminant, then fifteen times the maximum contaminant level goal (MCLG) as promulgated in 40 C.F.R. § 141.50; or

(3) If the product of fifteen times the MCL or MCLG exceeds 1 mg/l or if neither an MCL nor an MCLG is available for a particular contaminant, then 1 mg/l shall be the standard.

4.2 CERTIFICATION INSPECTIONS

Certification inspections shall be conducted to ensure that the Nitric Acid Tank Car is closed in accordance with this plan. The major emphasis of the closure inspection will be:

- To ensure that the sample collection techniques described in Section 3.0 are used;

Table 4-1. Decontamination action levels.

Analyte	MCL/MCLG (mg/l)[1/]	Decontamination Action Levels[2/]
Arsenic	0.05	0.75
Barium	1.0	1.0
Cadmium	0.01	0.15
Chromium	0.05	0.75
Lead	0.05	0.75
Mercury	0.002	0.03
Nickel	0.1	1.0
Selenium	0.01	0.15
Silver	0.05	0.75
Nitrate	10.0	1.0
pH	-	6 to 9

1/ Maximum Contaminant Levels or Maximum Contaminant Level Goals as listed in 40 C.F.R. Parts 141 and 142, and O.A.C. 3745-81-11.
2/ pH range is not characteristic of corrosivity.

- To ensure that the Nitric Acid Tank Car is properly cleaned and decontaminated;

- To ensure that all rinsate water is properly stored, labeled and characterized; and

- To ensure that all soil contaminants are removed and dispositioned in accordance with Removal Action No. 17.

4.3 CERTIFICATION DOCUMENTS

All partial and full closures of HWMU must be certified by both the owner or operator and a qualified, independent registered PE licensed in Ohio. The FEMP has agreed to provide certification. The certification provided by the FEMP will include the following:

(1) Certification Statement;

(2) The approved plan or reference to the plan;

(3) Description of volume of waste removed;

(4) All correspondence regarding closure activity after OEPA approval;

(5) Details of sampling and analysis methods (including, copies of hazardous waste manifests and chain of custody forms used for sample handling and tracking);

(6) Copies of Laboratory analyses reports;

(7) Narrative describing all activities during closure (this narrative may be presented in the form of a daily log of activities or field notes recorded by the owner or operator); and

(8) Signature of owner or operator.

4.4 STATEMENT OF CERTIFICATION

The FEMP will submit a Certification of RCRA Closure within 60 days after the Nitric Acid Tank Car closure is complete. The Certification will comply with the provisions of O.A.C. 3745-66-15 and 40 C.F.R. § 265.115. The Certification will state the following:

"Based on information made available to me, I....., (Title)...., do hereby certify that to the best of my knowledge, the Nitric Acid Tank Car has been closed in accordance with the closure plan information and data for the Nitric Acid Tank Car as approved by the Ohio EPA on....(date)."

4.5 POST-CLOSURE PLAN

Because this plan contemplates clean closure of the Nitric Acid Tank Car and Area after removal of the Tank Car, no post-closure care is anticipated.

4.6 NOTICE IN DEED

A notation in the property deed is required under O.A.C. 3745-66-19(b)(1) for areas that require post-closure care. Because the Nitric Acid Tank Car and Area will not require post-closure care, these notice requirements will not be necessary.

5.0 SCHEDULE

A proposed milestone schedule for the removal action is presented in Table 5-1. Actual dates are not specified because they are contingent upon OEPA and EPA approval of this plan.

Table 5-1. Milestones for the action schedule.

Milestone	Activity Duration (months)	Cumulative Duration (months)[1/]
Work Plan Approval	Start	0
Identify and Train Removal Staff	1	1
Perform Removal Preparations/Design	1	2
Transfer to Tank 17, Decontaminate Tank Car, Perform Soil Sampling and Removal	4	6
Final Report	2	8

[1/] Number of months from approval of the work plan.

A detailed, activity-specific schedule shall be included in the finalized work package for the removal action.

6.0 REFERENCES

EPA. 1991. *U.S. Department of Energy, Feed Materials Production Center, Fernald, Ohio (OHG 890 008 976), Consent Agreement as Amended Under CERCLA Sections 120 and 106(a).* Administrative Docket Number: V-W-90-C-057.

OEPA. 1990. *Review of Groundwater Sampling and Analysis Plans.* pp 0303.200.

OEPA. 1991. *Closure Plan Review Guidance.* May 28, 1991.

State of Ohio. 1988. *Consent Decree, Civil Action C-1-86-0217 and Current Proposed Amended Consent Decree Draft 6.* December 4, 1990.

WEMCO. 1990. *FMPC Site Health and Safety Plan.* Westinghouse Environmental Management Company of Ohio, June 1990.

WEMCO. 1992. *Improved Storage of Soil and Debris Removal Action 17 Work Plan.* Westinghouse Environmental Management Company of Ohio, Fernald, Ohio.

WEMCO. 1991. *Documentation Supporting Fernald Environmental Management Project Safe Shutdown Removal Action 12.* Westinghouse Environmental Management Company of Ohio, Fernald, Ohio.

WEMCO. 1992. *Removal of Waste Inventories Removal Action 9 Work Plan.* Westinghouse Environmental Management Company of Ohio, Fernald, Ohio.

WEMCO. 1991. *Fernald Environmental Management Project Background Sampling Plan.* Westinghouse Environmental Management Company of Ohio, Fernald, Ohio.

ATTACHMENT 1
REMOVAL SITE EVALUATION

NITRIC ACID TANK CAR AND AREA
Removal Action Work Plan and
Closure Plan Information and Data Package

Fernald Environmental Management Project

January 1993

CONTENTS

FIGURES

ACRONYMS AND ABBREVIATIONS

C.F.R.	Code of Federal Regulations
DOE	Department of Energy
EPA	Environmental Protection Agency
FEMP	Fernald Environmental Management Project
FMPC	Feed Materials Production Center
HNO_3	nitric acid
HWMU	hazardous waste management unit
MSDS	Material Safety Data Sheet
O.A.C.	Ohio Administrative Code
RSE	Removal Site Evaluation
UNH	uranyl nitrate hexahydrate

1.0 INTRODUCTION

Section IX.F.2 of the Amended Consent Agreement between the U. S. Department of Energy (DOE) and the U.S. Environmental Protection Agency (EPA) of September 20, 1991 requires the DOE to submit to the EPA a Removal Action Work Plan to support the Nitric Acid Tank Car and Area removal action. In compliance with the requirements of Part 300, Section 410 of Title 40 of the Federal Code (40 C.F.R. 300.410), this document will evaluate this site within the context of potential hazards to employees and the public, as well as the appropriateness of the proposed removal action. The scope for this Removal Site Evaluation (RSE) encompasses 1) sampling of the Tank Car contents to confirm volume and chemical characteristics; 2) removal and transfer of the Tank Car contents to the Process Water Storage Tank (Tank 17); 3) decontamination and disposal of the Tank Car itself; and 4) sampling and analysis of potentially contaminated soils. The removal of contaminated soil which might exist below the Tank Car will be addressed in the final remediation of OU-5.

The Nitric Acid Tank Car (No. DODX17135) is currently located on a railway siding in the northeast corner of the Fernald Environmental Management Project (FEMP) site (Figure 1-1). The tank car and that portion of the FEMP site interior track system upon which the car currently resides (Figure 1-2) has been determined to be a hazardous waste management unit (HWMU) because waste nitric acid possesses the hazardous waste characteristic of corrosivity (EPA Hazardous Waste No. D002) and has been stored in the car for an excess of 90 days.

When the Feed Materials Production Center (FMPC [now FEMP]) was producing uranium metal, nitric acid (HNO_3) was an important process chemical used in the formation of uranyl nitrate hexahydrate (UNH) solution which then chemically transformed into uranium tetrafluoride. Nitric acid was also used throughout the FMPC production area for acid cleaning and/or metal pickling operations. From 1975 until 1981, more than 56 million pounds of concentrated (55 to 60 percent) nitric acid was purchased.

During peak production, Tank Car DODX17135 was used as an efficient means of temporary storage HNO_3 storage. It could provide 100,000 pounds of mobile storage capacity. The car was normally kept on a rail siding until either its contents or storage capacity were needed elsewhere on site. Following acid transfers, the car was returned to the siding.

Visual inspection of the car indicates that there is a relatively small amount of liquid remaining in the tank, estimated at between 50 to 100 gallons. Though small, the volume is sufficient to preclude exemption from the hazardous waste classification under the "empty container rule" (40 C.F.R. 261.7 and Ohio Administrative Code [O.A.C.] 3745-51-07). The material in the tank car is not considered to be unused acid, nor is it intended for future use.

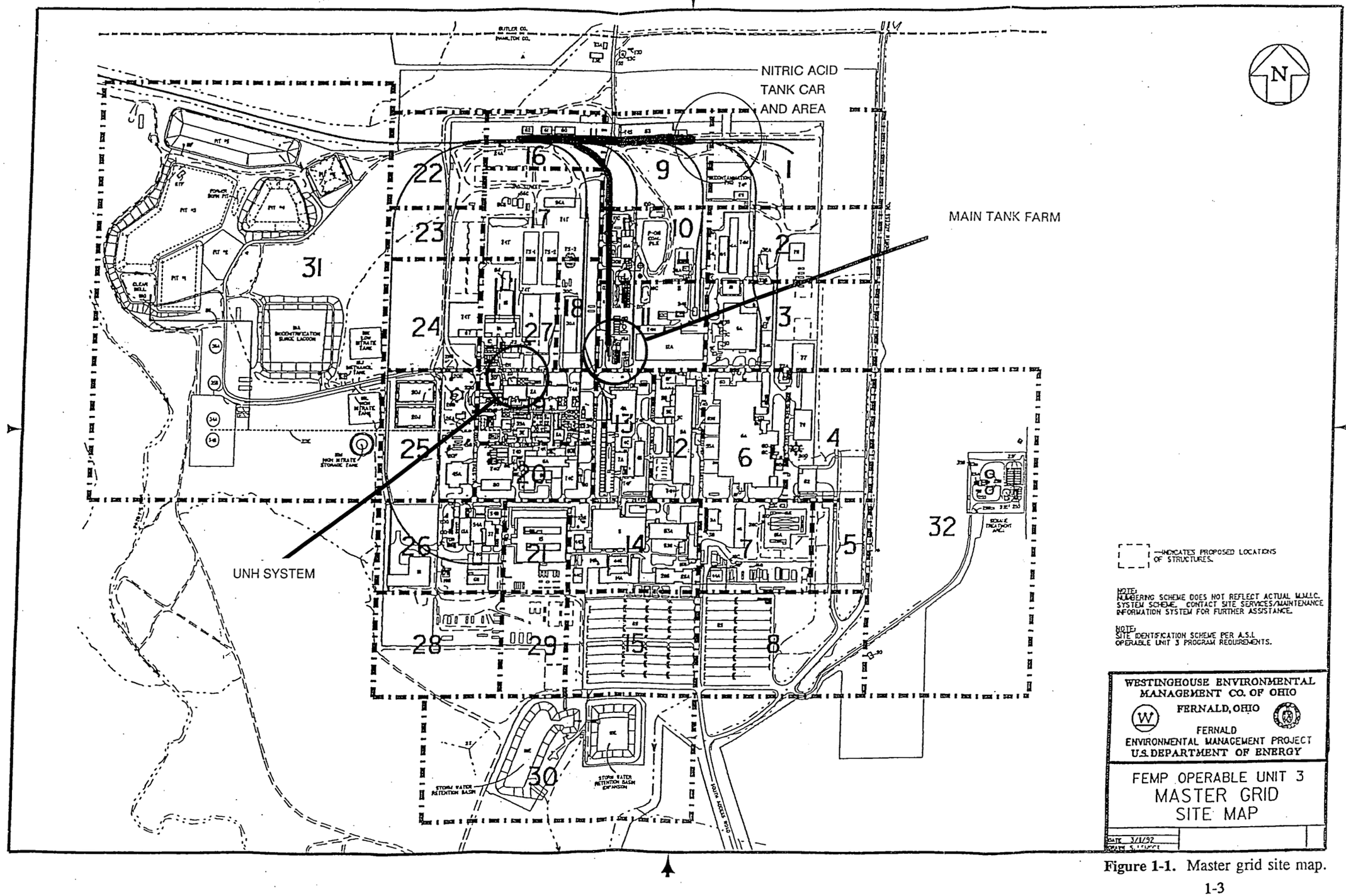

Figure 1-1. Master grid site map.

C-4

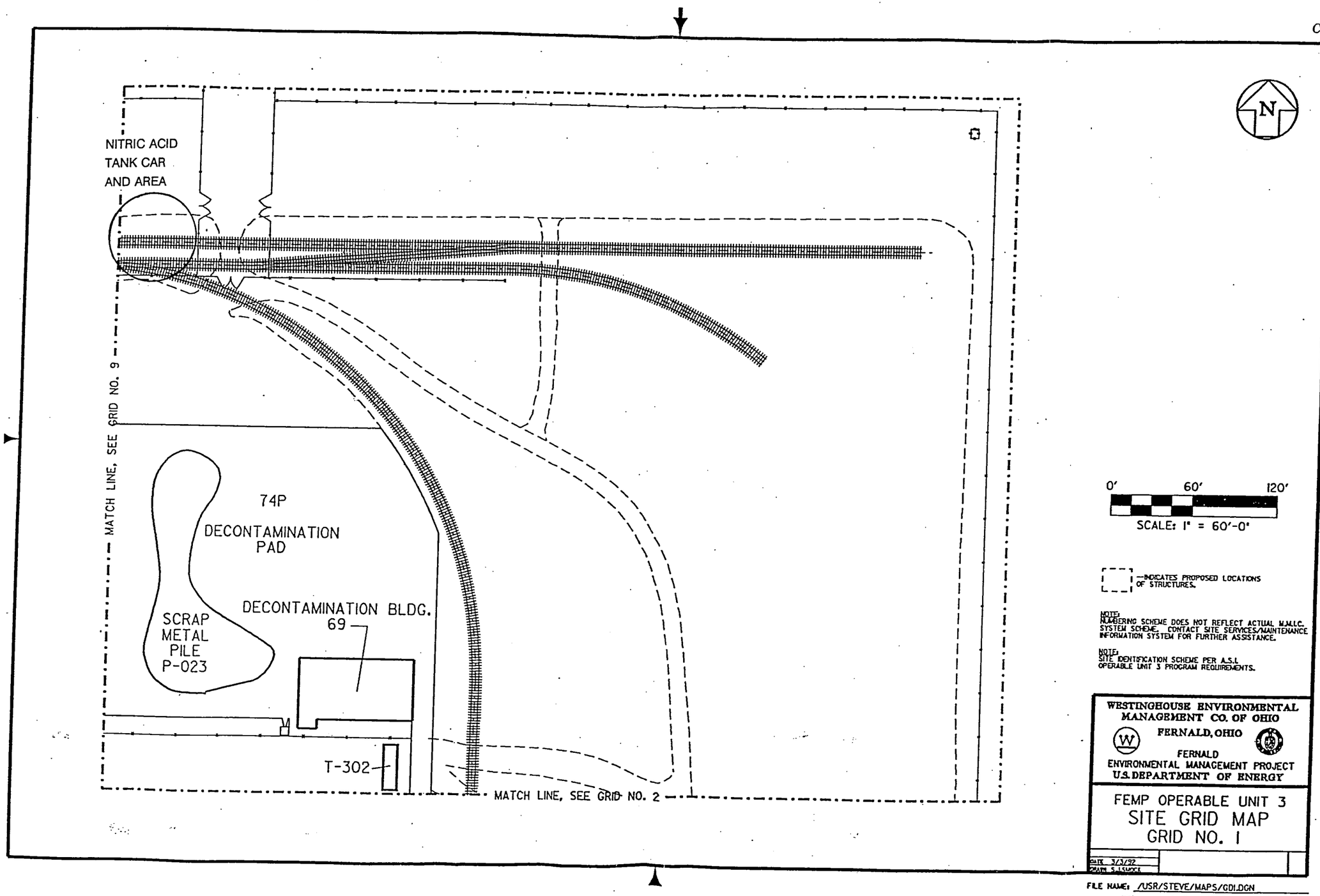

Figure 1-2. Grid no. 1.

2.0 SOURCE TERM

The Tank Car and surrounding area are inspected daily in compliance with inspection requirements for hazardous waste storage tanks (40 C.F.R. 265.195). In addition, the contents have been sampled and analyzed for total uranium and normality.

2.1 INSPECTION AND SAMPLING RESULTS

Daily inspections of the Tank Car have not revealed evidence of leakage or brought into question tank integrity. Although the Tank Car itself appears to be in a state of disrepair due to long disuse, a more thorough inspection is necessary to confirm its condition.

Analysis of the tank contents revealed that the liquid is approximately 3 N HNO_3 with a pH of less than 1, and contains approximately 2 ppm uranium. The normality of the liquid is substantially different from that of the concentrated reagent used during production (12 N). No information is currently available to explain this difference; two possible explanations are that: 1) the liquid is a rinsate left after a limited decontamination effort, or 2) the acid contents may have been partially neutralized prior to moving the Tank Car to its current location.

The uranium concentration is very low, on the order of 1,400 pCi/l on a specific activity basis. Based on the low uranium concentration and the knowledge that the primary use for HNO_3 was in the manufacture of uranium metal, the tank contents will not be considered to be a radiological hazard for the purpose of this RSE. No information is currently available regarding the presence or absence of other potentially hazardous components.

2.2 PATHWAY ASSESSMENT

The volume of liquid estimated to be contained in the Tank Car is too small to pose a threat to either groundwater or surface water in the event the Tank was to leak all of its contents. The Tank Car contents have been determined to be neither flammable nor explosive, precluding transport off site via such an event. Although HNO_3 reacts aggressively with certain materials, the introduction of these materials under current storage conditions is unlikely.

The most credible pathway for release of the hazardous contents to the environment is loss of tank integrity resulting in contamination of the immediate environment but not external to the FEMP site. At risk would be members of the on-site workforce, including hazardous material clean-up crews, and various flora and fauna potentially contacted by the corrosive liquid.

3.0 EVALUATION OF THE MAGNITUDE OF THE POTENTIAL THREAT

The available data does not allow a quantitative evaluation of the exposure pathway identified in Section 2.2. However, the sample analysis results can be compared with applicable regulatory requirements and guidance to yield a qualitative assessment of potential hazards associated with the Tank Car contents. The results and criteria are:

Nitric Acid: The potential hazards from HNO_3 contamination in the environment and on personnel are related directly to its corrosive and reactive nature. To provide a qualitative indication of potential impacts from contact with the Tank Car contents, the Material Safety Data Sheet (MSDS) is provided in Attachment 1. The MSDS lists key chemical data within the context of worker safety and health. Symptoms from exposure to various levels of HNO_3 are provided in Attachment 2.

Uranium: The magnitude of the potential impact from uranium contamination is assessed against the criteria for release to a sanitary sewer found in DOE Order 5400.5. The allowable level for natural uranium found in this order is 3E+03 pCi/l. Comparing this to the 1,400 pCi/l value for the Tank Car contents indicates that the uranium concentration is about one-half the allowable limit. The magnitude of the potential threat from uranium contained in the Tank Car contents is negligible.

4.0 ASSESSMENT OF THE NEED FOR A REMOVAL ACTION

Consistent with 40 C.F.R. Part 300.410 of the National Contingency Plan, DOE shall determine the appropriateness of a removal action. Of the eight factors to be considered in this determination, the following apply specifically to the Nitric Acid Tank Car:

40 C.F.R. 300.415

> (b)(2)(iii) - *Hazardous substances or pollutants or contaminants in drums, barrels, tanks, or other bulk storage containers, that may pose a threat of release:*

The applicability of this criterion is based on the assessment of construction and operating history of the Nitric Acid Tank Car as well as the results of sampling and analysis efforts. In addition, the pathway identified in Section 2.2 represents credible routes of exposure to man. These two facts support the need for the removal action.

5.0 APPROPRIATENESS OF A RESPONSE

A removal action is determined to be the appropriate response considering the hazardous nature of the Nitric Acid Tank Car contents, the potential for personnel injury, and the regulatory impact of an unplanned release.

6.0 REFERENCES

Code of Federal Regulations, Title 40, Part 261

Code of Federal Regulations, Title 40, Part 265

Code of Federal Regulations, Title 40, Part 300.

Ohio Administrative Code, Section 3745-51-07.

U.S. Department of Energy. 1990. *Radiation Protection of the Public and Environment.* DOE Order 5400.5, June 1990.

U.S. Department of Health and Human Services. 1981. *Occupational Health Guidelines for Chemical Hazards*. Publication No. 81-123, January 1981.

Nitric Acid, 10-20%

MATERIAL SAFETY DATA SHEET 4042

SECTION 1

Manufacturer's Name:	Westinghouse Materials Company of Ohio
Mailing Address:	P. O. Box 39870 Cincinnati, OH 45239
Shipping Address:	7400 Willey Road Fernald, OH 45030
Manufacturer's Emergency Telephone No.:	(513) 738 - 6511
Other Information Calls:	(513) 738 - 6212
Date MSDS Revised:	01/86

SECTION 2 - HAZARDOUS INGREDIENTS / IDENTITY

Principal Hazardous Components (synonyms)	Percent	PEL	1984/5 TLV	Other Limits
Nitric Acid (aqueous HNO_3)	10-20 by weight	2 ppm	2 ppm	5 ppm *

* ACGIH 1984/5 Short-Term Exposure Limit

SECTION 3 - PHYSICAL & CHEMICAL CHARACTERISTICS

Boiling Pt.(F)	~212°	Specific Gravity (H_2O=1.0)	Unknown
Vapor Pressure (mm Hg)	Unknown	Vapor Density (Air=1)	Unknown
Water Solubility	Complete	Water Reactivity	Exothermic Solution
Melting Pt.(F)	N/A	pH	< 1
Appearance & Odor	Water-like liquid having bitter fumes and taste		

SECTION 4 - FIRE & EXPLOSION DATA

Flammable? No

Protective Equipment: (See Section 8)

Unusual Fire or Explosion Hazards:

1. Releases mixture of toxic corrosive nitrous fumes (NO_x) and nitric acid vapor when heated.
2. May produce fire or explosion by violent reaction with reducing agents including but not limited to: acetic acid,acetic anhydride, (acetone+acetic acid), (acetone+sulfuric acid), acetylene, acrolein, acrylonitrile, allyl alcohol, allyl chloride, 2-amino ethanol, ammonia, ammonium hydroxide, aniline, anion exchange resins, (dichromate+anion exchange resins, antimony, antimony hydride, arsine, bismuth, boron, B_4H_{10}, boron decahydride, boron phosphide, bromine pentafluoride, n-butyraldehyde, calcium hypophosphite, carbon, cesium carbide,4-chloro-2-nitroaniline, chlorine trifluoride, chlorosulfonic acid, cresol, cumene, Cu_3N2, CuN_3, cyanides, cyclic ketones, cyclohexanol, cyclohexanone, diborane, 2,6-di-tbutyl phenol, diisopropyl ether, epichlorohydrin, ethanol, m-ethyl-aniline, eythlene diamine, ethylene imine, 5-ethyl-2-picolene, $C_2H_5PH_2$, iron II oxide, fluorine, furfuryl alcohol, germanium, glyoxal, hydrozine, hydrogen iodide, hydrogen peroxide, isoprene, (ketones+hydrogen peroxide), (lactic acid+hydrogen fluoride), lithium, lithium silicide, magnesium, magnesium phosphide, magnesium-titanium alloy, maganese, mesitylene, mesityl oxide, 2-methyl-5-ethyl-pyridine, 4-methyl-cyclohexanone, neodymium phosphide, nitrobenzene, oleum, organic matter, PH_3, PH_4I, phosphorous, P_4I_3, PCl_3, phthalic acid, phthalic anhydride, KH_2PO_2, beta-propriolactone, pyridine, RB_2C_2, selenium, selenium iodophosphide, (silver+ethanol), sodium, NaN_3, sodium hydroxide, sulfamic acid, (glycerides+sulfuric acid), terpenes, thiocyanates, thiophene, titanium, (sulfuric acid+n-hexane), toluidine, triazine, unsym.-dimethyl hydrazine, uranium, uranium-neodymium alloy, uranium-neodymium-zirconium alloy, vinylacetate, vinylidene chloride, zinc.

Occupational Health Guideline for Nitric Acid

INTRODUCTION

This guideline is intended as a source of information for employees, employers, physicians, industrial hygienists, and other occupational health professionals who may have a need for such information. It does not attempt to present all data; rather, it presents pertinent information and data in summary form.

SUBSTANCE IDENTIFICATION

- Formula: HNO_3
- Synonyms: Aqua fortis; white fuming nitric acid (WFNA); red fuming nitric acid (RFNA); hydrogen nitrate
- Appearance and odor: Colorless, yellow, or red fuming liquid with a suffocating, acrid odor.

PERMISSIBLE EXPOSURE LIMIT (PEL)

The current OSHA standard for nitric acid is 2 parts of nitric acid per million parts of air (ppm) averaged over an eight-hour work shift. This may also be expressed as 5 milligrams of nitric acid per cubic meter of air (mg/m^3). NIOSH has recommended a permissible exposure limit of 2 ppm averaged over a work shift of up to ten hours per day, forty hours per week. The NIOSH Criteria Document for Nitric Acid should be consulted for more detailed information.

HEALTH HAZARD INFORMATION

- **Routes of exposure**

Nitric acid can affect the body if it is inhaled or if it comes in contact with the eyes or skin. It can also affect the body if it is swallowed.

- **Effects of overexposure**

1. Short-term Exposure: Nitric acid vapor or mist is an irritant of the eyes, nose, throat, and skin. Liquid nitric acid or high concentrations of nitric acid vapor may cause severe burns of the eyes with permanent damage. Liquid nitric acid or high concentrations of nitric acid vapor may produce skin burns and ulcers. Nitric acid may stain the skin a bright yellow. Exposure to high concentrations of nitric acid vapor may cause severe breathing difficulties which may be delayed in onset and may also cause pneumonia. Swallowing nitric acid may cause burns of the mouth, throat, and stomach.

2. Long-term Exposure: Repeated or prolonged exposure to nitric acid mists or strong concentrations of nitric acid vapors may cause erosion of the exposed teeth.

3. Reporting Signs and Symptoms: A physician should be contacted if anyone develops any signs or symptoms and suspects that they are caused by exposure to nitric acid.

- **Recommended medical surveillance**

The following medical procedures should be made available to each employee who is exposed to nitric acid at potentially hazardous levels:

1. Initial Medical Examination:

—A complete history and physical examination: The purpose is to detect pre-existing conditions that might place the exposed employee at increased risk, and to establish a baseline for future health monitoring. Examination of the eyes, respiratory tract, skin, and teeth should be stressed. The skin should be examined for evidence of chronic disorders.

—14" x 17" chest roentgenogram: Nitric acid causes human lung damage. Surveillance of the lungs is indicated.

—FVC and FEV (1 sec): Nitric acid is a respiratory irritant. Persons with impaired pulmonary function may be at increased risk from exposure. Periodic surveillance is indicated.

—Eye disease: Nitric acid is a severe eye irritant and may cause tissue damage. Those with pre-existing eye problems may be at increased risk from exposure.

—Skin disease: Weak nitric acid is a defatting agent and can cause dermatitis on prolonged exposure. Persons with pre-existing skin disorders may be more susceptible to the effects of this agent.

These recommendations reflect good industrial hygiene and medical surveillance practices and their implementation will assist in achieving an effective occupational health program. However, they may not be sufficient to achieve compliance with all requirements of OSHA regulations.

* Extracted from Occupational Health Guidelines for Chemical Hazards, NIOSH/OSHA PB83-154609, January 1981.

2. Periodic Medical Examination: The aforementioned medical examinations should be repeated on an annual basis or at some other frequency to be determined by the responsible physician.

• **Summary of toxicology**

Nitric acid vapor or mist is an irritant of the eyes, mucous membranes, and skin. When nitric acid is exposed to air or comes in contact with organic matter, it decomposes to yield a mixture of toxic oxides of nitrogen, including nitric oxide and nitrogen dioxide. Exposure to high concentrations of nitric acid vapor or mist causes pneumonitis and pulmonary edema which may be fatal; onset of symptoms may be delayed for 4 to 30 hours. In contact with the eyes, the liquid produces severe burns which may result in permanent damage and visual impairment. On the skin, the liquid or concentrated vapor produces immediate, severe and penetrating burns; concentrated solutions cause deep ulcers and stain the skin a bright yellow or yellowish-brown color. The vapor and mist may erode the exposed teeth. Ingestion of the liquid will cause immediate pain and burns of the mouth, esophagus, and gastrointestinal tract.

CHEMICAL AND PHYSICAL PROPERTIES

• **Physical data**

1. Molecular weight: 63 (solute)

2. Boiling point (760 mm Hg): 121.6 C (251 F) (for "constant boiling," 68%); 84 C (183 F) (white fuming nitric acid); 60 C (140 F) (red fuming nitric acid)

3. Specific gravity (water = 1): 1.41 (constant boiling); 1.5 (white fuming); 1.55 (red fuming)

4. Vapor density (air = 1 at boiling point of nitric acid): 2— 3 approximately

5 Melting point: —41 C (—42 F) (for "constant boiling," 68%); —41.6 C (—43 F) (white fuming); —52 C (—61 F) (red fuming)

6. Vapor pressure at 20 C (68 F): 2.9 mm Hg (HNO3) (constant boiling), 2.6 mm Hg (H2O) (constant boiling); 62 mm Hg (white fuming); 103 mm Hg (red fuming)

7. Solubility in water, g/100 g water at 20 C (68 F): Miscible in all proportions

8. Evaporation rate (butyl acetate = 1): Data not available

• **Reactivity**

1. Conditions contributing to instability: Elevated temperatures may cause containers to burst and liberate toxic oxides of nitrogen.

2. Incompatibilities: Reacts explosively with combustible organic or readily oxidizable materials such as wood, turpentine, metal powders, hydrogen sulfide, etc. Contact with strong bases may cause violent spattering.

3. Hazardous decomposition products: Toxic gases and vapors (such as oxides of nitrogen) may be released when nitric acid decomposes.

4. Special precautions: Nitric acid will attack some forms of plastics, rubber, and coatings.

• **Flammability**

1. Not combustible, but is a strong oxidizer.

• **Warning properties**

1. Odor Threshold: No quantitative information is available concerning the odor threshold of nitric acid.

2. Eye Irritation Level: The AIHA *Hygienic Guide*, concerning eye contact with nitric acid, states that "nitric acid produces very severe immediate damage which may result in permanent damage and visual impairment."

3. Other Information: The AIHA *Hygienic Guide* notes that "'nitrous fumes,' expressed in terms of nitrogen dioxide, may cause immediate irritation of the throat at concentrations as low as 62 ppm."

4. Evaluation of Warning Properties: Patty points out that "nitric acid manufacture is more hazardous than hydrochloric acid manufacture in that . . . the oxides of nitrogen have inadequate warning properties in low, toxic concentrations." For the purposes of this guideline, nitric acid is treated as a material with poor warning properties.

MONITORING AND MEASUREMENT PROCEDURES

• **General**

Measurements to determine employee exposure are best taken so that the average eight-hour exposure is based on a single eight-hour sample or on two four-hour samples. Several short-time interval samples (up to 30 minutes) may also be used to determine the average exposure level. Air samples should be taken in the employee's breathing zone (air that would most nearly represent that inhaled by the employee).

• **Method**

Nitric acid may be measured by collection of nitric acid in a midget impinger, followed by ultraviolet spectrophotometric analysis. An analytical method for nitric acid is in the *NIOSH Manual of Analytical Methods*, 2nd

RESPIRATORS

• Good industrial hygiene practices recommend that engineering controls be used to reduce environmental concentrations to the permissible exposure level. However, there are some exceptions where respirators may be used to control exposure. Respirators may be used when engineering and work practice controls are not technically feasible, when such controls are in the process of being installed, or when they fail and need to be supplemented. Respirators may also be used for operations which require entry into tanks or closed vessels, and in emergency situations. If the use of respirators is necessary, the only respirators permitted are those that have been approved by the Mine Safety and Health Administration (formerly Mining Enforcement and Safety Administration) or by the National Institute for Occupational Safety and Health.

* Extracted from Occupational Health Guidelines for Chemical Hazards, NIOSH/OSHA PB83-154609, January 1981.

• In addition to respirator selection, a complete respiratory protection program should be instituted which includes regular training, maintenance, inspection, cleaning, and evaluation.

PERSONAL PROTECTIVE EQUIPMENT

• Employees should be provided with and required to use impervious clothing, gloves, face shields (eight-inch minimum), and other appropriate protective clothing necessary to prevent any possibility of skin contact with liquid nitric acid or liquids containing nitric acids having a pH equal to or less than 2.5.

• Employees should be provided with and required to use impervious clothing, gloves, face shields (eight-inch minimum), and other appropriate protective clothing necessary to prevent repeated or prolonged skin contact with solutions containing nitric acid having a pH greater than 2.5.

• Clothing contaminated with nitric acid should be placed in closed containers for storage until it can be discarded or until provision is made for the removal of nitric acid from the clothing. If the clothing is to be laundered or otherwise cleaned to remove the nitric acid, the person performing the operation should be informed of nitric acid's hazardous properties.

• Where there is any possibility of exposure of an employee's body to liquid nitric acid or solutions containing nitric acid having a pH equal to or less than 2.5, facilities for quick drenching of the body should be provided within the immediate work area for emergency use.

• Non-impervious clothing which becomes contaminated with nitric acid should be removed immediately and not reworn until the nitric acid is removed from the clothing.

• Employees should be provided with and required to use splash-proof safety goggles where there is any possibility of liquid nitric acid or solutions containing nitric acid contacting the eyes.

• Where there is any possibility that employees' eyes may be exposed to liquid nitric acid or solutions containing nitric acid having a pH equal to or less than 2.5, an eye-wash fountain should be provided within the immediate work area for emergency use.

SANITATION

• Skin that becomes contaminated with nitric acid should be immediately washed or showered to remove any nitric acid.

COMMON OPERATIONS AND CONTROLS

The following list includes some common operations in which exposure to nitric acid may occur and control methods which may be effective in each case:

Operation	Controls
Use in metallurgy as a pickling agent; in metal refining, ore recovery, metal etching, and photoengraving	Local exhaust ventilation; general dilution ventilation; personal protective equipment
Use in acidulation of phosphate rock and manufacture of nitrogen solutions for use in fertilizer industry	Local exhaust ventilation; general dilution ventilation; personal protective equipment
Use as a laboratory reagent; in wood pulping industry	Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment
Use during inorganic synthesis in manufacture of fertilizers, explosives, herbicides, antibiotics, meat-curing, pickling, ceramics, and pharmaceuticals	Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment
Use during organic synthesis in manufacture of nitrating and oxidizing agents, nylons, foams, lubricants, insecticides, dyes, explosives, photographic films, lacquers, and celluloids	Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment

EMERGENCY FIRST AID PROCEDURES

In the event of an emergency, institute first aid procedures and send for first aid or medical assistance.

• **Eye Exposure**

If nitric acid or strong concentrations of nitric acid vapors get into the eyes, wash eyes immediately with large amounts of water, lifting the lower and upper lids occasionally. If irritation is present after washing, get medical attention. Contact lenses should not be worn when working with this chemical.

• **Skin Exposure**

If nitric acid or strong concentrations of nitric acid vapors get on the skin, immediately flush the contaminated skin with water. If nitric acid soaks through the clothing, remove the clothing immediately and flush the skin with water. Get medical attention immediately.

• **Breathing**

If a person breathes in large amounts of nitric acid, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration.

* Extracted from Occupational Health Guidelines for Chemical Hazards, NIOSH/OSHA PB83-154609, January 1981.

Keep the affected person warm and at rest. Get medical attention as soon as possible.

• **Swallowing**

When nitric acid has been swallowed and the person is conscious, give the person large quantities of water immediately to dilute the nitric acid. Do not attempt to make the exposed person vomit. Do not make an unconscious person vomit. Get medical attention immediately.

• Rescue

Move the affected person from the hazardous exposure. If the exposed person has been overcome, notify someone else and put into effect the established emergency rescue procedures. Do not become a casualty. Understand the facility's emergency rescue procedures and know the locations of rescue equipment before the need arises.

SPILL, LEAK, AND DISPOSAL PROCEDURES

• Persons not wearing protective equipment and clothing should be restricted from areas of spills or leaks until cleanup has been completed.

• If nitric acid is spilled or leaked, the following steps should be taken:

1. Ventilate area of spill or leak.
2. Flush with copious quantities of water and neutralize with alkaline material (such as soda ash, lime, etc)..

• Waste disposal method:

Nitric acid may be disposed of by neutralizing with water and alkaline material (such as soda ash, lime, etc). and disposing in a secured sanitary landfill.

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* Extracted from Occupational Health Guidelines for Chemical Hazards, NIOSH/OSHA PB83-154609, January 1981.

RESPIRATORY PROTECTION FOR NITRIC ACID

Condition	Minimum Respiratory Protection* Required Above 5 mg/m³
Particulate or Vapor Concentration	
250 mg/m³ or less	A chemical cartridge respirator with a full facepiece providing protection against nitric acid.**
	A gas mask with a chin-style or a front- or back-mounted organic vapor canister providing protection against nitric acid.
	Any supplied-air respirator with a full facepiece, helmet, or hood.
	Any self-contained breathing apparatus with a full facepiece.
	A Type C supplied-air respirator operated in pressure-demand or other positive pressure or continuous-flow mode.
Greater than 250 mg/m³*** or entry and escape from unknown concentrations	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.
	A combination respirator which includes a Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure or continuous-flow mode and an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
Fire Fighting	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.
Escape	Any gas mask containing non-oxidizable sorbents and providing protection against nitric acid.
	Any escape self-contained breathing apparatus.

*Only NIOSH-approved or MSHA-approved equipment should be used.

**Nitric acid is an oxidizer and should not come in contact with oxidizable materials. Some cartridges and canisters may contain oxidizable materials, such as activated charcoal, and therefore and should not be used to provide protection against nitric acid. Only non-oxidizable sorbents are allowed.

***Use of supplied-air suits may be necessary to prevent skin contact while providing respiratory protection from airborne concentrations of nitric acid; however, this equipment should be selected, used, and maintained under the immediate supervision of trained personnel. Where supplied-air suits are used above a concentration of 250 mg/m³, an auxiliary self-contained breathing apparatus operated in positive pressure mode should also be worn.

* Extracted from Occupational Health Guidelines for Chemical Hazards, NIOSH/OSHA PB83-154609, January 1981.

ATTACHMENT 2
ANALYTICAL SUPPORT LEVELS

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The intended use of acquired data is to asses the nature of the site and the degree and extent of potential problems resulting from past activities, to evaluate the potential hazard to human health and the environment, to evaluate remedial actions, to choose and implement preferred remedial actions, and to monitor the migration of contaminants and the effectiveness of remedial actions.

Data Quality Objectives (DQOs) are qualitative and quantitative statements specifying the quality of data required to support decision making. Because they are based on end use of the data to be collected, different uses require different levels of data quality. There are five Fernald Environmental Management Project (FEMP)-defined analytical levels that will be assigned depending on intended use of the data and the Quality Assurance/Quality Control (QA/QC) methods required to achieve the desired level of quality. These levels are analogous to the 1987 EPA-defined DQO levels 1 through 5 (U.S. Environmental Protection Agency [EPA] 1987). However, because radionuclides comprise a large proportion of the analyses supporting FEMP programs and projects and because these radionuclide analyses have been used and verified by DOE and DOE contractors for many years, it is appropriate to address these measurements as standard. Therefore, in order to maintain consistency in definition of DQO levels and to avoid confusion between EPA and DOE/EPA programs, DQO levels at FEMP will be referred to as analytical support levels (ASL) A through E.

ASL A (Qualitative Field Analysis) - Provides the most rapid (real or short time) results. ASL A is often used for health and safety monitoring at the site, preliminary comparison to Applicable or Relevant and Appropriate Requirements (ARARs), initial site characterization to locate areas for subsequent and more accurate analyses, field screening of samples to select those for fixed laboratory analysis, and engineering screening of alternatives (bench-scale tests). These types of data include those generated on site through the use of Photo- or Flame-Ionization Detectors (PID or FID), pH, conductivity, alpha and beta-gamma friskers, or radiological wipe samples. ASL A is analogous to EPA DQO Level 1.

Example: Field screening for alpha, beta, and gamma radiation conducted with portable field equipment provides real time qualitative analysis for the presence or absence of radioactive isotopes.

Example: Field screening for chemical gases in the well bore of groundwater monitoring wells using Photo-Ionization Detectors provides real time qualitative analysis for presence of volatile compounds (e.g., benzene, toluene).

ASL B (Semi-Quantitative/Quantitative and Qualitative Analyses) - Provides more quality control checks than ASL A and results may be qualitative, semi-quantitative, or quantitative. ASL B can be assigned when rapid turnaround results are needed. FEMP-specified analytical protocols shall be used. There are two sublevels available for specifying QA/QC, data reporting, and data validation requirements.

Sublevel 1 specifies QA/QC, data reporting, and data validation requirements for FEMP-specified analytical protocols, which are similar to those used for ASLs C and D, but with different QA/QC sample type and frequency, quality control criteria for acceptance ranges, and requirements for data packages.

Sublevel 2 specifies user-defined and special requirements. The data user shall specify QA/QC, data reporting, and data validation requirements based on intended data use and regulatory requirements. Specific requirements shall be defined in PSPs.

Methods may range from more sophisticated screening techniques to fully defined methods similar to ASL C or D for radiological and nonradiological parameters, but with reduced QA/QC frequency and data reporting requirements for more rapid turnaround times. Also included in ASL B are standard methods (e.g., EPA 500-series drinking water methods with QA/QC requirements different than those specified for ASLs C and D) and conventional parameter analysis in support of regulatory requirements such as NPDES permit monitoring.

Example: Measurement of gross alpha and beta radioactivity in water in compliance with the Safe Drinking Water Act to provide information on drinking water quality.

Example: Determination of volatile halogenated organic compounds (e.g., chloroform) in water by purge and trap gas chromatography without second column confirmation, with a limited suite of field and laboratory QC samples, and a minimal data package.

ASL C (Quantitative with Fully Defined QA/QC) - Provides data generated with full QA/QC checks of types and frequencies specified for ASL D according to FEMP-specified analytical protocols for radiological and nonradiological parameters. The analytical methods are identical to ASL D for QA/QC sample analysis and method performance criteria. However, the data package does not typically contain raw instrument output but does include summaries of QA/QC sample results. ASL C may be used when analyses require a rigid, well-defined protocol, but where other information is available, so that a complete raw data

package validation effort is not required. Laboratories shall be required to retain, in the project file, raw instrument data required to upgrade ASL C reports to ASL D.

Example: Analysis of total uranium by the fluorimetric method with a full set of QA/QC samples as specified for ASL D. A summary data package is provided including QA/QC sample performance without raw instrument output. A limited level of data validation is required because only the summary forms need review.

Example: Determination of volatile organic compounds in soil by purge and trap gas chromatography/mass spectrometry with a full complement of QA/QC samples as specified for ASL D. A summary data package is provided including QA/QC sample performance without raw instrument output. A limited level of data validation is required because only the summary forms need review.

ASL D (Confirmational With Complete QA/QC and Reporting) - Provides data generated with a full complement of QA/QC checks of specified types and frequencies according to FEMP-specified analytical protocols for radiological and nonradiological parameters. The data package includes raw instrument output for validation of ASL D data. It may be used to confirm data gathered at ASLs B and C and when full validation of raw data is required.

Example: Analysis of total uranium by the fluorimetric method, with a full set of QA/QC samples per analytical batch with analytical results and the full raw data package reported from the laboratory.

Example: Determination of volatile organic compounds in soil or water by purge and trap gas chromatography/mass spectrometry with a full complement of field and laboratory QA/QC samples. A complete raw data package is provided and validated for the analyses.

ASL E (Non-Standard) - Analyses by non-standard protocols that often require method development or validation (e.g., when exacting detection limits or analysis of an unusual chemical compound are required). ASL E methods may be significantly different from those specified for ASLs B, C, or D data. New methods may be developed for ASL E data to allow for parameters or matrices that cannot be analyzed using existing standard methods. This could be caused by interferences, analyses performed outside of accepted requirements for existing methods, or new methods developed to meet site requirements or project-specific requirements that cannot be met by existing analytical methods.

Example: Analysis or evaluation of a geotextile material for suitability to use as a component of a remedial action at the site. Existing evaluation methods may not be adequate to evaluate site-specific needs so development of a new method is required.

Example: Determination of organic compounds (e.g., benz(a)anthracene) in drinking water at sub-part per billion levels by special method on-column injection gas chromatography/mass spectrometry with selective ion monitoring detection and a full suite of field and laboratory QA/QC samples as required for ASLs C and D data. A complete raw data package may be required for validation.

ATTACHMENT 3
HEALTH AND SAFETY PLAN

NITRIC ACID TANK CAR AND AREA
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Fernald Environmental Management Project

January 1993

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TABLES

FIGURES

ACRONYMS AND ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
AEDO	Assistant Emergency Duty Officer
ALARA	as low as reasonably achievable
ARAR	Applicable Or Relevant and Appropriate Requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
C.F.R.	Code of Federal Regulations
CGI	Combustible Gas Indicator
DED	Deputy Emergency Director
DOE	U.S. Department of Energy
EC	Emergency Chief
EDO	Emergency Duty Officer
EOC	Emergency Operations Center
EPA	U.S. Environmental Protection Agency
ERT	Emergency Response Team
FEMP	Fernald Environmental Management Project
FM	Factory Mutual
FMPC	Feed Materials Production Center
FS	feasibility study
G-M	Gieger-Mueller
HASP	Health and Safety Plan
HSM	health and safety manager
HSO	health and safety officer
IDLH	immediately dangerous to life and health
IRST	Industrial Radiological Safety & Training
LEL	Lower Exposure Limit
MHSA	Mine Health and Safety Administration
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
NPL	National Priorities List
OSHA	Occupational Safety and Health Administration

ACRONYMS AND ABBREVIATIONS (continued)

PID	Photo-ionization Detector
PEL	Permissible Exposure Limits
PPE	Personal Protective Equipment
RAWP	Removal Action Work Plan
RI	remedial investigation
SCQ	Site-Wide CERCLA Quality Assurance Project Plan
SS	Stainless Steel
TCLP	Toxicity Characteristic Leaching Procedure
TLD	Thermo-luminescent Dosimeter
TLV	Threshold Limit Value
TWA	Time Weighted Average
UL	Underwriters Laboratory
WBGT	Wet Bulb Globe Temperature
WEMCO	Westinghouse Environmental Management Company of Ohio

1.0 SCOPE OF WORK

This Health and Safety Plan (HASP) is to be used during the Nitric Acid Tank Car and Area removal action. Compliance with this plan is required of all workers and third parties who enter the Exclusion or Contamination Reduction Zone associated with this project.

This HASP is intended to provide guidance for the removal staff and to meet Fernald Environmental Management Project (FEMP) site requirements. The removal staff will be responsible for developing and implementing its own HASP.

All persons associated with the removal action must be familiar with the information, instructions, and emergency response procedures contained in this plan.

1.1 TASKS

A detailed description of tasks can be found in the Removal Action Work Plan. The tasks associated with this removal action include the following:

- Site preparation and contents sampling
- Tank Car contents removal
- Treatment, characterization, and disposal of contents
- Decontamination and disposal of Tank Car
- Collection and analysis of soil samples

1.2 REGULATIONS AND GUIDELINES

All activities conducted during the Nitric Acid Tank Car and Area removal action at the FEMP shall be in compliance with the provisions and requirements of the following documents:

- *U.S. Department of Labor OSHA Standards*, 29 C.F.R. (Code of Federal Regulations) Parts 1910 and 1926, specifically 1910.120 - "Hazardous Waste Operations and Emergency Response"

- *FMPC* (Feed Materials Production Center) *Industrial Hygiene and Safety Manual*, Westinghouse Materials Company of Ohio, FMPC-2128, April 4, 1989

- *FMPC Site Health and Safety Plan*, Westinghouse Materials Company of Ohio, June 1990

- USEPA, *Standard Operating Safety Guidelines*, November 1984

- *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, NIOSH/OSHA/USCG/EPA, October 1985.

2.0 ORGANIZATION AND RESPONSIBILITIES

The project organization is typically contractor dependent. For the purposes of this plan, generic project organization is described. The removal staff's HASP organization should correspond to the organization presented in this section.

As a hazardous waste site cleanup project progresses, it may be necessary to modify some organizational aspects of the project, such as personnel responsibilities, so that individual tasks can be performed as efficiently and safely as possible. Any changes to the overall organizational structure must be recorded in the HASP and communicated to all parties involved in the work being performed.

2.1 PROJECT MANAGER

The project manager is responsible for the overall operation of the Nitric Acid Tank Car and Area removal action. The project manager will act as the contact person with the Westinghouse Environmental Management Company of Ohio (WEMCO).

2.2 REMOVAL SITE SUPERVISOR

The removal site supervisor is responsible for the overall safe operation of personnel, and will ensure that the health and safety officer (HSO) is present during all activities indicated in Section 1.1. The removal site supervisor will interact and coordinate the project and schedule with FEMP site organizations.

2.3 HEALTH AND SAFETY MANAGER

The health and safety manager (HSM) is responsible for completing and overseeing the implementation of the HASP. The HSM is responsible for selecting the HSO and overseeing that individual's site performance.

2.4 HEALTH AND SAFETY OFFICER

The HSO will be a representative of the organization assigned responsibility for the removal action and is responsible for implementing the HASP. This individual is responsible for radiation monitoring, air monitoring of chemicals and fumes, maintaining the Contamination Reduction Zone, overseeing construction safety, and conducting initial site safety training.

2.5 DIRECTORY OF RELEVANT CONTACT ORGANIZATIONS

Title	Location	Telephone
Westinghouse IRST	Bldg. 53	8453
Industrial Hygiene	Bldg. 53	6211
Safety, Engineering & Fire Services	Bldg. 53	6802
Medical Services	Bldg. 53	6217
Emergency		6511
Assistant Emergency Duty Officer (AEDO)		6431

3.0 SITE HISTORY

The FEMP is owned by the U.S. Department of Energy (DOE) and was operated from 1952 until 1989 for the processing of high purity uranium metal. In 1989, facility production operations were placed on standby to focus on environmental remediation. The facility was formally shut down in 1991 after appropriate congressional notifications. At present, remaining workforces at the facility are focused solely on the implementation of environmental restoration related initiatives.

The facility is a 1,050-acre parcel located in southwestern Ohio. In November 1989, the FEMP was placed on the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) National Priorities List (NPL) as a result of concerns related to past and potential releases of hazardous substances to the environment. Consistent with Section 120 of CERCLA, the DOE and U.S. Environmental Protection Agency (EPA) jointly signed a Consent Agreement in March 1990 establishing a schedule for the implementation of a site-wide remedial investigation (RI)/feasibility study (FS) and a series of removal actions at the FEMP. This agreement was amended in September 1991. This RAWP has been developed consistent with the terms of the Amended Consent Agreement.

During the period that the FEMP was producing uranium metal, nitric acid was an important process chemical used in the formation of uranyl nitrate hexahydrate (UNH) solution which, through chemical transformation into uranium oxide intermediates and subsequent hydrofluorination, was used to make green salt (UF_4). Green salt, in turn, was used to produce uranium metal by a thermal reduction process with magnesium. Nitric acid was also used throughout the FEMP production area for acid cleaning and/or metal pickling operations. From 1975 until 1991, more than 56 million pounds of concentrated (55 to 60 percent, 12 N) nitric acid was purchased.

During peak production periods, it was necessary to store some of the nitric acid in large portable storage containers. Tank Car DODX17135 proved to be an efficient means for temporary storage, as it could provide 100,000 pounds of transportable storage capacity for concentrated nitric acid. The car was kept on a rail siding and was not normally

moved until either its contents or available storage capacity were needed elsewhere on the site. Following acid transfers, the car was transported back to the siding.

Visual inspection of the Tank Car indicates that there is a relatively small amount of liquid remaining in the tank. Although the quantity of material in the tank is small, it is not sufficiently empty to preclude the hazardous waste determination. A visual inspection of the car on February 15, 1991 indicated that between 50 and 100 gallons of material remained in the container. Under the "empty container" rule (40 C.F.R. 261.7 and O.A.C. 3745-51-07), a container of greater than 110 gallons can contain no more than 0.3% by weight of its capacity and still be considered "empty." Based on an estimate made via visual inspection, the quantity of material in the Tank Car exceeds this limit. The material in the Tank Car is not unused acid, nor is it intended for future production or laboratory use.

The nitric acid residue in the Tank Car is considered a solid waste because it was discarded by abandonment (40 C.F.R. 261.2[b][3] and O.A.C. 3745-51-02[B][3]). Consequently, the Tank Car used to store waste is a solid waste management unit. Analysis of the residues contained in the Tank Car indicated a pH of less than one. Therefore, the acid exhibits the hazardous waste characteristic of corrosivity, and is a hazardous waste (40 C.F.R. 261.2[a][1] and O.A.C. 3745-52-22-[A][1]).

The Nitric Acid Tank Car (No. DODX17135), the soil beneath it, and that portion of Track #2 where the car currently resides, have been determined to be a hazardous waste management unit (HWMU) (40 C.F.R. 260.10 and O.A.C. 3745-50-10-[A][42]). This determination was made because discarded nitric acid has been stored in the car in excess of 90 days, and the acid has the hazardous waste characteristic of corrosivity (EPA Hazardous Waste Number D002).

4.0 HAZARD ASSESSMENT

This section has been prepared in accordance with Occupational Safety and Health Administration (OSHA) 29 C.F.R. 1910.120 and the Feed Materials Production Center (FMPC) Site Health and Safety Plan. All work with materials shall employ the ALARA (as low as reasonably achievable) concept for either chemical or radiological explosives. A summary of potential hazards associated with each of the individual tasks is presented in Table 4-1.

4.1 CHEMICAL HAZARDS

Nitric acid is the primary contaminant of concern. Because the liquid is considered a waste, additional chemical constituents may be present in the liquid. The liquid will be sampled as part of the removal action to identify any additional constituents.

The pH of the liquid is below one. Nitric acid is severely corrosive, and though not flammable, it is a strong oxidizer that can react with combustible materials to cause fires. Contact with the liquid may occur during sampling, pump out, or cleaning operations.

Health effects as a result of exposure to nitric acid are related to the corrosivity of the liquid or vapors. Severe irritation of the skin, eyes, or mucous membranes can occur. Inhalation may result in irritation of the upper respiratory tract, pneumonitis, or bronchitis. No chronic effects are associated with nitric acid.

4.2 RADIATION HAZARDS

Total uranium content in the liquid is 1,400 pCi/l. A radiation survey will be conducted as part of the site preparation in order to better characterize the radiation hazards. The Removal Site Evaluation (Attachment 1 to the plan) determined that radiological hazards associated with the Tank Car and contents were negligible.

Table 4-1. Chemical and toxicological characteristics of Nitric Acid Tank Car materials.

Compounds	CAS #	ACGIH TLV	OSHA PEL	Routes of Exposure	Toxic Properties	Target Organs	Chemical Properties
Nitric Acid	7697-37-2	5.2 mg/m^3 STEL: 10 mg/m^3	5 mg/m^3 STEL: 10 mg/m^3	Inhalation Ingestion Skin/Eye Contact	Irritate eyes, mucous membranes, skin; delayed pulmonary edema, pneumonitis, bronchitis, dental erosion	Eyes, resp. system, skin, teeth	Acrid odor, yellow-clear fuming liquid. BP: 181 °F VP: 48mm

BP - Boiling point (degrees Fahrenheit)
CAS - Chemical Abstract Service Registry
mg/m^3 - Milligrams per cubic meter
PEL - Permissible Exposure Limit
ppm - Parts per million
TLV - Threshold Limit Value
VP - Vapor Pressure

4.3 PHYSICAL HAZARDS

In addition to the chemical and radiological hazards previously described, a variety of physical hazards will be present similar to those associated with any removal project of this nature. These physical hazards are due to poor housekeeping, motor vehicle operation, heavy equipment operation, the use of power and hand tools, steam cleaning, hot cutting, and handling and storage of fuels. These hazards are not unique and are generally familiar to most industrial workers. They will be covered in site-specific training and, if necessary, during daily safety briefings.

Table 4-2 presents an overview of the activity-specific hazards associated with the proposed activities.

4.3.1 Noise

Noise is a potential hazard associated with the operation of heavy equipment, power tools, pumps, and generators. Suspected high noise operations will be evaluated to determine if protective measures are warranted. Employees with 8 hour time weighted average (TWA) exposures exceeding 85 dBA will become part of a hearing conservation program.

4.3.2 Fire or Explosion

The potential for a fire or explosion to occur is minimal. Materials incompatible with nitric acid will be limited within the Exclusion Zone. During hot cutting of the tank with an acetylene torch, the cylinders and supply lines will be in line with WEMCO procedures. Hot cutting of the tank will be considered as a last option for the final disposition of the Tank Car.

4.3.3 Steam Cleaning

Steam cleaning of the inside of the tank may yield nitric acid mists. Operators involved in this activity shall be required to wear Level C protection to afford proper face and body protection.

Table 4-2. Activity-specific hazards.

Activity	Radiation	Chemical	Noise	Heat/Cold Stress	Physical
Site preparation and contents sampling	Yes	Yes	Yes	Yes	Yes
Tank Car contents removal	Yes	Yes	Yes	Yes	Yes
Treatment, characterization, and disposal of contents	Yes	Yes	Yes	Yes	Yes
Decontamination and disposal of Tank Car	Yes	Yes	Yes	Yes	Yes
Collection and analysis of soil samples	Yes	Yes	No	Yes	Yes

4.4 HEAT/COLD STRESS

Heat stress is a significant hazard associated with the use of Level C protective equipment in hot weather environments. Local weather conditions encountered during late spring, summer, and early fall are likely to produce conditions that will require restricted work schedules in order to protect employees. Heat stress will be monitored and the action levels described in Section 5.10 will be used to institute appropriate work/rest regimens. Potential hazards in cold environments can be direct (frostbite, hypothermia) or indirect (slick surfaces, brittle equipment, poor judgment and shortcuts). Winter conditions will require attention to proper clothing, equipment warm-up time, and freeze protection for walking/working surfaces. Additionally, training may be needed to instruct on-site workers in preventing cold injuries and to provide information on dietary adjustments.

Appendix A contains American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) for heat stress and cold stress; these TLVs will be the guiding documents for temperature extremes encountered during the Nitric Acid Tank Car removal action.

5.0 ACCIDENT PREVENTION

5.1 RESPONSIBLE INDIVIDUALS

All individuals on site are expected to conduct themselves and act in a manner which minimizes the potential for accidents. All on-site health and safety personnel, supervisory and management personnel, and crew foremen shall ensure that individuals under their direct supervision are aware of the standard operating procedures and are implementing these procedures in a safe manner. Violations of established health and safety requirements may result in disciplinary actions up to and including dismissal.

5.2 PERSONNEL RESTRICTIONS

The items listed below are rules and restrictions to be followed by all on-site individuals and any visitors:

- Horseplay of any kind will not be tolerated.
- The personal protective equipment specified by the HSO and this HASP shall be worn by all personnel.
- Eating, drinking, chewing tobacco or gum, smoking, and any other practice that may increase the possibility of hand-to-mouth contact is prohibited in the Exclusion and Contamination Reduction Zones.
- All lighters, matches, cigarettes and other forms of tobacco shall remain in the support zone.
- Individuals shall not be allowed to wear contact lenses while conducting on-site work operations in the Exclusion Zone or Contamination Reduction Zone.
- Individuals shall not be allowed to wear jewelry while conducting on-site work operations in the Exclusion Zone or Contamination Reduction Zone.

- Facial hair (beards, long sideburns or mustaches) interfering with a satisfactory fit of the mask-to-face seal is not allowed on personnel who may be required to wear respiratory protection of any kind.

- Alcoholic beverages shall not be allowed during breaks (alcohol can increase the effect of exposure to toxic chemicals, create judgment errors which result in accidents, and increase the potential for heat stress).

- Any individual taking prescribed drugs shall inform the HSO of the type of medication. The HSO will review the matter with the HSM and the Contractor Medical Consultant, who will decide if the employee can safely work on-site while taking the medication.

- Each individual shall notify support personnel before entering the Exclusion Zone, and must comply with the buddy system which will always be used for Exclusion Zone operations.

- All accidents, no matter how minor, must be reported immediately to the HSO.

5.3 FIRE PREVENTION AND PROTECTION

In order to minimize the potential for fires and their impact, proper fire prevention and protection procedures are necessary.

5.3.1 Fire Prevention

The following list includes some of the most often cited fire prevention rules, but is not intended to be all-inclusive:

- No smoking is allowed in the Exclusion Zone or the Contamination Reduction Zone.

- All sources of ignition are prohibited within a 50 foot radius of substances or operations which constitute a fire hazard. These operations or areas shall be posted with signs indicating: NO SMOKING OR OPEN FLAMES.

- All tanks, containers, and pumping equipment, whether portable or stationary, will be Underwriters Laboratory (UL) or Factory Mutual (FM) approved if they are being used for the storage or transfer of flammable and/or combustible liquids. These storage containers will also meet all applicable OSHA regulations.

- Equipment requiring flammable liquid fuel shall be shut down during refueling, servicing, or maintenance. This requirement may be waived for diesel-powered machinery serviced by a closed system provided that there are attachments to prevent spillage.

5.3.2 Fire Protection

Personnel involved in the Nitric Acid Tank Car and Area removal action are directed to use fire extinguishers to provide a means of egress for escape from a fire situation or to extinguish fires in the incipient stage only. Several of the most common fire extinguisher requirements are addressed as follows:

- Portable fire extinguishers shall be provided where necessary, inspected, and maintained in accordance with National Fire Protection Association (NFPA) Regulation #10, Portable Fire Extinguishers.

- Fire extinguishers shall be conveniently placed, distinctly marked, and maintained in a fully charged and operable condition.

- All heavy machinery must be equipped with at least one dry chemical or carbon dioxide fire extinguisher having a minimum UL rating of 5-B:C.

- Fire extinguishers will be supplied in storage areas according to the hazards present.

If a fire or explosion should occur, the appropriate emergency response guidelines outlined in Section 12.0 shall be followed.

5.4 CONTAMINATION AND EXPOSURE PREVENTION

All handling of contaminated materials shall be handled as ALARA. On-site personnel have the potential to become contaminated in various ways, such as:

- Being splashed with liquids during sampling or handling operations
- Contacting contaminated liquids or solids
- Walking through contaminated liquids or solids
- Contacting contaminated equipment or machinery.

All on-site personnel shall be aware of areas where contact with contaminated materials may occur. Exposures to hazardous or contaminated materials can be kept to a minimum by strict adherence to the recommended personal protective equipment and decontamination procedures.

As much care as reasonably possible will be used to prevent contamination of small equipment. Sampling and monitoring instrumentation shall not be set on contaminated surfaces. Care will also be taken to minimize contamination of monitoring instrumentation.

5.5 HOUSEKEEPING

Good housekeeping practices can reduce the potential for fire and accidents. This list includes some of the most pertinent requirements, but may not be all-inclusive:

- Tools, materials, extension cords, debris, and other items shall be properly stored and used to decrease the risk of tripping, falling, or other related hazards.

- Tools, materials, and equipment used overhead and subject to falling shall be properly secured.

- All construction areas and storage sites shall remain free from the accumulation of combustible materials. A routine procedure will be established for cleanup by an authorized supervisor.

- Incompatible materials will be segregated.

- All spills of flammable or combustible liquids and the areas they contaminate must be cleaned and containerized immediately.

- Work will not be allowed in untidy areas until the situation has been remedied.

- The site manager will inspect the work area daily for adequate housekeeping, record unsatisfactory findings or situations on the daily inspection report, and see that these areas are cleaned accordingly.

5.6 SAFETY MEETINGS

Initial Health and Safety Meetings. Before initiation of work operations at the site, the HSO and/or HSM will provide a health and safety briefing to all personnel present. This presentation will address the material in this HASP and any other pertinent information (previous experience has shown that this training generally requires one to two hours, depending upon the level of experience of the personnel being trained). This is addressed in more detail in Section 10.0.

Daily Safety Briefings. Before entering the Exclusion Zone each day, a short health and safety briefing will be conducted by the HSO to address the day's activities. It shall serve to notify individuals of any deficiencies requiring change or correction. It will emphasize the specific concerns associated with planned work activities. Items covered in each meeting will be documented.

5.7 ACCIDENT INVESTIGATION AND REPORTING

All accidents or injuries, however slight, resulting from on-site work activities must be reported to the HSO. Once informed, the HSO is required to complete an Accident/Incident Report and submit it to WEMCO within 24 hours of the incident occurring. If necessary, the HSM will report to the site to conduct an inspection and investigation.

5.8 WORK/REST REGIMEN

The proposed work/rest regimen will be dependent on weather conditions encountered and the level of personal protective equipment used by on-site personnel. The Nitric Acid Tank Car and Area removal action may be conducted during any of the seasons, therefore, work conditions will vary significantly in regard to weather. At a Wet Bulb Globe Temperature (WBGT) Index temperature above 85°F the Industrial Radiological Safety & Training (IRST) shall be contacted.

If the WBGT Index remains below 72.5°F, the following work schedule is a warm weather guideline for all levels of protective clothing listed in this plan:

Work:	2 Hours
Break:	15 Minutes
Work:	2 Hours
Lunch:	45 Minutes
Work:	2 Hours
Break:	15 Minutes
Work:	2 Hours
Total:	9 Hours and 15 minutes

If the WBGT Index exceeds 72.5°F, the work/rest cycle below will serve solely as a guideline.

WBGT Index (°F)*	Water Intake Quarts/Hour	Hourly Work/Rest** Cycle in Minutes
82° - 83°	1/2 - 1	50/10
84° - 87°	1 - 1 1/2	45/15
88° - 89°	1 1/2 - 2	30/30
90° & above	More than 2	20/40

* Impermeable clothing adds 10° to the measured WBGT.

** Rest means minimal physical activity. Rest should be accomplished in the shade. Any activity requiring only minimal physical activity can be performed during rest periods. Examples: Training by lecture or demonstration, minor maintenance procedures on vehicles.

The HSO, health and safety technicians and buddies will be watching the employees at all times for any potential symptoms of heat stress or any unusual behavior. These measures should help prevent occurrence of any heat stress illnesses. Appendix A provides additional guidelines and information on monitoring suggestions for physiological conditions such as heat and cold stress.

5.9 BUDDY SYSTEM

Workers shall comply with the buddy system on site, meaning that they shall enter the Exclusion Zone in groups of at least two (2) when wearing personal protective equipment. No entry will be made into the Exclusion Zone when an atmosphere exists that is immediately dangerous to life and health (IDLH). Although this situation is not anticipated, if crew members are located in the Exclusion Zone when an IDLH atmosphere is detected, they will be evacuated through the use of a safety harness without requiring entry by other personnel.

5.10 GENERAL CONSTRUCTION SAFETY HAZARDS

A variety of physical hazards will be present similar to those associated with any large construction project. Some of those hazards are as follows:

- Equipment Inspections: All vehicles in use shall be visually checked at the beginning of each shift with each operator responsible for inspecting their assigned vehicle.

- Temporary Electrical: Only qualified electricians shall perform work on energized electrical equipment. All installations shall conform with the National Electrical Safety Code. All electrical wiring and equipment shall be of a type listed with UL or FM for the specific application. Ground fault interrupters will be used in all electrical circuits for portable electric tools.

- Power and Hand Tools: All hand tools shall be in good repair and used only for the purpose for which they were designed. Power tools shall be inspected and determined to be in safe operating condition as frequently as needed. Powered tools shall be grounded by a multi-conductor cord having an identified grounding conductor and a multi-contact polarized plug in receptacle. In the alternative, double insulated tools may be used if they carry a label that indicates the tool is indeed double insulated.

Only trained equipment operators are allowed to operate heavy machinery on site. The number of personnel in the vicinity of heavy equipment operations and in contaminated areas shall be kept to a minimum. Those individuals not directly involved in work operations will be required to maintain a 30-foot distance so as to not interfere. All heavy equipment shall be properly maintained in a safe operating condition and be equipped with an audible back-up alarm.

These hazards and procedures are not unique and are generally familiar to most industrial workers. They will be covered in the site-specific and daily safety briefings.

5.11 LOCK-OUT/TAG-OUT

Maintenance personnel sometimes perform work on machinery or components that normally operate under high voltages, tension or extreme pressure. Work to be performed on such equipment can cause severe trauma and sometimes death if those forces are not relieved and locked out. Equipment to be worked on should first be put into a Zero Mechanical State. This may be as simple as unplugging an appliance or lowering a bucket to the ground and taking the key to a backhoe. Some types of maintenance may require disconnecting and blanking feed pipes, physically locking the electrical supply off, and taking active means to supply fresh air, as in confined space entries. Typical lockout procedures include the following steps:

1) Notify the operator and others that work is to be done

2) Post signs at all control locations that the equipment is being repaired

3) Place your lock on the electrical box, control lever, etc., and tag it

4) Block mechanisms, if appropriate

5) Once work is completed, have supervisor inspect before returning to service.

Lock-out/tag-out will be conducted according to FEMP procedures.

5.12 CONFINED SPACE ENTRY

During the removal action no confined space work is anticipated. If during the course of work it becomes necessary to enter a confined space (such as the Tank Car), then the requirements of IHVS-IH-05, "Control of Entering and/or Work in a Confined Space" will be followed.

6.0 MONITORING

Monitoring shall be conducted for nitric acid during activities which involve the potential exposure to nitric acid liquid. Monitoring shall be conducted on materials and personnel as detailed in Section 3.3 of the plan and as summarized in the following sections. All health and safety monitoring shall be performed in accordance with the applicable sections of the FEMP Site-Wide CERCLA Quality Assurance Project Plan (SCQ). The action levels are identified in Table 6-1.

6.1 AIR MONITORING FOR CHEMICALS

Air monitoring for nitric acid using colorimetric tubes will be performed during all phases of liquid handling. The range of the colorimetric tubes is 1 to 50 ppm. Monitoring will occur during operations which the HSO deems as potential sources of exposure. The number of samples taken during an operation shall be determined by the HSO and shall be based upon the operation and engineering controls present.

6.2 RADIATION

Radiation monitoring for alpha and beta-gamma will occur during egress from the Exclusion Zone. Individuals and equipment will be frisked. If the external radiation dose rate within the Exclusion Zone exceeds 0.01 rem/hr for a period longer than one (1) minute, operations will be suspended until the cause of the elevated levels has been determined. If the level of removable contamination on Exclusion Zone working surfaces exceeds 2,000 dpm/100 cm^2 alpha or 10,000 dpm/100 cm^2 beta-gamma, operations will be suspended until the cause of the elevated levels has been determined.

Table 6-1. Action levels.

Instrument	Response	Action
LEVEL D EXCLUSION ZONES		
Nitric Acid Detector Tubes	Greater than 4 ppm	Upgrade to Level C; contact IRST
Oxygen	Less than 19.5%	Contact IRST; upgrade to Level B
	Greater than 23.5%	Remove/shut off ignition sources & investigate for cause of excursion
LEVEL C EXCLUSION ZONE		
Oxygen	Less than 19.5%	Contact IRST; upgrade to Level B
	Greater than 23.5%	Remove/shut off ignition sources & investigate for cause of excursion
Nitric Acid Detector Tubes	50 ppm	Upgrade to supplied air respirators

7.0 PERSONAL PROTECTIVE EQUIPMENT

7.1 INTRODUCTION

The personal protective equipment and action levels established for this project are based on available data. As additional testing and monitoring information become available, the HSO, with approval of Industrial Radiological Safety and Training (IRST), may adjust the action levels and protective equipment accordingly. Initial protection levels for different work activities are identified in Table 7-1. These items may change to provide the best possible protection and safety factors for the work operations on site.

7.2 UPGRADE AND DOWNGRADE

The HSO may upgrade or downgrade the levels of protection once approval from the IRST has been received. The change in level of protection shall be based on variations in site conditions relative to the initial hazard assessment. As information from real-time monitors becomes available, this information will be used to adjust levels of protection for specific work tasks.

The decision to upgrade the level of protection will be made by the HSO with approval of the IRST based upon the prevailing site conditions, including exposure, contamination, meteorological conditions and the site operation involved. Industrial Hygiene will be notified in the event that nitric acid exceeds 4 ppm in the air.

A decision to downgrade from a level of protection published in this HASP as part of Table 6-1 is permitted, when recommended by the HSO in consultation with the HSM, and approved by the IRST, when site conditions warrant such a downgrade. The removal site supervisor must be notified of the proposed change. Where the HSO has upgraded the level of protection due to prevailing site conditions, and site conditions return to the pre-upgrade state, the HSO is authorized to return to the previously published levels of protection upon notice to the removal site supervisor.

Table 7-1: Operation-specific protection levels for the Nitric Acid Tank Car and Area removal action.

Level D Operations

- Site preparation
- Collection and analysis of soil samples
- Heavy equipment operation

Level D Modified Operations

- Decontamination and disposal of Tank Car
- Decontamination of personnel and equipment

Level C Operations

- Contents sampling
- Removal of Tank Car contents
- Treatment, characterization, and disposal of contents

Note: The levels of protection for any particular operation may be modified based upon current information and conditions.

7.3 LEVELS OF PROTECTION

The following is a brief description of each level of protection. Since these levels are basic guidelines, it will be necessary to adjust the protection levels based on each specific operation or activity.

The basis for the levels of protection are OSHA 1910.120 Appendix B. Much of the work on site will be conducted in Level D or D-modified protection. As identified in Section 4.0, Hazard Assessment, Level D or D-modified protection provides sufficient protection against nitric acid and external radiation anticipated to be found during Nitric Acid Tank Car and Area removal action activities.

Level C protection may provide the same level of skin protection as Level B, but will utilize a lower level of respiratory protection. Level C respiratory protection uses a full face air purifying respirator with canisters or cartridges NIOSH rated for acid gases. With each of these levels of protection there is a degree of variability or modification dependent on the specific tasks, specific chemicals, form and amount of chemicals present. For example, different tasks on the same site may require gloves of different materials, length, or thickness. Variations of a level of protection will be indicated by a qualifier, such as "Modified Level D."

The equipment required for the levels of protection (respiratory, skin and eye) are listed in Table 7-2.

7.4 PERSONAL PROTECTIVE EQUIPMENT FOR INSPECTORS AND VISITORS

Government contracting officers shall be provided personal protective equipment by the HSO. Before being allowed into the Exclusion Zone or restricted working areas, these persons must have medical and training clearance. The levels of protection outlined in Table 7-2 are also required for authorized government personnel. Visitors and government personnel will not be allowed in the Exclusion Zone or the Contamination Reduction Zone unless authorized by the HSO and the removal site supervisor.

Table 7-2. Initial personal protective equipment levels for the Nitric Acid Tank Car and Area removal action.

LEVEL OF PROTECTION	PERSONAL PROTECTIVE EQUIPMENT
D	Cotton coveralls
	Neoprene (or equally protective material) steel-toed boots
	Safety glasses
	Hard hat
	Gloves
D-MODIFIED	Cotton coveralls
	Acid resistant splash suit (jacket and pants or one-piece coverall)
	Inner surgical gloves
	Butyl rubber or neoprene gloves
	Neoprene steel-toed boots
	Hard hat
	Face shield and safety glasses
	Nuke booties (optional)
C	Cotton inner coveralls
	Full facepiece, air purifying, OV/Acid/HEPA cartridge respirator
	Acid resistant splash suit (jacket and pants or one-piece coverall)
	Inner surgical gloves
	Butyl rubber or neoprene gloves
	Neoprene steel-toed boots
	Nuke booties (optional)
	Hard hat

8.0 SITE CONTROL

8.1 GENERAL ORGANIZATION

The work area will be divided into two specific areas. The area where the removal activities will be taking place will be the Exclusion Zone, which has the highest potential hazard due to physical and chemical dangers. Access to the Exclusion Zone will be restricted to those individuals trained and approved to perform the removal action activities. The Exclusion Zone will be delineated using barrier tape or other easily recognizable devices with one common entrance/exit point. The Exclusion Zone will include the entire Tank Car and surrounding area and any additional areas needed to temporarily store equipment or containers of waste. The Exclusion Zone boundaries may need to be expanded or altered to accommodate airborne hazards or other unforeseen circumstances that may arise during the project. If the Exclusion Zone is to be altered significantly, appropriate personnel will be consulted.

The second zone to be established will be the Contamination Reduction Zone. This area will be located immediately adjacent to the entrance/exit to the Exclusion Zone. This zone will also be delineated using barrier tape or other easily recognizable devices. This zone will be utilized for the removal of disposable protective clothing, including boots, gloves, tyvek suits, etc. and the decontamination of equipment utilized to perform this activity. Entrance to the Contamination Reduction Zone will be limited to one entrance/exit point, preferably on the upwind side of the removal action activities, and will be closely monitored and controlled by the field supervisor. Personnel may be needed in this zone to aid workers in decontamination activities upon their departure from the Exclusion Zone.

8.2 ILLUMINATION

Work activities involving the Tank Car and liquid contents will occur during daylight hours only.

9.0 DECONTAMINATION PROCEDURES

Necessary equipment for decontamination of chemical substances will be readily available in the area surrounding the Exclusion Zone. Decontamination reduces the threat of spread of contaminants to other on-site areas by the cleaning of equipment and personnel at the work site prior to departure from the area. It is advised at all times to reduce the amount of contact to contamination in the work areas where possible, thereby minimizing the degree of decontamination required. If necessary, personnel aiding in the decontamination of Exclusion Zone workers will be equipped with personal protective equipment to prevent the threat of contamination to themselves. Variation in decontamination procedures will be made at the discretion of the HSO.

The following procedures will be implemented for proper decontamination of equipment and personnel during these activities:

- Personnel enter decontamination area from Exclusion Zone and drop tools, etc. on contaminated side of barrier tape or object. This equipment will be surveyed and then decontaminated, if necessary, for later use.

- Personnel remove protective clothing and place on contaminated side of barrier tape or object. This waste will later be placed into appropriate containers.

- Reusable materials will be wiped down with a liquid/detergent mixture on a sorbent pad. The generation of contaminated free liquid will be kept to a minimum. The disposal of the sorbent pads will be included with contaminated solid waste.

10.0 TRAINING

The major objectives of training programs for employees involved in FEMP hazardous waste site activities include the following:

- Awareness of the potential hazards that might be encountered
- Knowledge and skills necessary to perform work with a minimal risk to worker health and safety
- Awareness of the purpose and limitations of safety equipment
- The assurance that workers can safely avoid or escape from emergencies that may occur within their work area.

Categories of personnel include the following:

- Occasional General Site Worker - These workers are on site occasionally for a specific limited task such as observation, water monitoring, land surveying or geophysical surveying. They are unlikely to be exposed over permissible exposure limits. They are to receive 24 hours of basic training and 8 hours of field training.
- General Site Workers - These employees are on site for the majority of their work time. They are equipment operators, general laborers, and others involved in operations with hazardous substances. These employees could be exposed daily to hazardous substances and are involved in planned cleanup activities. They are to receive 40 hours of training and 24 hours of field training.
- Supervisors/Managers and Occasional General Site Worker - These employees are responsible for directing the efforts of occasional and administrative

workers. They are to receive the same 24 hours as their workers plus an additional 8 hours of Hazardous Waste Management training.

- Supervisors/Managers of General Site Workers - These employees are responsible for overseeing the general site workers. They are to receive the same 40 hours training as the general site workers and 24 hours of field training and an additional 8 hours of Hazardous Waste Management training.

- Visitors - Visitors to a hazardous waste site must also be briefed on safety. Work being performed in an Exclusion Zone should always be observed from a clean area. Visitors include elected and appointed officials, senior level management, and other interested parties.

Employees shall not engage in field activities until they have been trained to a level commensurate with their job responsibilities and with the degree of anticipated hazards. A documented record of training will be maintained for each employee. In addition, each employee will be issued a written certificate upon the successful completion of their required training. It is the responsibility of all managers and supervisors to ensure that employees complete the required initial training as well as the annual refresher training necessary to meet the requirements of 29 C.F.R. 1910.120.

10.1 TRAINING REQUIREMENTS

General Site Worker	Occasional General Site Worker (Minimal Exposure)
40 hrs. Initial	24 hrs. Initial
24 hrs. Field	8 hrs. Field
8 hrs. Annual Refresher	8 hrs. Annual Refresher

Supervisors/Managers of

General Site Worker	Occasional General Site Worker (Minimal Exposure)
40 hrs. Initial	24 hrs. Initial
24 hrs. Field	8 hrs. Field
8 hrs. Annual Refresher	8 hrs. Annual Refresher

10.1.1 Escorted Visitors

Escorted visitors must review the FEMP Site Orientation video tape and be accompanied by a FEMP employee who has met all training requirements to access the process area.

10.1.2 Unescorted Visitors

Unescorted visitors must review the FEMP Site Orientation video tape prior to accessing the administrative area. Before accessing the process area, unescorted visitors must complete the following courses:

- Safety Orientation - 1 hour

Depending on the areas to be visited, personnel may also be required to complete applicable training required by 29 C.F.R. 1910.120 as defined in Section 4.1.

10.2 SITE-SPECIFIC TRAINING

Before entering the Exclusion or Contamination Reduction Zone, all personnel shall receive training on this HASP from the HSO. Personnel shall read this HASP; any questions will be answered by the HSO.

11.0 MEDICAL SURVEILLANCE

11.1 GENERAL

The Occupational Health Program, also known as the Occupational Medicine Program, is an integral part of the FEMP Health and Safety Program, and conforms with DOE Order 5480.8, the Contractor Occupational Medicine Program. The primary focus of this program is employee protection against health hazards in the work environment. This objective is accomplished by the following:

1) Medical and work histories, laboratory testing, and a physical examination and assessment that assist management in ensuring the placement of employees in work they can perform without undue hazard to themselves, their co-workers, plant facilities, plant site environments, the public at large, or the general environment.

2) Early detection, treatment and rehabilitation of the occupationally ill or injured.

3) The application of preventive medical measures toward the maintenance of good physical and mental health of employees.

4) Continuing medical surveillance of employees, their job tasks, and their work environments.

5) Encouraging employees to maintain their physical and mental health, and educate themselves in health and safety by providing them with professional guidance and counseling.

6) A positive interaction with the Safety, Industrial Hygiene, Emergency Planning, and Radiation Health functions at the FEMP.

The objectives of the Medical Program are carried out by a team of eight individuals, including two licensed physicians, one of whom is board certified in Preventive/

Occupational Medicine; two registered nurses; two technologists (x-ray and laboratory); and two clerk specialists.

Employee placement, i.e., matching the employee to the job (item 1 above), is accomplished by offering each employee a complete physical evaluation each year. For some (e.g., hourly workers, emergency response team members, and security) a yearly physical is mandatory. In addition to medical history, this evaluation consists of laboratory tests of the blood and urine, a test of pulmonary function, hearing testing, electrocardiography, a physician exam, and a physician evaluation. For some employees (e.g., asbestos exposed workers, firing range instructors), additional testing is mandated.

11.2 THE OCCUPATIONAL HEALTH PROGRAM AND 29 C.F.R. 1910.120

Like the Occupational Health Program, the primary focus of 29 C.F.R. 1910.120, *The Hazardous Waste Operations and Emergency Response Standard*, is employee protection. The standard is narrow in focus in the sense that it only applies to significant employee exposure involving hazardous waste. However, the standard places on the examining physician the responsibility to determine if there are any detected medical conditions that would place the employee at an increased risk of material health impairment from work in hazardous waste operations or emergency response, or from respirator use. Further, he or she must state this opinion in writing (the Physician's Written Opinion) along with any limitations on the employee or on the use of personal protective equipment, e.g., respirators. The standard requires that the employee receive a copy of this opinion.

The physician's written opinion of each employee with respect to each hazardous waste exposure is the culminating event in the employee protection scheme. As such, the standard mandates that the physician be supplied with the following as an aid in making the evaluation: a description of the employee's duties as they relate to the exposure; the employee's representative or anticipated exposure level; and a description of the personal protective and respiratory equipment used or to be used. Form FMPC-HR-3162 (9/15/89) ensures and documents compliance with 29 C.F.R. 1910.120 and also assists with employee training and management education.

With respect to 29 C.F.R. 1910.120, the involvement of the Medical Services Section for a given hazardous waste is activated by either a significant employee exposure or the potential for such exposure, i.e., a potential employee exposure that is either at or near the action level, or at or near the PEL. This involvement is usually triggered through information provided to the Medical Services Section by the Industrial Hygiene or Radiation Health functions. It has also come about through direct observation of work practices and situations by members of the medical staff. The cleanup of bird droppings is one example where compliance with 29 C.F.R. 1910.120 was recognized. It should be noted however, that although the FEMP has been declared a Superfund site, many routine activities, such as the renovation of the Environmental Safety and Health Building, would not ordinarily bring about a significant employee exposure to an identifiable waste hazard. Without such exposure to a specific hazard, the focus and intent of 29 C.F.R. 1910.120 is not met.

In summary, the Occupational Health Program constitutes an integral part of the FMPC Safety and Health Program. The focus of each is employee protection. With respect to 29 C.F.R. 1910.120, the Occupational Health Program is triggered when an employee exposure to a hazardous waste, or the potential for such exposure, becomes significant. When this occurs, a Physician's Written Opinion, based in part on input from Management, Industrial Hygiene, Radiation Health, and Safety (form FMPC-HR-3162 [9/15/89]) is mandated for each affected employee. In this opinion, the physician has the responsibility to state if there are any detected medical conditions that would place the employee at an increased risk of material health impairment from work in hazardous waste operations or emergency response, or from respirator use. He or she must also note any limitations on the employee or on the use of personal protective equipment, e.g., respirators. The positive interaction of the Medical Services Section with all departments and sections, especially Industrial Hygiene, Radiation Health, Safety, and Emergency Response, is critical to ensure that the primary objective of employee protection is met.

12.0 EMERGENCY PROCEDURES

This section of the HASP overviews contingencies and emergency planning procedures required at the FEMP.

All FEMP employees, visitors, contractors, and subcontractors are responsible for the safe operation of the facility. Safe operation depends on systems, facilities and equipment being engineered for safety; administrative and procedural controls; and trained, alert personnel who follow procedures and identify and report potential hazards for corrective action. Personnel must also be able to quickly make the transition from a normal operational organization to an emergency organization.

The project manager, supervisor in charge, or project leader with primary oversight responsibility for workers has primary responsibility for ensuring that employees know the components of this emergency response plan. This person is responsible for taking appropriate measures to ensure the safety of both his/her employees and on-site personnel. Possible actions may involve evacuation of personnel from the work area. The person in charge is additionally responsible for ensuring that corrective measures have been implemented, appropriate authorities at FEMP have been notified, and follow-up reports are completed.

12.1 EMERGENCY ORGANIZATION

12.1.1 Field Management

The shift utility engineer is the assistant emergency duty officer (AEDO) and provides management oversight and liaison with the emergency duty officer (EDO) or the deputy emergency director (DED) when the Emergency Operations Center (EOC) is activated.

12.1.2 Emergency Response Team

The emergency response team (ERT) is responsible for event mitigation and damage control, spill and release control, firefighting, environmental monitoring, medical

assistance, and rescue. The ERT is led by a safety and fire inspector, who serves as the emergency chief (EC). The ERT is also supported by emergency responders who have expertise in specific areas such as radiological and chemical air sampling and monitoring.

12.1.3 Security Forces

The Administration Department (Safeguards and Security Section) is responsible for the overall security of the FEMP, response to security events, and support for operational emergencies. The Shift Security Organization consists of a security shift lieutenant, a communications officer, and security inspectors.

12.1.4 Emergency Operations Center Staff

The EOC staff is a functional organization that oversees and directs emergency response actions. This staff is located in a command and control center designed and equipped for directing and coordinating such emergency response actions. The EOC staff is composed of five functional groups. Positions have been identified for EOC staff members; primary and alternate responders have been selected for each position.

12.1.5 U.S. Department of Energy, DOE Site Office

The DOE Site Office provides oversight, ensures an effective response, conducts investigations, makes appropriate notifications, coordinates interactions with the media, and requests assistance.

12.2 EMERGENCY COORDINATION

The overall responsibility for administration of the FEMP Emergency Plan is vested in an emergency planning staff who ensure the readiness and continual enhancement of the essential components of the site emergency plan and the FEMP specific county emergency plans.

The AEDO has been designated the primary on-site emergency coordinator. The AEDO has authority to initiate all necessary response actions, including activation of the EOC.

The AEDO also has the authority to activate the FEMP Off-site Emergency Warning System at any time. Additional support may be summoned at any time by the AEDO through the Communications Center by activation of the EOC. All EOC staff members are supplied with personal pagers that can be activated by a group page. Off-duty utility engineers, security lieutenants, and safety and fire inspectors may also be summoned in this manner.

12.3 EMERGENCY RESPONSE PROCEDURES

The activities and hazards of the Nitric Acid Tank Car and Area removal action have been evaluated to determine the potential emergencies to be anticipated. As a result, three categories of emergencies have been established. This list may be revised if on-site conditions or operations warrant. In the event of a revision or addition to the list, the Emergency Plan will be appropriately updated. The following lists the categories of emergencies.

Injury/Illness
Fire
Spills/Environmental Release

Although not all of the following emergencies will be applicable to each activity, the procedures that follow will serve as the basis for decision making and the actions to take during a real emergency.

12.3.1 General Response Scheme

Action by the Person Discovering Emergency:

1) Immediately notify personnel to evacuate the danger area and activate the local evacuation alarm.

2) Take action to ensure own personal safety.

3) If situation is very urgent, report it directly to the Communications Center on Emergency Phone 6511, pull manual fire alarm, or have it relayed to the Communications Center over the site-wide FM radio net if a person with a portable radio is nearby. Otherwise, report information to a local supervisor who will relay it to the Communications Center or AEDO.

4) If there is any threat to personal safety, move directly to a designated rally point and report to the supervisor for accountability.

5) When reporting to the AEDO, include the following information:

   a) Exact location

   b) Nature of emergency, i.e., fire, explosion, chemical release; also personnel, equipment, and chemicals or materials involved and amounts if known

   c) The magnitude of the emergency, i.e., an estimate of the extent, size quantity, volume, intensity, area, etc.

   d) Emergency actions already taken.

6) If possible, without jeopardizing personal safety, remain in vicinity to direct emergency service groups (e.g., emergency response team, ambulance, etc.) to the scene and assist in bringing the emergency under control.

Action by the Line Supervisor:

1) Report emergency to Communications Center if not already done.

2) Determine need for emergency service groups and summon them.

3) Determine need and initiate local evacuation of personnel from building or area.

4) Alert personnel to move to safe rally point.

5) Shut down equipment if possible.

6) Take other steps to eliminate or reduce emergency if possible.

7) Notify AEDO if not already done.

8) Account for all personnel at location or at rally point.

Action by the AEDO:

After the AEDO has been notified, the AEDO has complete authority during the event to direct all actions considered necessary to mitigate the problem. Whenever an emergency occurs, the AEDO:

1) Directs establishment of Control Zones (Hot, Warm, Cold)

2) Ensures proper personal protective equipment for responders

3) Directs establishment of decontamination for responders if chemical or gross radioactive contamination is involved

4) Requests air monitoring for chemicals or radioactivity on site, off site and to clear areas if release potential exists

5) Directs establishment of radiation frisking to release victims for off-site transport.

In addition, the AEDO:

1) Receives notification that an event has occurred

2) Takes initial response action to the event (fire, explosion, medical, spill, etc.)

3) Assesses possible human health and environmental hazards of the event and defines or assesses the hazard impact

   a) Identifies the substance and its source

   b) Determines the extent and the amount of materials involved

4) Establishes the initial event classification

5) Directs the communication operator to conduct required notifications

6) Directs the activation of the Off-site Emergency Warning System if necessary

7) Receives confirmation of warning system activation and required notifications from the communications operator

8) Authorizes the request for mutual aid

9) Directs evacuation or provides for sheltering if required

10) Serves as management's field representative when the EOC is activated and represents the DED in the field

11) Notifies the EDO of significant actions prior to EOC activation

12) Notifies DED of significant actions after EOC activation

13) Mans the field command post to ensure coordination of all EOC instructions

14) Communicates response orders from the EOC staff to the EC and others as needed

15) Formulates and forwards requests for additional resources to the DED

16) Notifies Environmental Compliance of events to ensure that proper regulatory reporting is done

17) Preserves evidence and secures the scene

18) Authorizes the "All Clear" signal when the emergency is under control and/or resolved

19) Initiates and supervises necessary precautions to ensure that further fires, explosions and releases do not occur, recur or spread to other hazardous waste or materials

20) Initiates and supervises appropriate monitoring for leaks, pressure build-up, gas generation or rupture in valves, pipes, or other equipment

21) Initiates and supervises re-entry activities, including recovery, treatment, storage, and/or disposal of any recovered waste, contaminated soil, surface water, or other materials resulting from the emergency

22) Ensures that all emergency equipment is returned to normal status when the event has been terminated, and notifies Environmental Compliance and legal groups of the status of the event resolution.

Action When Building or Area Is Not Directly Involved

If a building or area is not directly involved, but due to proximity or wind direction is exposed to fire, smoke, or fumes, supervisors will be responsible for taking action appropriate to the situation which may include:

1) Close doors and windows facing the fire or through which fumes or smoke may enter

2) Close air intakes of ventilating systems if fumes or smoke is being drawn in; exhaust systems may be continued in operation if fumes or smoke is not drawn in

3) Shut off gas and process liquids

4) Secure classified material or remove to a safe location

5) Evacuate personnel not needed for emergency duties according to the individual plant emergency plan

6) Remove combustible or otherwise hazardous materials to a safe location

7) Remove equipment and materials of high value to a safe location

8) Assist the AEDO if called upon.

CAUTION: Rescue of persons from an evacuated building or area will be undertaken only by a trained Emergency Response Team under the direction of the EC.

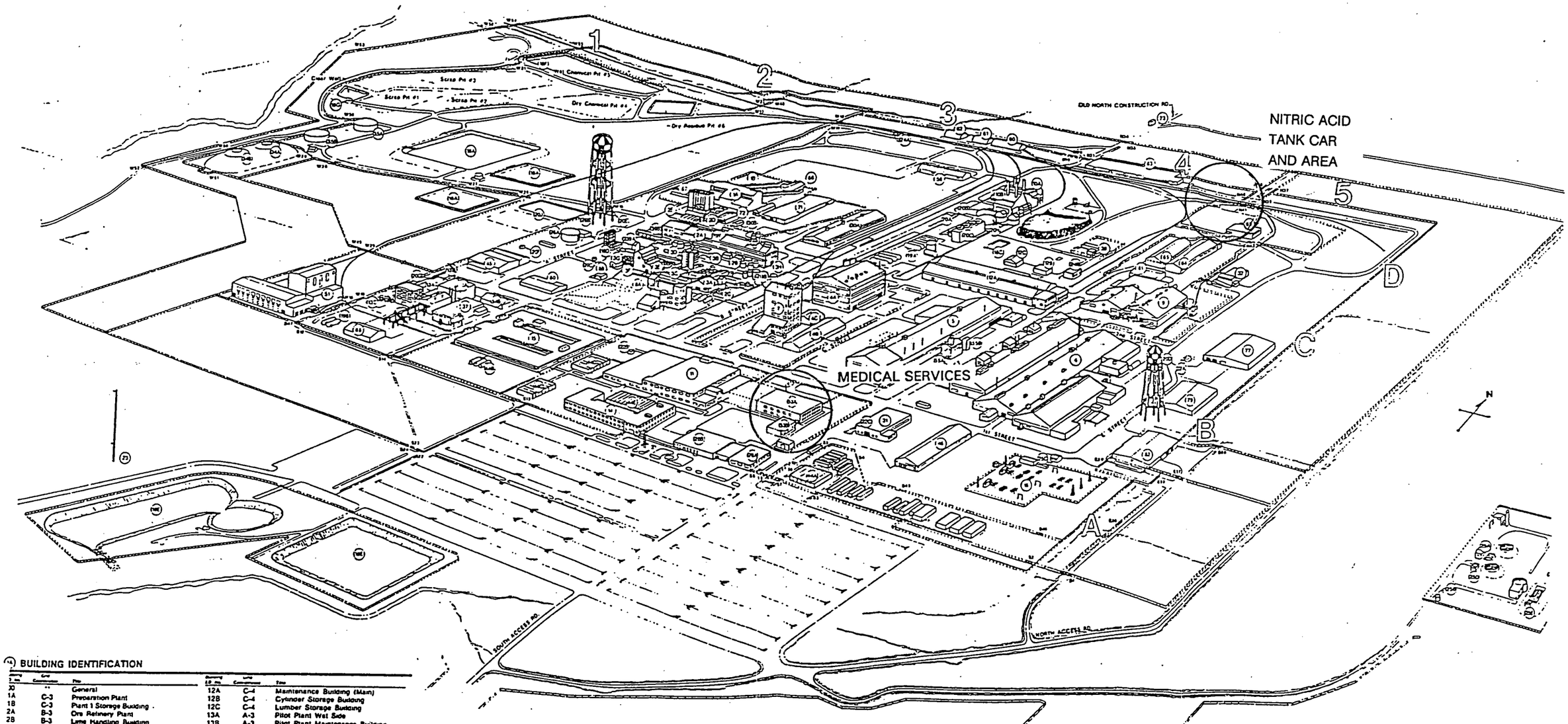
12.3.2 Injury/Illness

Emergency first aid will be applied on site as deemed necessary. Emergency medical services will be contacted to respond, or victim will be transported to the designated medical facility. The medical data sheet of the injured person will accompany in each case. Figure 12-1 identifies the route to the medical services building.

12.3.2.1 Emergency Decontamination. In the case of medical emergency, gross decontamination procedures will be implemented and the person transported to the nearest medical facility immediately. If a life threatening injury occurs and the injured person cannot undergo decontamination procedures without causing additional injuries, he or she should be transported in a body bag, plastic wrap, or wrapped in a blanket. The medical facility will be informed that the injured person is on the way, and has not been decontaminated. The medical facilities will be notified of the potential chemicals present

FMPC SITE

Nitric Acid Tank Car and Area



(24) BUILDING IDENTIFICATION

Building ID No.	Grid Coordinate	Title
10	--	General
1A	C-3	Preparation Plant
1B	C-3	Plant 1 Storage Building
2A	B-3	Ore Refinery Plant
2B	B-3	Lime Handling Building
2C	B-3	Bulk Lime Handling Building
2D	C-3	Metal Dissolver Building
2E	C-3	NFS Storage and Pump House
3A	B-3	Maintenance Building
3B	B-3	Ozone Building
3C	B-3	Control House
3D	B-3	NAR Towers
3E	B-3	Hot Raffinate Building
3F	B-3	Digestion Fume Recovery
3G	B-3	Refrigeration Building
3H	B-3	Refinery Sump
4A	B-4	Green Salt Plant
4B	B-4	Plant 4 Warehouse
4C	B-4	Plant 4 Maintenance Building
	B-4	Metals Production Plant
	B-5	Metals Fabricating Plant
	B-4	Plant 7
5A	B-3	Recovery Plant
5B	B-3	Maintenance Building
9	C-5	Special Products Plant
10A	D-4	Boiler Plant
10B	D-4	Boiler House Maintenance Building
11	A-4	Service Building
12A	C-4	Maintenance Building (Main)
12B	C-4	Cylinder Storage Building
12C	C-4	Lumber Storage Building
13A	A-3	Pilot Plant Wet Side
13B	A-3	Pilot Plant Maintenance Building
13C	A-3	Sump Pump House
14	A-4	Administration Building
15	A-3	Laboratories
16	A-5	Main Electrical Substation
18A	C-2	Surge Lagoon
18B	B-3	General Sump
18C	C-4	Coal Pile Runoff Basin
18D	B-3	Biodenitrification Towers
18E	*	Storm Water Retention Basin
18F	D-1	Pit 5 Sluice Gate
18G	C-1	Clearwell Pump House
19A	C-4	Metal Tank Farm
19B	A-3	Pilot Plant Ammonia Tank Farm
20A	C-4	Valve/Control Building
20B	D-4	Filter/Chemical Building
20C	C-4	Cooling Towers
20D	B-5	Elevated Storage Tank (Potable H_2O)
20E	B-3	Well House
20F	B-3	Well House
20G	A-3	Well House
20H	D-4	Process Water Storage Tank
20J	B-2	Lime Slurry Pits
22A	B-5	Gas Meter Building
22B	A-3	Storm Sewer Lift Station
22C	A-5	Truck Scale
23	*	Meteorological Tower
24A	D-3	Railroad Scale House
24B	C-4	Railroad Engine Building
25A	*	Chlorination House
25B	*	MH #175
25C	A-5	Sewage Lift Station Building
25D	*	U.V. Disinfection Building
25E	*	Dispeter Control House
26A	B-3	Pump House - M.P. Fire Protection
26B	B-3	Fire Protection Storage Tank
28A	A-4	Security Building
28B	A-4	Human Resources Building
30A	C-3	Chemical Warehouse
30B	C-3	Drum Storage Warehouse
31	A-5	Engine House - Garage
32	D-5	Magnesium Storage
34A	B-1	K-65 Storage Tank - North
34B	B-1	K-65 Storage Tank - South
35A	C-1	Metal Oxide Storage Tank - North
35B	B-1	Metal Oxide Storage Tank - South
37	A-3	Pilot Plant Annex
38	D-4	Propane Storage
39A	B-3	Incinerator Building
39B	B-3	Warehouse
39C	B-3	Incinerator Building Scrubber Room House
44A	A-5	Trailer Complex - 6-Plex - East
44B	A-3	Trailer Complex - 3-Plex
44C	A-3	Trailer Complex - 7-Plex - South
44D	A-3	Trailer Complex - 7-Plex - North
44E	A-4	Trailer Complex - 10-Plex
45	B-3	Building 45
46	A-5	Heavy Equipment Garage
51	A-2	UF_6 to UF_4 Reduction Facility II
53A	A-4	Health, Safety & Production Control Building
53B	A-4	In-Vivo Building
54A	A-3	UF_6 to UF_4 Reduction Facility I
54B	A-3	Warehouse/Weather Shelter
55A	B-4	Slag Recycling Plant
55B	B-4	Slag Recycling Pit/Extractor
56	D-3	CP Storage Warehouse
60	D-3	Quonset Number 1
61	D-3	Quonset Number 2
62	D-3	Quonset Number 3
63	D-4	KC-2 Warehouse
64	D-5	Plant 9 Warehouse
65	D-5	Plant 5 Warehouse
66	C-3	Drum Reconditioning Building
67	C-3	Plant 1 Storage Building
68	A-3	Pilot Plant Warehouse
69	D-5	Decontamination Building
71	C-3	General In-Process Storage Warehouse
72	C-3	Drum Storage Building
73	*	Fire Brigade Training Center Building
77	C-5	Finished Products Warehouse
78	*	New D&D Facility (On Hold)
79	B-5	Plant 6 Warehouse
80	B-3	Plant 6 Warehouse
81	C-5	Plant 9 Warehouse
82	B-5	Receiving & Incoming Materials Inspection Area

* Outside of Perimeter Security Fence

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Figure 12-1. Hospital route.

and the exposure-prevention measures that can be employed during treatment. Decontamination measures for other emergencies will be based upon the toxicity of the contaminants on site and the immediacy of the emergency on hand.

12.3.3 Fire

Fire extinguishers will be available when removal work takes place. Whenever hot work such as torch cutting is performed, a fire extinguisher will be readily available. Personnel at the site shall not extinguish fires that are beyond the incipient stage. The AEDO shall be contacted when a fire occurs.

12.3.4 Hazardous Waste Spill or Waste Release

Remedial action (without implementing Contingency Plan)

Remedial action will be conducted for any minor releases of hazardous waste. Releases requiring minor remediation should normally not exceed the classification of NON-ROUTINE EVENT. Although NON-ROUTINE events do not constitute implementation of the Contingency Plan, they shall nevertheless be reported to the AEDO so that he/she can make the final determination of the category of the event.

Remedial cleanup procedures must follow the direction of the AEDO and must follow the FMPC/DOE Event Reporting scheme.

Specific response to spills (when implementing Contingency Plan)

In the event of an emergency involving a spill, the specific procedures provided in the six sections (procedures based on EMERGENCY RESPONSE GUIDEBOOK INFORMATION or the physical characteristics of flammability, reactivity, and health related hazards of the material released) shall be used in conjunction with the FMPC Spill Incident Reporting and Cleanup Site Policy and Procedure.

The color coding indicators on the drums are useful designators to assist during a spill response. This color coding scheme can be used to provide, at a glance, an idea of the

proper spill response procedures to be used and the waste compatibility to be concerned with.

The FMPC Emergency Response Team is maintained and prepared for immediate response to a hazardous waste spill situation at all times.

Prevention of Recurrence or Spread of Hazardous Waste Fires, Explosions or Releases

Actions to prevent the recurrence or spread of fires, explosions, or releases include:

1) Respond promptly

2) Fight fire

3) Collect and contain released materials

4) Recover or isolate containers

5) Stop processes and operations where necessary

6) Monitor valves, pipes and equipment for leaks, pressure buildup, or ruptures.

12.3.5 Post-Emergency Equipment Maintenance

After an emergency, all emergency equipment listed in Section G-5, Emergency Equipment, will be cleaned and ready for its intended use before operations are resumed in the affected area(s) of the FMPC facility. Depleted stocks of materials will be replenished, self-contained breathing apparatus cleaned and refilled, protective clothing cleaned, etc. Before operations are resumed in the affected area(s) of the facility, an inspection of all safety equipment will be conducted.

Fire And Rescue

Fire and rescue equipment at the FEMP includes several vehicles with forcible entry tools, communications equipment, electric lights and generators, portable pumps, and protective equipment. There is also an inventory of heavy equipment.

Fire protection and extinguishing equipment at the FEMP includes building sprinkler systems (both wet-pipe and dry-pipe), fire and smoke alarm systems, hand-held fire extinguishers, and fire hydrants.

Personnel Decontamination Equipment

Decontamination equipment is stored on the mobile Emergency Spill Response Vehicle (328) and in Building 53. This equipment consists of brushes, soap, solution retention devices, and recovery containers. All of the equipment is designed to be used in conjunction with a portable water supply or water supplied from emergency equipment (pumpers/tankers).

Larger scale decontamination of equipment and/or facilities will be completed by the assigned section at the FEMP under the supervision of the AEDO or his/her representative.

Medical

The Medical Services is located in Building 53A and consists of the following:

- Medical Services, staffed by physicians, nurses, and technicians
- Medical Services Laboratory.

Medical vehicles for emergency use include two fully equipped ambulance vehicles. There are also various pieces of diagnostic equipment, hospital wards, and other equipment. The location for Building 53A is presented in Figure 12-1.

Emergency Power System

There are three emergency generators that furnish emergency power for lighting, communications, and for certain designated facilities.

The emergency generators are tested at least once each week by the utility engineers according to established procedures. Records of these tests are maintained by the utility engineer. When a power failure affects the Communications Center and the emergency generator fails to start, a portable unit is available. This unit is mobile and may be transported about the site. The Garage is responsible for keeping a record of this unit.

Additional Emergency Equipment

- Self-contained breathing apparatus and other respiratory equipment
- Acid suits
- Showers and eye bubbler stations
- Emergency power and lighting equipment
- Gasoline pumps and submersible electric pumps.

13.0 RECORDKEEPING

A variety of logs, records and subsequent reports will be produced as the activities of this project progress. These documents will provide a record of the events occurring during the project and provide a reference for evaluating performance in the area of health and safety.

13.1 LOGBOOKS

Logbooks will be used to document important events as they occur. Some general procedures will pertain to the use of all logbooks. The following information will be recorded on each page of all logbooks:

- Initials of persons making entry
- Date
- Time of each entry (military time)
- Location.

The log will be signed at the end of each day or work shift by the HSO. All entries will be made in black ink. No pages will be removed from the log book and each page will be consecutively numbered.

13.1.1 Daily Safety Log

This document will be used by the HSO to record all activities within the Exclusion Zone. In addition to standard log information, this log will contain:

- Names and job titles of all personnel in the work group
- Level of protection
- Health and safety monitoring equipment
- Weather conditions
- Work/rest schedule
- A description of the activities as they are occurring

- Any pertinent observations
- Sample number (if appropriate).

This document will be submitted daily to the site manager.

13.1.2 Air Monitoring Results Report

This document shall be used by the HSO to record information related to air monitoring and shall include the following:

- Duration of monitoring
- Work location and tasks
- Real-time instrument readings
- Instrument calibration
- Project boundary samples collected
- Personnel samples collected
- Data on project boundary and personnel samples (when data is received).

13.1.3 Daily Safety Briefing Log

This log will record the daily safety briefings conducted by the HSO, and will include an outline of the topics discussed and the names of personnel attending.

13.1.4 Instrument Calibration Log

Instruments will be calibrated before and after each use. The results of each calibration will be recorded by the HSO or designee on the appropriate calibration record which will include the following:

- Instrument name
- Serial #
- Appropriate settings (span, gain, type of probe)
- Concentration of calibration gas (as appropriate)
- Instrument response

- Battery condition
- Brief description of any problems or malfunctions
- Initials of calibrator.

13.2 RECORDS

A variety of records will be collected and organized to protect important information collected before and during site operations. Access to these records will be on a "need to know" basis.

13.2.1 Training Records

Records of proper training will be maintained for all personnel. All workers not trained by this contractor will be required to provide documentation of health and safety training for hazardous waste site operations meeting the requirements of 29 C.F.R. 1910.120. Workers who cannot provide sufficient documentation as determined by the HSO will be required to receive training prior to any on-site work.

A training record file will be established for each worker by the HSO and will contain the following documents:

- Certificate of Approved Hazardous Waste Site Safety and Health Training
- Certificate of CPR/First Aid Training (if applicable)
- Certificate of Site Specific Training
- Documentation of any special safety training (e.g., confined space entry)
- Certificates of refresher training (as appropriate)
- Documentation of 3-Day On-The-Job Supervision.

13.2.2 Medical Records

Complete medical records will be maintained by the consulting physician. Some medical-related records will, however, be maintained on site by the HSO. These will include:

- Qualification statement for hazardous waste sitework

- Qualification for respirator use
- Respirator fit test results
- Emergency medical data sheet
- Results of worker exposure monitoring.

13.2.3 Personal Monitoring Records

The TLD and air monitoring results for worker exposure monitoring will be collected and placed in each person's site file by the HSO. The monitoring results will be given to the employee in the form of a letter.

13.3 REPORTS

The reports to be submitted during and after the Nitric Acid Tank Car and Area removal action are described below.

13.3.1 Accident/Incident Reports

An Accident/Incident Report will be submitted to the contracting officer and others following any event involving emergency first aid, lost time, or property damage in excess of $300.00. A file will be maintained for all accident/incident reports. This file will be used to maintain the OSHA 200 log.

13.3.2 Weekly Safety Reports

A weekly safety report will be provided to the project manager and project health and safety officer on the following monday of each week. Significant occurrences and violation of safety practices will be described. Actions taken to minimize potential hazards and any deficiencies will also be included. This report will be prepared and signed by the HSO.

13.3.3 Close Out Safety Report

A final safety report will be prepared by the HSO and provided to WEMCO summarizing the safety performance achieved during all phases of the project. Specific elements of the report will include:

- A description of significant events, exposures, accidents, illness and action taken to prevent their recurrence
- Documentation of final medical exams for all site personnel
- Procedures for final decontamination of facilities and equipment
- A summary of all monitoring results including air, heat stress and meteorological
- A description of any state or federal inspections involving the health and safety of the site workers.

APPENDIX A

ACGIH TLVs for Heat Stress and Cold Stress

ADOPTED
THRESHOLD LIMIT VALUES

AIRBORNE UPPER SONIC AND ULTRASONIC ACOUSTIC RADIATION

These TLVs refer to sound pressure levels that represent conditions under which it is believed that nearly all workers may be repeatedly exposed without adverse health effects. The values listed in Table 1 should be used as guides in the control of noise exposure and, due to individual susceptibility, should not be regarded as fine lines between safe and dangerous levels. The levels for the third-octave bands centered below 20 kHz are below those which cause subjective effects. Those levels for 1/3 octaves above 20 kHz are for prevention of possible hearing losses from subharmonics of these frequencies.

TABLE 1. Permissible Airborne Upper Sonic and Ultrasound Acoustic Radiation Exposure Levels

Mid-Frequency of Third-Octave Band kHz	One-Third Octave—Band Level in dB re 20 μPa
10	80
12.5	80
16	80
20	105
25	110
31.5	115
40	115
50	115

Subjective annoyance may occur in some sensitive individuals at levels between 75 and 105 dB at 20 kHz 1/3 octave band and hearing protection or engineering controls may be needed to minimize or prevent the annoyance.

COLD STRESS

The cold stress TLVs are intended to protect workers from the severest effects of cold stress (hypothermia) and cold injury and to describe exposures to cold working conditions under which it is believed that nearly all workers can be repeatedly exposed without adverse health effects. The TLV objective is to prevent the deep body temperature from falling below 36°C (96.8°F) and to prevent cold injury to body extremities (deep body temperature is the core temperature of the body determined by conventional methods for rectal temperature measurements). For a single, occasional exposure to a cold environment, a drop in core temperature to no lower that 35°C (95°F) should be permitted. In addition to provisions for total body protection, the TLV objective is to protect all parts of the body with emphasis on hands, feet, and head from cold injury.

Introduction

Fatal exposures to cold among workers have almost always resulted from accidental exposures involving failure to escape from low environmental air temperatures or from immersion in low temperature water. The single most important aspect of life-threatening hypothermia is the fall in the deep core temperature of the body. The clinical presentations of victims of hypothermia are shown in Table 1. Workers should be protected from exposure to cold so that the deep core temperature does not fall below 36°C (96.8°F); lower body temperatures will very likely result in reduced mental alertness, reduction in rational decision making, or loss of consciousness with the threat of fatal consequences.

Pain in the extremities may be the first early warning of danger to cold stress. During exposure to cold, maximum severe shivering develops when the body temperature has fallen to 35°C (95°F). This must be taken as a sign of danger to the workers and exposure to cold should be immediately terminated for any workers when severe shivering becomes evident. Useful physical or mental work is limited when severe shivering occurs.

Since prolonged exposure to cold air, or to immersion in cold water, at temperatures well above freezing can lead to dangerous hypothermia, whole body protection must be provided.

1. Adequate insulating dry clothing to maintain core temperatures above 36°C (96.8°F) must be provided to workers if work is performed in air temperatures below 4°C (40°F). Wind chill cooling rate and the cooling power of air are critical factors. [Wind chill cooling rate is defined as heat loss from a body expressed in watts per meter squared which is a function of the air temperature and wind velocity upon the exposed body.] The higher the wind speed and the lower the temperature in the work area, the greater the insulation value of the protective clothing required. An equivalent chill temperature chart relating the actual dry bulb air temperature and the wind velocity is presented in Table 2. The equivalent chill tempera-

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TABLE 1. Progressive Clinical Presentations of Hypothermia*

Core Temperature °C	Core Temperature °F	Clinical Signs
37.6	99.6	"Normal" rectal temperature
37	98.6	"Normal" oral temperature
36	96.8	Metabolic rate increases in an attempt to compensate for heat loss
35	95.0	Maximum shivering
34	93.2	Victim conscious and responsive, with normal blood pressure
33	91.4	Severe hypothermia below this temperature
32 } 31 }	89.6 } 87.8 }	Consciousness clouded; blood pressure becomes difficult to obtain; pupils dilated but react to light; shivering ceases
30 } 29 }	86.0 } 84.2 }	Progressive loss of consciousness; muscular rigidity increases; pulse and blood pressure difficult to obtain; respiratory rate decreases
28	82.4	Ventricular fibrillation possible with myocardial irritability
27	80.6	Voluntary motion ceases; pupils nonreactive to light; deep tendon and superficial reflexes absent
26	78.8	Victim seldom conscious
25	77.0	Ventricular fibrillation may occur spontaneously
24	75.2	Pulmonary edema
22 } 21 }	71.6 } 69.8 }	Maximum risk of ventricular fibrilation
20	68.0	Cardiac standstill
18	64.4	Lowest accidental hypothermia victim to recover
17	62.6	Isoelectric electroencephalogram
9	48.2	Lowest artificially cooled hypothermia patient to recover

* Presentations approximately related to core temperature. Reprinted from the January 1982 issue of *American Family Physician*, published by the American Academy of Family Physicians.

TABLE 2. Cooling Power of Wind on Exposed Flesh Expressed as Equivalent Temperature (under calm conditions)*

Estimated Wind Speed (in mph)	Actual Temperature Reading (°F)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperature (°F)											
calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds greater than 40 mph have little additional effect.)	*LITTLE DANGER* In < hr with dry skin. Maximum danger of false sense of security				*INCREASING DANGER* Danger from freezing of exposed flesh within one minute.				*GREAT DANGER* Flesh may freeze within 30 seconds.			
	Trenchfoot and immersion foot may occur at any point on this chart.											

* Developed by U.S. Army Research Institute of Environmental Medicine, Natick, MA.

ture should be used when estimating the combined cooling effect of wind and low air temperatures on exposed skin or when determining clothing insulation requirements to maintain the deep body core temperature.

2. Unless there are unusual or extenuating circumstances, cold injury to other than hands, feet, and head is not likely to occur without the development of the initial signs of hypothermia. Older workers or workers with circulatory problems require special precautionary protection against cold injury. The use of extra insulating clothing and/or a reduction in the duration of the exposure period are among the special precautions which should be considered. The precautionary actions to be taken will depend upon the physical condition of the worker and should be determined with the advice of a physician with knowledge of the cold stress factors and the medical condition of the worker.

Evaluation and Control

For exposed skin, continuous exposure should not be permitted when the air speed and temperature results in an equivalent chill temperature of –32°C (–25.6°F). Superficial or deep local tissue freezing will occur only at temperatures below –1°C (30.2°F) regardless of wind speed.

At air temperatures of 2°C (35.6°F) or less, it is imperative that workers who become immersed in water or whose clothing becomes wet be immediately provided a change of clothing and be treated for hypothermia.

TLVs recommended for properly clothed workers for periods of work at temperatures below freezing are shown in Table 3.

Special protection of the hands is required to maintain manual dexterity for the prevention of accidents:

1. If fine work is to be performed with bare hands for more than 10–20 minutes in an environment below 16°C (60.8°F), special provisions should be established for keeping the workers' hands warm. For this purpose, warm air jets, radiant heaters (fuel burner or electric radiator), or contact warm plates may be utilized. Metal handles of tools and control bars should be covered by thermal insulating material at temperatures below –1°C (30.2°F).
2. If the air temperature falls below 16°C (60.8°F) for sedentary, 4°C (39.2°F) for light, –7°C (19.4°F) for moderate work and fine manual dexterity is not required, then gloves should be used by the workers.

To prevent contact frostbite, the workers should wear anti-contact gloves.

1. When cold surfaces below –7°C (19.4°F) are within reach, a warning should be given to each worker by the supervisor to prevent inadvertent contact by bare skin.
2. If the air temperature is –17.5°C (0°F) or less, the hands should be protected by mittens. Machine controls and tools

for use in cold conditions should be designed so that they can be handled without removing the mittens.

Provisions for additional total body protection are required if work is performed in an environment at or below 4°C (39.2°F). The workers should wear cold protective clothing appropriate for the level of cold and physical activity:

1. If the air velocity at the job site is increased by wind, draft, or artificial ventilating equipment, the cooling effect of the wind should be reduced by shielding the work area or by wearing an easily removable windbreak garment.
2. If only light work is involved and if the clothing on the worker may become wet on the job site, the outer layer of the clothing in use may be of a type impermeable to water. With more severe work under such conditions, the outer layer should be water repellent, and the outerwear should be changed as it becomes wetted. The outer garments should include provisions for easy ventilation in order to prevent wetting of inner layers by sweat. If work is done at normal temperatures or in a hot environment before entering the cold area, the employee should make sure that clothing is not wet as a consequence of sweating. If clothing is wet, the employee should change into dry clothes before entering the cold area. The workers should change socks and any removable felt insoles at regular daily intervals or use vapor barrier boots. The optimal frequency of change should be determined empirically and will vary individually and according to the type of shoe worn and how much the individual's feet sweat.
3. If exposed areas of the body cannot be protected sufficiently to prevent sensation of excessive cold or frostbite, protective items should be supplied in auxiliary heated versions.
4. If the available clothing does not give adequate protection to prevent hypothermia or frostbite, work should be modified or suspended until adequate clothing is made available or until weather conditions improve.
5. Workers handling evaporative liquid (gasoline, alcohol or cleaning fluids) at air temperatures below 4°C (39.2°F) should take special precautions to avoid soaking of clothing or gloves with the liquids because of the added danger of cold injury due to evaporative cooling. Special note should be taken of the particularly acute effects of splashes of "cryogenic fluids" or those liquids with a boiling point that is just above ambient temperature.

Work–Warming Regimen

If work is performed continuously in the cold at an equivalent chill temperature (ECT) or below –7°C (19.4°F), heated warming shelters (tents, cabins, rest rooms, etc.) should be made available nearby. The workers should be encouraged to use these shelters at regular intervals, the frequency depending on the

TABLE 3. Threshold Limit Values Work/Warm-up Schedule for Four-Hour Shift*

Air Temperature—Sunny Sky		No Noticeable Wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind	
°C (approx.)	°F (approx.)	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks
-26° to -28°	-15° to -19°	(Norm. Breaks)	1	(Norm. Breaks)	1	75 min	2	55 min	3	40 min	4
-29° to -31°	-20° to -24°	(Norm. Breaks)	1	75min	2	55 min	3	40 min	4	30 min	5
-32° to -34°	-25° to -29°	75 min	2	55 min	3	40 min	4	30 min	5	Non-emergency work should cease	
-35° to -37°	-30° to -34°	55 min	3	40 min	4	30 min	5	Non-emergency work should cease			
-38° to -39°	-35° to -39°	40 min	4	30 min	5	Non-emergency work should cease					
-40° to -42°	-40° to -44°	30 min	5	Non-emergency work should cease							
-43° & below	-45° & below	Non-emergency work should cease									

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Notes for Table 3:

1. Schedule applies to moderate to heavy work activity with warm-up breaks of ten (10) minutes in a warm location. For Light-to-Moderate Work (limited physical movement): apply the schedule one step lower. For example, at -35°C (-30°F) with no noticeable wind (Step 4), a worker at a job with little physical movement should have a maximum work period of 40 minutes with 4 breaks in a 4-hour period (Step 5).
2. The following is suggested as a guide for estimating wind velocity if accurate information is not available:
   5 mph: light flag moves; 10 mph: light flag fully extended; 15 mph: raises newspaper sheet; 20 mph: blowing and drifting snow.
3. If only the wind chill cooling rate is available, a rough rule of thumb for applying it rather than the temperature and wind velocity factors given above would be: 1) special warm-up breaks should be initiated at a wind chill cooling rate of about 1750 W/m²; 2) all non-emergency work should have ceased at or before a wind chill of 2250 W/m². In general the warm-up schedule provided above slightly under-compensates for the wind at the warmer temperatures, assuming acclimatization and clothing appropriate for winter work. On the other hand, the chart slightly over-compensates for the actual temperatures in the colder ranges, since windy conditions rarely prevail at extremely low temperatures.
4. TLVs apply only for workers in dry clothing.

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* Adapted from Occupational Health & Safety Division, Saskatchewan Department of Labour.

severity of the environmental exposure. The onset of heavy shivering, frostnip, the feeling of excessive fatigue, drowsiness, irritability, or euphoria are indications for immediate return to the shelter. When entering the heated shelter, the outer layer of clothing should be removed and the remainder of the clothing loosened to permit sweat evaporation or a change of dry work clothing provided. A change of dry work clothing should be provided as necessary to prevent workers from returning to work with wet clothing. Dehydration, or the loss of body fluids, occurs insidiously in the cold environment and may increase the susceptibility of the worker to cold injury due to a significant change in blood flow to the extremities. Warm sweet drinks and soups should be provided at the work site to provide caloric intake and fluid volume. The intake of coffee should be limited because of the diuretic and circulatory effects.

For work practices at or below −12°C (10.4°F) ECT, the following should apply:

1. The worker should be under constant protective observation (buddy system or supervision).
2. The work rate should not be so high as to cause heavy sweating that will result in wet clothing; if heavy work must be done, rest periods should be taken in heated shelters and opportunity for changing into dry clothing should be provided.
3. New employees should not be required to work fulltime in the cold during the first days of employment until they become accustomed to the working conditions and required protective clothing.
4. The weight and bulkiness of clothing should be included in estimating the required work performance and weights to be lifted by the worker.
5. The work should be arranged in such a way that sitting still or standing still for long periods is minimized. Unprotected metal chair seats should not be used. The worker should be protected from drafts to the greatest extent possible.
6. The workers should be instructed in safety and health procedures. The training program should include as a minimum instruction in:
   a. Proper rewarming procedures and appropriate first aid treatment.
   b. Proper clothing practices.
   c. Proper eating and drinking habits.
   d. Recognition of impending frostbite.
   e. Recognition of signs and symptoms of impending hypothermia or excessive cooling of the body even when shivering does not occur.
   f. Safe work practices.

Special Workplace Recommendations

Special design requirements for refrigerator rooms include:

1. In refrigerator rooms, the air velocity should be minimized as much as possible and should not exceed 1 meter/sec (200 fpm) at the job site. This can be achieved by properly designed air distribution systems.
2. Special wind protective clothing should be provided based upon existing air velocities to which workers are exposed.

Special caution should be exercised when working with toxic substances and when workers are exposed to vibration. Cold exposure may require reduced exposure limits.

Eye protection for workers employed out-of-doors in a snow and/or ice-covered terrain should be supplied. Special safety goggles to protect against ultraviolet light and glare (which can produce temporary conjunctivitis and/or temporary loss of vision) and blowing ice crystals should be required when there is an expanse of snow coverage causing a potential eye exposure hazard.

Workplace monitoring is required as follows:

1. Suitable thermometry should be arranged at any workplace where the environmental temperature is below 16°C (60.8°F) so that overall compliance with the requirements of the TLV can be maintained.
2. Whenever the air temperature at a workplace falls below −1°C (30.2°F), the dry bulb temperature should be measured and recorded at least every 4 hours.
3. In indoor workplaces, the wind speed should also be recorded at least every 4 hours whenever the rate of air movement exceeds 2 meters per second (5 mph).
4. In outdoor work situations, the wind speed should be measured and recorded together with the air temperature whenever the air temperature is below −1°C (30.2°F).
5. The equivalent chill temperature should be obtained from Table 2 in all cases where air movement measurements are required; it should be recorded with the other data whenever the equivalent chill temperature is below −7°C (19.4°F).

Employees should be excluded from work in cold at −1°C (30.2°F) or below if they are suffering from diseases or taking medication which interferes with normal body temperature regulation or reduces tolerance to work in cold environments. Workers who are routinely exposed to temperatures below −24°C (−11.2°F) with wind speeds less than five miles per hour, or air temperatures below −18°C (0°F) with wind speeds above five miles per hour, should be medically certified as suitable for such exposures.

Trauma sustained in freezing or subzero conditions requires special attention because an injured worker is predisposed to cold injury. Special provisions should be made to prevent hypothermia and freezing of damaged tissues in addition to providing for first aid treatment.

TABLE 2. Stockholm Workshop HAVS Classification System for Cold-induced Peripheral Vascular and Sensorineural Symptoms

Vascular Assessment		
Stage	**Grade**	**Description**
0	———	No attacks
1	Mild	Occasional attacks affecting only the tips of one or more fingers
2	Moderate	Occasional attacks affecting distal and middle (rarely also proximal) phalanges of one or more fingers
3	Severe	Frequent attacks affecting ALL phalanges of most fingers
4	Very Severe	As in Stage 3, with trophic skin changes in the finger tips

Note: Separate staging is made for each hand, e.g., 2L(2)/1R(1) = stage 2 on left hand in 2 fingers: stage 1 on right hand in 1 finger.

Sensorineural Assessment	
Stage	**Symptoms**
0SN	Exposed to vibration but no symptoms
1SN	Intermittent numbness, with or without tingling
2SN	Intermittent or persistent numbness, reducing sensory perception
3SN	Intermittent or persistent numbness, reducing tactile discrimination and/or manipulative dexterity

Note: Separate staging is made for each hand.

Note: The first paragraph on page 86 of this Booklet replaces the following from page 82 of the 1990–91 Booklet: "The TLVs in Table 1 refer to component acceleration levels and durations of exposure that represent conditions under which it is believed that nearly all workers may be exposed repeatedly without progressing to Stage 1 of the Stockholm Workshop Classification System for Vibration-induced White Finger (VWF), also known as Raynaud's Phenomenon of Occupational Origin (Table 2)."

HEAT STRESS

Note: Materials on the Notice of Intended Changes have been incorporated into the text and are indicated by a † preceding the revision/addition and by a vertical rule in the margin. [See pages 91, 92, and 98.]

The heat stress TLVs specified in Table 1 and Figure 1 refer to heat stress conditions under which it is believed that nearly all workers may be repeatedly exposed without adverse health effects. These TLVs are based on the assumption that nearly all acclimatized, fully clothed (e.g., lightweight pants and shirt) workers with adequate water and salt intake should be able to function effectively under the given working conditions without exceeding a deep body temperature of 38°C (100.4°F).

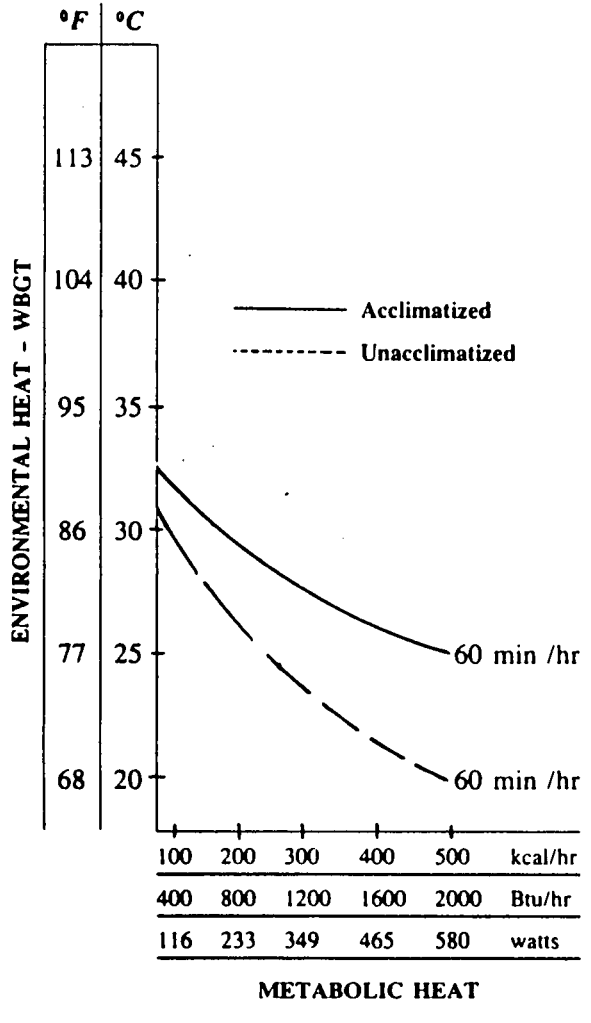
†Where there is a requirement for protection against other harmful substances in the work environment and additional personal protective clothing and equipment must be worn, a correction to the WBGT TLV values, as presented in Table 1 and Figure 1, must be applied. The values in Figure 1 are approximations and are not intended as a substitute for physiological monitoring.

Since measurement of deep body temperature is impractical for monitoring the workers' heat load, the measurement of environmental factors is required which most nearly correlate with deep body temperature and other physiological responses to heat. At the present time, the Wet Bulb Globe Temperature Index (WBGT) is the simplest and most suitable technique to measure the environmental factors. WBGT values are calculated by the following equations:

TABLE 1. Examples of Permissible Heat Exposure Threshold Limit Values [Values are given in °C and (°F) WBGT]*

	Work Load		
Work—Rest Regimen	**Light**	**Moderate**	**Heavy**
Continuous work	30.0 (86)	26.7 (80)	25.0 (77)
75% Work — 25% Rest, each hour	30.6 (87)	28.0 (82)	25.9 (78)
50% Work — 50% Rest, each hour	31.4 (89)	29.4 (85)	27.9 (82)
25% Work — 75% Rest, each hour	32.2 (90)	31.1 (88)	30.0 (86)

* For unacclimatized workers, the permissible heat exposure TLV should be reduced by 2.5°C.



†Figure 1 — Permissible heat exposure Threshold Limit Values for heat acclimatized and unacclimatized workers.

Note: Figure 1 has been modified from the 1990-91 TLV/BEI Booklet by deletion of "Xs" on the two curves and the addition of marks on the x and y axes for the numerical indices.

1. Outdoors with solar load:
   WBGT = 0.7 NWB + 0.2 GT + 0.1 DB
2. Indoors or Outdoors with no solar load:
   WBGT = 0.7 NWB + 0.3 GT

where:

WBGT = Wet Bulb Globe Temperature Index
NWB = Natural Wet-Bulb Temperature
DB = Dry-Bulb Temperature
GT = Globe Temperature

The determination of WBGT requires the use of a black globe thermometer, a natural (static) wet-bulb thermometer, and a dry-bulb thermometer.

Higher heat exposures than those shown in Table 1 and Figure 1 are permissible if the workers have been undergoing medical surveillance and it has been established that they are more tolerant to work in heat than the average worker. Workers should not be permitted to continue their work when their deep body temperature exceeds 38°C (100.4°F).

Evaluation and Control

I. *Measurement of the Environment*

The instruments required are a dry-bulb, a natural wet-bulb, a globe thermometer, and a stand. The measurement of the environmental factors should be performed as follows:

A. The range of the dry and the natural wet bulb thermometer should be −5°C to +50°C (23°F to 122°F) with an accuracy of ± 0.5°C. The dry bulb thermometer must be shielded from the sun and the other radiant surfaces of the environment without restricting the airflow around the bulb. The wick of the natural wet-bulb thermometer should be kept wet with distilled water for at least 1/2 hour before the temperature reading is made. It is not enough to immerse the other end of the wick into a reservoir of distilled water and wait until the whole wick becomes wet by capillarity. The wick should be wetted by direct application of water from a syringe 1/2 hour before each reading. The wick should extend over the bulb of the thermometer, covering the stem about one additional bulb length. The wick should always be clean and new wicks should be washed before using.

B. A globe thermometer, consisting of a 15-cm (6-inch) diameter hollow copper sphere painted on the outside with a matte black finish or equivalent, should be used. The bulb or sensor of a thermometer (range −5°C to +100°C [23°F to 212°F] with an accuracy of ± 0.5°C) must be fixed in the center of the sphere. The globe thermometer should be exposed at least 25 minutes before it is read.

C. A stand should be used to suspend the three thermometers so

that they do not restrict free air flow around the bulbs, and the wet-bulb and globe thermometer are not shaded.

D. It is permissible to use any other type of temperature sensor that gives a reading identical to that of a mercury thermometer under the same conditions.

E. The thermometers must be placed so that the readings are representative of the conditions under which the employees work or rest, respectively.

II. *Work Load Categories*

Heat produced by the body and the environmental heat together determine the total heat load. Therefore, if work is to be performed under hot environmental conditions, the workload category of each job should be established and the heat exposure limit pertinent to the workload evaluated against the applicable standard in order to protect the worker exposure beyond the permissible limit.

A. The work load category may be established by ranking each job into light, medium, or heavy categories on the basis of type of operation:

(1) light work (up to 200 kcal/hr or 800 Btu/hr): e.g., sitting or standing to control machines, performing light hand or arm work,

(2) moderate work (200–350 kcal/hr or 800–1400 Btu/hr): e.g., walking about with moderate lifting and pushing, or

(3) heavy work (350–500 kcal/hr or 1400–2000 Btu/hr): e.g., pick and shovel work.

Where the work load is ranked into one of said three categories, the permissible heat exposure TLV for each workload can be estimated from Table 1 or calculated using Tables 2 and 3.

B. The ranking of the job may be performed either by measuring the worker's metabolic rate while performing a job or by estimating the worker's metabolic rate with the use of Tables 2 and 3. Additional tables available in the literature[1-4] may be utilized also. When this method is used, the permissible heat exposure TLV can be determined by Figure 1.

III. *Work–Rest Regimen*

The TLVs specified in Table 1 and Figure 1 are based on the assumption that the WBGT value of the resting place is the same or very close to that of the workplace. Where the WBGT of the work area is different from that of the rest area, a time-weighted average value should be used for both environmental and metabolic heat.

The time-weighted average metabolic rate (M) should be determined by the equation:

TABLE 2. Assessment of Work Load

Average values of metabolic rate during different activities.

A. Body position and movement	kcal/min
Sitting	0.3
Standing	0.6
Walking	2.0-3.0
Walking up hill	add 0.8 per meter (yard) rise

B. Type of Work		Average kcal/min	Range kcal/min
Hand work	*light*	0.4	0.2-1.2
	heavy	0.9	
Work with one arm	*light*	1.0	0.7-2.5
	heavy	1.7	
Work with both arms	*light*	1.5	1.0-3.5
	heavy	2.5	
Work with body	*light*	3.5	2.5-15.0
	moderate	5.0	
	heavy	7.0	
	very heavy	9.0	

$$\text{Av. } M = \frac{M_1 \times t_1 + M_2 \times t_2 + \ldots + M_n \times t_n}{t_1 + t_2 + \ldots + t_n}$$

where M_1, M_2...and M_n are estimated or measured metabolic rates for the various activities and rest periods of the worker during the time periods t_1, t_2...and t_n (in minutes) as determined by a time study.

The time-weighted average WBGT should be determined by the equation:

$$\text{Av. WGBT} = \frac{WBGT_1 \times t_1 + WBGT_2 \times t_2 + \ldots + WBGT_n \times t_n}{t_1 + t_2 + \ldots + t_n}$$

where $WBGT_1$, $WBGT_2$ ... and $WBGT_n$ are calculated values of WBGT for the various work and rest areas occupied during total time periods; t_1, t_2 ... and t_n are the elapsed times in minutes spent in the corresponding areas which are determined by a time

study. Where exposure to hot environmental conditions is continuous for several hours or the entire work day, the time-weighted averages should be calculated as an hourly time-weighted average, i.e., $t_1 + t_2 + \ldots t_n = 60$ minutes. Where the exposure is intermittent, the time-weighted averages should be calculated as two-hour time-weighted averages, i.e., $t_1 + t_2 + \ldots + t_n = 120$ minutes.

The TLVs for continuous work are applicable where there is a work–rest regimen of a 5-day work week and an 8-hour work day with a short morning and afternoon break (approximately 15 minutes) and a longer lunch break (approximately 30 minutes). Higher exposure values are permitted if additional resting time is allowed. All breaks, including unscheduled pauses and administrative or operational waiting periods during work, may be counted as rest time when additional rest allowance must be given because of high environmental temperatures.

TABLE 3. Activity Examples

- Light hand work: writing, hand knitting
- Heavy hand work: typewriting
- Heavy work with one arm: hammering in nails (shoemaker, upholsterer)
- Light work with two arms: filing metal, planing wood, raking of a garden
- Moderate work with the body: cleaning a floor, beating a carpet
- Heavy work with the body: railroad track laying, digging, barking trees

Sample Calculation

Assembly line work using a heavy hand tool.

A.	Walking along	2.0 kcal/min
B.	Intermediate value between heavy work with two arms and light work with the body	3.0 kcal/min
	Subtotal:	5.0 kcal/min
C.	Add for basal metabolism	1.0 kcal/min
	Total:	6.0 kcal/min

IV. *Water and Salt Supplementation*

During the hot season or when the worker is exposed to artificially generated heat, drinking water should be made available to the workers in such a way that they are stimulated to frequently drink small amounts, i.e., one cup every 15–20 minutes (about 150 ml or 1/4 pint).

The water should be kept reasonably cool, 10°C to 15°C (50°F to 60°F) and should be placed close to the workplace so that the worker can reach it without abandoning the work area.

The workers should be encouraged to salt their food abundantly during the hot season and particularly during hot spells. If the workers are unacclimatized, salted drinking water should be made available in a concentration of 0.1% (1 g NaCl to 1.0 liter or 1 level tablespoon of salt to 15 quarts of water). The added salt should be completely dissolved before the water is distributed, and the water should be kept reasonably cool.

V. *Other Considerations*

A. *Clothing:* The permissible heat exposure TLVs are valid for light summer clothing as customarily worn by workers when working under hot environmental conditions. If special clothing is required for performing a particular job and this clothing is heavier or it impedes sweat evaporation or has higher insulation value, the worker's heat tolerance is reduced, and the permissible heat exposure TLVs indicated in Table 1 and Figure 1 are not applicable. For each job category where special clothing is required, the permissible heat exposure TLV should be established by an expert.

†Table 4 identifies TLV WBGT correction factors for representative types of clothing.

B. *Acclimatization and Fitness:* Acclimatization to heat involves a series of physiological and psychological adjustments that occur in an individual during the first week of exposure to hot environmental conditions. The recommended heat stress TLVs are valid for acclimated workers who are physically fit. Extra caution must be employed when unacclimated or physically unfit workers must be exposed to heat stress conditions.

C. *Adverse Health Effects:* The most serious of heat-induced illnesses is heat stroke because of its potential to be life threatening or result in irreversible damage. Other heat-induced illnesses include heat exhaustion which in its most serious form leads to prostration and can cause serious injuries as well. Heat cramps, while debilitating, are easily reversible if properly and promptly treated. Heat disorders due to excessive heat exposure include electrolyte imbalance, dehydration, skin rashes, heat edema, and loss of physical and mental work capacity.

If during the first trimester of pregnancy, a female worker's core temperature exceeds 39°C (102.2°F) for extended periods, there is an increased risk of malformation to the unborn fetus. Additionally, core temperatures above 38°C (100.4°F) may be as-

†TABLE 4. TLV WBGT Correction Factors in °C for Clothing

Clothing Type	Clo Value*	WBGT Correction
Summer work uniform	0.6	0
Cotton coveralls	1.0	-2
Winter work uniform	1.4	-4
Water barrier, permeable	1.2	-6

*Clo: Insulation value of clothing. One clo unit = 5.55 kcal/m²/hr of heat exchange by radiation and convection for each °C of temperature difference between the skin and adjusted dry bulb temperature.

Note: Deleted from Table 4 are trade names and "fully encapsulating suit, gloves, boots, & hood," including its Clo value of 1.2 and WBGT correction of -10.

sociated with temporary infertility in both females and males.

References

1. Astrand, P-O.; Rodahl, K.: Textbook of Work Physiology. McGraw-Hill Book Co., New York, San Francisco (1970).
2. Ergonomics Guide to Assessment of Metabolic and Cardiac Costs of Physical Work. Am. Ind. Hyg. Assoc. J. 32:560 (1971).
3. Energy Requirements for Physical Work. Research Progress Report No. 30. Purdue Farm Cardiac Project, Agricultural Experiment Station, West Lafayette, IN (1961).
4. Durnin, J.V.G.A.; Passmore, R.: Energy, Work and Leisure. Heinemann Educational Books, Ltd., London (1967).

IONIZING RADIATION

The Physical Agents TLV Committee accepts the philosophy and recommendations of the National Council on Radiation Protection and Measurements (NCRP) for ionizing radiation. The NCRP is chartered by Congress to, in part, collect, analyze, develop, and disseminate information and recommendations about protection against radiation and about radiation measurements, quantities, and units, including development of basic concepts in these areas. NCRP Report No. 91, *Basic Radiation Protection Criteria* (January 15, 1971), provides basic philosophy and concepts leading to protection criteria. Other NCRP reports address specific areas of radiation protection and, collectively, provide an excellent basis for establishing a sound program for radiation control. As substantive documentation of a sound basis for ionizing radiation protection, the Committee recommends NCRP Report No. 39 and NCRP Report No. 22, *"Maximum Permissible Body Burdens and Maximum Permissible Concentrations of Radionuclides in Air and in Water for Occupational Exposure* (National Bureau of Standards Handbook 69, June 5, 1959; Addendum 1, August 1963). These documents, as well as information on numerous other NCRP Reports addressing specific subjects in ionizing radiation protection, are available from: NCRP Publications, 7910 Woodmont Ave., Suite 1016, Bethesda, MD 20814.

The Committee also strongly recommends that all exposure to ionizing radiation be kept as low as reasonably achievable.

ATTACHMENT 4
QUALITY ASSURANCE PROJECT PLAN

NITRIC ACID TANK CAR AND AREA
Removal Action Work Plan and
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ACRONYMS AND ABBREVIATIONS

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ASL	analytical support level
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DOE	U.S. Department of Energy
DQO	Data Quality Objective
EPA	U.S. Environmental Protection Agency
FEMP	Federal Environmental Management Project
HWMU	hazardous waste management unit
OEPA	Ohio Environmental Protection Agency
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
SAP	Sampling and Analysis Plan
SCQ	Site-Wide CERCLA Quality Assurance Project Plan

1.0 INTRODUCTION

The Fernald Environmental Management Project (FEMP) is owned by the U.S. Department of Energy (DOE) and is a former uranium processing facility. The current mission of FEMP is waste management and environmental restoration; as such, it is subject to a wide range of environmental statutes and regulations.

The U.S. Environmental Protection Agency (EPA) requires that environmental monitoring and measurement programs mandated or supported by EPA contain a centrally managed Quality Assurance (QA) program. Parties generating data under such a program shall be required to implement procedures that ensure precision, accuracy, completeness, and representativeness of the data and documentation thereof (DOE and EPA 1991).

The Site-Wide Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Quality Assurance Project Plan (SCQ) program was developed for FEMP environmental sampling and analysis, with a twofold purpose: 1) establish minimum standards of performance for operational and analytical activities, and 2) ensure that standards are followed by parties covered by the program. The SCQ integrates CERCLA requirements into applicable sampling activities at FEMP consistent with EPA recommendations to consolidate QA requirements and documents whenever possible (EPA 1989).

The SCQ is designed to ensure that work performed for environmental programs and supporting activities at FEMP is of adequate quality to fulfill project-specific Data Quality Objectives (DQOs). The organization, objectives, functional activities, and specific QA/Quality Control (QC) activities associated with the CERCLA program at FEMP are presented. Basic requirements for sampling, sample handling and storage, chain-of-custody records, and laboratory and field analyses are specified in the sections and appendices of the SCQ.

Data generated under this project are intended to fulfill defined needs of DOE, EPA, the Ohio Environmental Protection Agency (OEPA), and the public. The DQOs and requirements for meeting and verifying DQOs are included as part of the SCQ.

2.0 NITRIC ACID TANK CAR AND AREA HISTORY

The Nitric Acid Tank Car (No. DODX17135) is located on Track 2 in the northeast corner of the production area at the FEMP, east of Building 53.

During the period that the FEMP (previously FMPC) was in production, nitric acid was an important process chemical for producing uranium metal. During peak production periods it became necessary to store some of the nitric acid in large portable storage containers. Tank Car No. DODX17135 was used for this purpose, storing concentrated nitric acid. The car was kept on the rail siding until its contents or storage capacity was needed, whereupon it was moved to the desired location on site. Following the acid transfer, the Tank Car was moved back to the siding.

Visual inspection of the Tank Car indicates that there is a relatively small amount (50 to 100 gallons) of liquid remaining in the tank. This material is not considered to be unused acid, nor is it intended for future production or laboratory use. The nitric acid residue remaining in the rail car is considered a solid waste because it has been discarded by abandonment. Consequently, the Tank Car is a solid waste management unit.

Analysis of the residues found in the Tank Car also indicate a pH of less than one. The acid exhibits the hazardous waste characteristic of corrosivity and is thus considered a hazardous waste. Since the discarded nitric acid has been stored in the Tank Car in excess of 90 days and the acid has the hazardous characteristic of corrosivity, both the Tank Car and the associated contiguous land area on which it resides constitute a hazardous waste management unit (HWMU).

3.0 APPLICABLE SCQ REQUIREMENTS FOR THE NITRIC ACID TANK CAR AND AREA ACTION

The Nitric Acid Tank Car and Area removal action was previously identified as being covered by the SCQ to ensure that work performed is of adequate quality to fulfill project specific objectives. As such, it is necessary to identify those sections of the SCQ that will be implemented during Phase 1 and Phase 2 field actions. Phase 1 field actions will remove, package and dispose of the contents of the Tank Car, followed by decontamination and dispositioning of the car itself. Phase 2 field actions will require investigation of the surrounding soil for related contamination followed by area characterization, if necessary. Pertinent sections which shall govern both phases are as follows:

Section 2 - Project Description
Section 3 - Project Organization and Responsibilities
Section 4 - Quality Assurance Objectives
Section 5 - Field Activities
Section 6 - Sampling Requirements
Section 7 - Sample Custody
Section 8 - Calibration Procedures and Frequency
Section 9 - Analytical Procedures
Section 10 - Internal Quality Control Checks and Frequency
Section 11 - Data Reduction, Validation and Reporting
Section 12 - Performance and System Audits
Section 13 - Preventive Maintenance
Section 15 - Corrective Actions
Section 16 - Quality Assurance Reports to Management

As this project is mainly a removal effort with minimum sampling and analysis applicability, these sections are further defined by reference to specific subsections and paragraphs within the SCQ and/or plan.

3.1 PROJECT DESCRIPTION

The FEMP project description is as defined in Section 2 of the SCQ, and in Section 2.0 of this Quality Assurance Project Plan. Project objectives and schedule are stated in the plan Sections 1.2, 2.5, and 3.1.

3.2 PROJECT ORGANIZATION AND RESPONSIBILITY

The project description is as defined in Section 3 of the SCQ. The Nitric Acid Tank Car and Area removal action organization and responsibilities are included in Sections 3.2 of the plan.

3.3 QUALITY ASSURANCE OBJECTIVES

The removal action quality assurance objectives are found in Section 4 of the SCQ. Specifically, the removal task will address controls on planning, implementation, and assessment of removal action activities with emphasis on training, records administration, document control, sampling, chain of custody, instrument calibration and preventive maintenance, corrective actions, DQO, data accuracy, precision, completeness, representativeness and comparability, and surveillance/audits. The data generated will be of known quality and in compliance with the selected data quality objectives. Additional sampling and analysis objectives are defined in Section 3.3 of the plan. All personnel working on this task will be trained in accordance with Subsection 4.4.1 of the SCQ as defined in Section 3.2 of the work plan. Records administration will be in accordance with Subsection 4.4.2 of the SCQ. Document control will be in accordance with Subsection 4.4.3.

3.4 FIELD ACTIVITIES

Field activities will consist mainly of removal activities, but will also include a physical sample collection. The general policies for conducting the field activities will be in accordance with Section 5 of the SCQ. All field activities will be documented in a daily log as stated in SCQ Subsection 5.1. General procedures for conducting field activities are contained in Appendix J of the SCQ and will be followed for applicable activities. When project field activities are unique to the specific activities, detailed procedures will be developed and documented in the SAP.

Each field procedure will specify reasons or uses for the activity, methods to be used, applicable material specifications and documentation requirements specific to that activity. Procedures contained in Appendix J may be incorporated in the SAP by reference. Sampling and analysis activities will be in accordance with the removal action SAP.

If geophysical surveys are to be conducted, they will be in accordance with Subsection 5.3 of the SCQ. Field radiological contamination surveys will be in accordance with Subsection 5.4.

3.5 SAMPLING REQUIREMENTS

Sampling requirements on the removal action will be performed in accordance with Section 6 and Appendix K of the SCQ. These requirements will be referenced in the Task SAP along with the task-specific sampling procedures required to meet the removal action data needs. Section 3.3 of the plan describes the SAP.

- DQOs based on intended use of the data and analytical support level (ASL).
- Rationale for sample collection
- Sample collection locations
- Sampling procedure describing:
  - Hazards
  - Equipment and Calibration
  - Documentation required
  - Labels, chain of custody, handling, storage, and shipping
  - Decontamination requirements
  - Reports
  - Data validation requirements
  - QA/QC samples required along with protocols
- Analytical Procedures

3.6 SAMPLE CUSTODY

Sample custody will be in accordance with Section 7 of the SCQ.

3.7 CALIBRATION PROCEDURES AND FREQUENCY

Calibration of test and measurement equipment, and special process equipment defined in the work plan, will be in accordance with Section 8 of the SCQ and equipment manufacturer's recommendations. All equipment to be used in the removal action will be listed in the work plan along with applicable calibration requirements. Appendix I of the SCQ will be included by reference. Calibration procedures will be authored if appropriate calibration procedures do not already exist. Field users of calibrated equipment will be responsible for inspecting calibration status of the equipment before use and will document the inspection in the calibration log.

If equipment cannot be calibrated or becomes inoperable during use it will be tagged and removed from service until it can be repaired and recalibrated. Equipment that cannot be repaired will be permanently removed from the project and replaced.

3.8 ANALYTICAL PROCEDURES

Analytical procedures and methods for sample analysis will be in accordance with the requirements of Section 9 of the SCQ and referenced in the removal action SAP. Table 9.1 (SCQ Appendix A) used as a resource to select the appropriate method. If the required analytical method is not included in Table 9.1, the new analytical requirements shall be identified and will be added to SCQ Attachment I - (FEMP Laboratory Analytical Methods Manual).

3.9 INTERNAL QUALITY CONTROL CHECKS AND FREQUENCY

Internal quality control checks and frequency will be in accordance with SCQ Section 10 and defined in the SAP. Required frequencies for the quality control checks are found in SCQ Table 2-2 (Appendix A). These frequencies will satisfy requirements for Removal Action ASLs listed in Attachment 2 of the plan.

3.10 DATA REDUCTION, VALIDATION AND REPORTING

Data reduction, validation and reporting will be in accordance with requirements specified in SCQ Section 11 and the Data Validation Plan located in SCQ Appendix D.

3.11 PERFORMANCE AND SYSTEM AUDITS

Self assessments and independent assessments of the removal action will be in accordance with SCQ Section 12. Self assessment will be performed once during the duration of the task to verify compliance with the SCQ and project-specific requirements.

3.12 PREVENTIVE MAINTENANCE

Preventive maintenance will be performed on instruments and equipment used on the removal action in accordance with SCQ Section 13. A list will be included in the work plan identifying equipment that requires preventive maintenance. A list will be based on manufacturers recommendations and operating history of the equipment. Preventive maintenance activities will be documented on maintenance logs.

3.13 CORRECTIVE ACTIONS

Corrective actions will be in accordance with SCQ Section 15.

3.14 QUALITY ASSURANCE REPORTS TO MANAGEMENT

Project reports will be in accordance with SCQ Section 16.

4.0 REFERENCES

DOE (U.S. Department of Energy) and EPA (U.S. Environmental Protection Agency). 1991. *Consent Agreement as Amended under CERCLA Sections 120 and 106* (a). Administrative Docket Number: V-W-90-C-057. U.S. Department of Energy, Feed Materials Production Center, Fernald, Ohio, and U.S. Environmental Protection Agency Region V.

EPA (U.S. Environmental Protection Agency). 1989. *Final Standard-Quality Assurance Project Plan Content Document*. U.S. Environmental Protection Agency, Region V, Chicago, Illinois. Prepared for Contract 68-01-7331 by Camp, Dresser and McKee, Inc.

ATTACHMENT 5
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

NITRIC ACID TANK CAR AND AREA
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TABLES

ACRONYMS AND ABBREVIATIONS

AEA	Atomic Energy Act
ALARA	as low as reasonably achievable
ARAR	applicable or relevant and appropriate requirement
BAT	best available technology
CCW	constituent concentrations in waste
CCWE	constituent concentrations in waste extract
CDE	committed dose equivalent
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
C.F.R.	Code of Federal Regulations
CPID	Closure Plan Information Data
DAC	derived air concentration
DCG	derived concentration guide
DDE	deep-dose equivalent
DOE	U.S. Department of Energy
DPM	disintegrations per minute
EDE	effective dose equivalent
EPA	U.S. Environmental Protection Agency
Fed. Reg.	Federal Register
FEMP	Fernald Environmental Management Project
FMPC	Feed Materials Production Center
HWMU	hazardous waste management unit
LDR	land disposal restriction
NAAQS	National Ambient Air Quality Standards
NCP	National Oil and Hazardous Substance Pollution Contingency Plan
NESHAP	National Emission Standards for Hazardous Air Pollutants
NRC	Nuclear Regulatory Commission
NSPS	New Source Performance Standards
O.A.C.	Ohio Administrative Code
OEPA	Ohio Environmental Protection Agency
O.R.C.	Ohio Revised Code

ACRONYMS AND ABBREVIATIONS (continued)

OSHA	Occupational Safety and Health Administration
OU	Operable Unit
PACD	Proposed Amended Consent Decree
RAWP	Removal Action Work Plan
RCRA	Resource Conservation and Recovery Act
RPP	radiation protection program
SARA	Superfund Amendments and Reauthorization Act
TBC	To-Be-Considered
TCLP	Toxicity Characteristic Leaching Procedure
TSDF	treatment, storage, or disposal facility
U.S.C.	U.S. Code

1.0 INTRODUCTION

The removal of the Nitric Acid Tank Car and Area is required under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 106 (42 U.S.C. [U.S. Code] § 9600 et seq., as amended by the Superfund Amendments and Reauthorization Act of 1986 [SARA]). Section 106 requires that a response action occur when there is imminent or substantial endangerment to the public health, welfare or environment because of an actual or threatened release of a hazardous substance. The removal action is also the subject of a Consent Agreement (the Agreement) between the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Energy (DOE). The Agreement, most recently amended in April 1991, establishes the framework for the Fernald Environmental Management Project (FEMP) environmental investigation and cleanup. Section 1X.F.2 requires the DOE to submit a Removal Action Work Plan (RAWP) to support the Nitric Acid Tank Car and Area removal action. The information contained in this plan satisfies the requirements of a Closure Plan Information and Data (CPID) Package and a RAWP.

The closure of the Nitric Acid Tank Car and Area is also the subject of a Consent Decree between the DOE and the Ohio Environmental Protection Agency (OEPA). The state of Ohio and the DOE entered into a Consent Decree on December 2, 1988 (Civil Action No. C-1-86-0217), which requires abatement of water pollution and hazardous waste violations at the Feed Materials Production Center (FMPC). The Proposed Amended Consent Decree (PACD) is currently being negotiated to reflect DOE's updated Consent Agreement with EPA. The latest PACD Draft 6 is dated December 4, 1990.

Pursuant to Section II, Paragraph 3.12 of the Consent Decree, DOE submitted a compliance schedule that identifies projected activities for newly identified hazardous waste management units (HWMUs). The Nitric Acid Tank Car and Area has been identified as an HWMU and is included in DOE's Resource Conservation and Recovery Act (RCRA) compliance schedule. Pursuant to RCRA, HWMUs must be "clean" closed. This plan is submitted to fulfill the written closure plan requirements under RCRA.

The purpose of the Nitric Acid Tank Car and Area action is to reduce an immediate threat to human health and the environment. Cleanup levels are identified in the ARARs for the decontamination of the Tank Car. Remediation of the soils adjacent to the Tank Car will be conducted in a manner to achieve clean closure.

The EPA has specified a framework for developing and implementing response actions under the National Oil and Hazardous Substances Pollution Contingency Plan (NCP, 40 C.F.R. [Code of Federal Regulations] Part 300, Subpart E [1990]). Under the NCP, EPA requires that removal actions under CERCLA attain ARARs to the extent practicable under the circumstances. In addition, federal and state advisories, criteria or guidance should be considered in planning the removal action. In determining whether attainment of ARARs is necessary, the EPA will examine the urgency of the situation and the scope of the removal action.

The EPA defines "applicable" requirements as:

> cleanup standards, standards of control and other substantive environmental protection requirements, criteria or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, or location, or other circumstance at a CERCLA site (*CERCLA Compliance with Other Laws Manual*, OSWER Directive 9234.1-01, August 8, 1988; 40 C.F.R. § 300.400 [1990]).

If requirements fail the applicability test, requirements may be "relevant and appropriate" which are defined as:

> cleanup standards, standards of control and other substantive environmental protection requirements, criteria or limitations promulgated under federal or state law that while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance at a CERCLA site, addresses problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site (OSWER Directive 9234.1-01, August 8, 1988).

"To-Be-Considered" documents (TBCs) should also be examined for a removal action. TBCs are nonpromulgated federal- or state-issued advisories or guidance that are not legally binding and are thus not legally enforceable as ARARs. In many circumstances, however, TBCs will be considered along with ARARs and may be employed to determine the cleanup level required for protection of human health and the environment.

An important TBC at DOE facilities are DOE Orders, which enumerate the authority granted to the DOE under the Atomic Energy Act (AEA), 42 U.S.C. § 2011 et seq. and play an important role at DOE facilities. Because these Orders are not promulgated, they are considered TBCs; however, they are legally enforceable against DOE contractors and subcontractors.

This section identifies the ARARs required for the Nitric Acid Tank Car and Area removal action and closure. Specific requirements pertaining to removal of the Tank Car and its contents, characterization of nearby soils, safety of occupational workers and the public, and management of hazardous and radiological waste will be discussed. The ARARs and TBCs focus on federal and state statutes, regulations, criteria and guidelines. A state standard will be applicable or relevant and appropriate only if it is more stringent then the federal requirement (40 C.F.R. § 300.400[g][4]).

The specific types of ARARs evaluated for the Nitric Acid Tank Car and Area removal action and closure include the following:

- Contaminant-specific
- Location-specific
- Action-specific.

Contaminant-specific ARARs are usually health- or risk-based numerical values or methodologies that are applied to site-specific conditions and result in the establishment of numerical contaminant values. In the case of the Nitric Acid Tank Car and Area removal action and closure, contaminant-specific ARARs address chemical and/or radionuclide contamination of the Tank Car and its contents, nearby soils, air, and

equipment. The contaminant-specific ARARs evaluated for this removal action are discussed in Section 2.0.

Location-specific ARARs are conditions placed on the concentration of hazardous substances or the conduct of activities because the activity or substance occurs in specific locations. The location-specific ARARs identified for this removal action are discussed in Section 3.0.

Action-specific ARARs apply to particular removal methods, technologies and management practices, and are evaluated during the detailed screening and evaluation of removal alternatives. These action-specific ARARs are identified in Section 4.0. The TBC requirements identified for the removal action are discussed in Section 5.0.

2.0 CONTAMINANT-SPECIFIC REQUIREMENTS

Contaminant-specific requirements are concentration limits for hazardous and radioactive substances which are established based upon their presence in various environmental media. The contaminant-specific ARARs pertinent to the Nitric Acid Tank Car and Area removal action are summarized below.

2.1 FEDERAL REQUIREMENTS

The federal contaminant-specific requirements are enumerated in federal statutes and regulations, the United States Code (U.S.C.) and the Code of Federal Regulations (C.F.R.), respectively.

2.1.1 Resource Conservation and Recovery Act

The RCRA (42 U.S.C. § 6901 et seq.) requires that generators identify hazardous wastes and comply with standards for the transportation and management of hazardous waste at facilities which treat, store or dispose of hazardous waste. These standards are enumerated in regulations promulgated by the EPA (40 C.F.R. Parts 260 through 268). Subtitle C, Hazardous Waste Management, mandates the creation of cradle-to-grave management and a permitting system for hazardous wastes. The RCRA defines hazardous waste as "solid waste" which because of its quantity, concentration, or physical, chemical or infectious characteristics may cause or significantly contribute to an increase in mortality or serious illness, or may pose a substantial hazard to human health or the environment when improperly managed (RCRA § 1004[5], 42 U.S.C. § 6903[5]). The OEPA was authorized to implement RCRA in the state of Ohio (RCRA § 3006, 42 U.S.C. § 1693). This authorization enables the OEPA and EPA to jointly regulate hazardous waste in the state of Ohio.

The RCRA is applicable to the Nitric Acid Tank Car and Area closure and removal action. Pursuant to the RCRA requirements, the EPA has promulgated regulations that identify and list hazardous wastes (40 C.F.R. Part 261). These implementing regulations categorize "hazardous wastes" in two different ways: by formal listing or by exhibiting a

characteristic (40 C.F.R. § 261.3). These standards are contaminant-specific ARARs applicable or relevant and appropriate to the removal action. A waste is "characteristic" if it fails enumerated tests for corrosivity, ignitability, reactivity or toxicity. The toxicity test requires that a waste meet or exceed Toxicity Characteristic Leaching Procedure (TCLP) designation limits to be toxic. The TCLP designation limits are contaminant-concentration values which cause a waste to be hazardous. If a waste meets or exceeds the TCLP standards, it must be managed as a RCRA hazardous waste. The liquid contained in the Tank Car exhibits the characteristic of corrosivity under the EPA regulations because the Tank Car's contents are aqueous and have a pH less than or equal to two, and toxicity characteristic as a result of TCLP chromium concentrations greater than 5 mg/L. The waste, therefore, has the EPA Hazardous Waste Numbers of D002 and D007.

In addition, the nearby soils must be characterized and analyzed for potential TCLP exceedances for inorganics. Soil samples will be analyzed for pH, nitrate, uranium isotopes, and a total metals analysis for the TCLP metals. If the results of the total metals analyses indicate that TCLP limits may be exceeded, a TCLP extraction will be performed and a second metals analysis performed for direct comparison to the limit. If these wastes meet or exceed the TCLP designations, they will need to be stored, treated, and disposed of as a RCRA hazardous waste.

The EPA has also promulgated land disposal restriction regulations (LDRs) that establish concentration limits for the hazardous constituents of wastes (40 C.F.R. Part 268). The EPA has promulgated two sets of limits for LDRs: constituent concentrations in the waste extract (CCWE), which uses the TCLP test procedure to obtain a leached sample of the waste, and constituent concentrations in waste (CCW), which examines the total contaminant concentration in the waste. The LDRs are numerical values that designate whether a waste can be prohibited from land disposal. The Nitric Acid Tank Car waste must comply with the numerical values specified in Table 2-1.

2.1.2 Clean Air Act

The Clean Air Act establishes a nationwide program for the control of hazardous air pollutants and other emissions. The EPA has been delegated the authority to establish

Table 2-1. Land disposal limits.

	CCWE (mg/l)		CCW (mg/l)	
	Wastewater	Nonwastewater	Wastewater	Nonwastewater
Arsenic		5.0		
Barium		100	100	
Cadmium		1.0	1.0	
Chromium		5.0	7.0	
Lead		5.0	2.0	
Mercury			0.20	
Nickel	134[1/]			
Selenium		5.7	1.0	
Silver		5.0	5.0	

1/ This value is specified at RCRA § 3004 (1)(2)(vi).

National Ambient Air Quality Standards (NAAQS), National Emission Standards for Hazardous Air Pollutants (NESHAP), and New Source Performance Standards (NSPS)(40 C.F.R. Parts 50, 60, 61). No NSPS or NAAQS are applicable to the Tank Car removal action because the removal action will not require air emissions from major stationary sources.

Under NESHAP, the EPA has established emission standards according to specific types of sources which emit particular types of pollutants. The DOE facilities that emit radionuclides are specifically regulated under 40 C.F.R. Part 61, Subpart H. The NESHAP sets the radionuclide emission standards for DOE facilities based upon each facility. Under 40 C.F.R. Part 61, Subpart H, the EPA has established the effective dose equivalent (EDE) for DOE facilities at 10 mrem/yr. All buildings, structures, and operations within one contiguous site are considered a single facility, and the facility, not each source, must meet the dose standard. Therefore, the total of all radionuclide emissions from the FEMP DOE site, including the emissions from the Nitric Acid Tank Car removal area, must meet the 10 mrem/yr standard.

2.1.3 Nuclear Regulatory Commission Regulations

The Nuclear Regulatory Commission (NRC) has promulgated regulations under 10 C.F.R. Part 20 that establish standards for the protection of persons against radiation in restricted and unrestricted areas (56 Fed. Reg. [Federal Register] 23360, May 21, 1991). The regulations require NRC-licensed facilities to establish a radiation protection plan that combines meeting the enumerated dose standards with maintaining radiation exposures as low as reasonably achievable (ALARA) to provide the greatest degree of protection from radiation. Although the DOE is not subject to NRC licensing standards, the standards in 10 C.F.R. Part 20 are relevant and appropriate because they address problems sufficiently similar to those at the FEMP that their use is well suited to this remedial action. Because the Nitric Acid Tank Car and Area is labeled as a "radiological area" radiological protection standards for occupational workers need to be considered.

Subpart C enumerates the occupation dose standards for adults and for special exposure. The annual EDE for an adult shall not exceed 5 rem/yr; or the sum of the deep-dose equivalent (DDE) and the committed dose equivalent (CDE) to any organ or tissue, other than the lens of the eye, shall not exceed 50 rem/yr. The dose equivalent shall not exceed 15 rem/yr to the lens of the eye, and the shallow-dose equivalent shall not be greater than 50 rem/yr to the skin (10 C.F.R. § 20.1201). Different standards apply to minors, embryo/fetus and planned special exposures (10 C.F.R. §§ 20.1207, 20.1208, 20.1206).

Subpart D specifies the dose limits for members of the public: the total EDE to the public shall not exceed 0.1 rem/yr and 0.002 rem/hr. The public's authorized exposure to controlled areas shall not exceed 0.5 rem/yr (10 C.F.R. § 20.1301).

2.1.4 Occupational Safety and Health Administration Standards

The Occupational Safety and Health Administration (OSHA) regulations enumerate standards in 29 C.F.R. Part 1910, Subpart Z for occupational exposure to toxic and hazardous air contaminants. Tables Z-1-A and Z-2 in the regulations specify eight-hour time-weighted averages and short-term exposure limits for hundreds of toxic and hazardous air contaminants. It is anticipated that the removal action, under anticipated

operating conditions, will not exceed any of the air contaminant concentrations specified in this regulation.

2.2 STATE OF OHIO REQUIREMENTS

State contaminant-specific requirements are enumerated in statutes and regulations, the Ohio Revised Code (O.R.C.), and the Ohio Administrative Code (O.A.C.), respectively.

2.2.1 State Hazardous Waste Management Regulations

The EPA has authorized the OEPA to implement RCRA in the state of Ohio. As part of this authorization, the OEPA has developed a state-specific hazardous waste management program (O.A.C. 3745-50 et seq.). These regulations are applicable to the Tank Car removal action. Generally, the state hazardous waste regulations parallel the federal regulations. The state definition of "hazardous waste" incorporates the EPA definition (O.A.C. 3745-51-10). Under the Ohio regulations, a waste is hazardous if it is specifically listed or if the waste exhibits characteristic properties of reactivity, ignitability, corrosivity or toxicity (O.A.C. 3745-51-20).

The liquid contained in the Tank Car exhibits the characteristic of corrosivity under the Ohio regulations because the Tank Car's contents are aqueous and have a pH less than or equal to two (O.A.C. 3745-51-22[I]). The contents are also toxic based on the concentration of chromium (O.A.C. 3745-51-24). The waste, therefore, has an OEPA hazardous waste number of D002. The waste also exhibits a toxicity characteristic as a result of TCLP chromium concentrations greater than 5 mg/L. The waste, therefore, also has the EPA Hazardous Waste Number D007.

In addition, the nearby soils must be characterized and analyzed for potential TCLP exceedances for inorganics. Soil samples will be analyzed for pH, nitrate, uranium isotopes, and a total metals analysis for the TCLP metals. If the results of the total metals analyses indicate that TCLP limits may be exceeded, a TCLP extraction will be performed and a second metals analysis performed for direct comparison to the limit. If these wastes meet or exceed the TCLP designations, they will need to be stored, treated, and disposed of as a RCRA hazardous waste.

2.2.2 Air Quality

The Ohio Department of Health established rules for the protection of workers and the general public from overexposure to radiation (O.A.C. 3701-38). Because federal facilities subject to the AEA are exempt, these regulations are relevant and appropriate to the Nitric Acid Tank Car and Area removal action. The radiation protection rules are similar to NRC's regulations (prior to promulgation of NRC's new rules in May 1991) which protect workers and the general public from radiation exposure.

The Ohio Department of Health requires that occupational workers in restricted areas not receive a dose in excess of the following values: 18¾ rem/quarter to the hands and forearms or feet and ankles; 1¼ rem/quarter to the whole body, head and trunk, organ or lens of the eye; and 7½ rem/quarter to the skin (O.A.C. 3701-38-11). The regulations also enumerate derived air concentration (DAC) values for radioactive material in restricted areas (O.A.C. 3701-38-13[d]). Finally, the Ohio regulations require that exposure to radiation in unrestricted areas shall not exceed a dose of 2 mrem/hr or 100 mrem/7 consecutive days. Exceedances of these levels may be granted if radiation exposure will not exceed a dose to the whole body of 0.5 rem/yr (O.A.C. 3701-38-15).

3.0 LOCATION-SPECIFIC REQUIREMENTS

Location-specific ARARs are restrictions on the concentration levels of hazardous substances or the conduct of activities solely because the substance or activities occur in specific locations. Some examples of special locations include floodplains, wetlands, historic places and sensitive ecosystems or habitats. The Nitric Acid Tank Car and Area, a hazardous waste management unit, is not located in any of the aforementioned specified areas.

4.0 ACTION-SPECIFIC REQUIREMENTS

Action-specific ARARs are requirements that are triggered when a specific response action is chosen. The action-specific ARARs are based upon the activity outlined in Section 3.2 of this plan.

4.1 FEDERAL REQUIREMENTS

4.1.1 Comprehensive Environmental Response, Compensation, and Liability Act

The CERCLA and the EPA regulations implementing CERCLA under the NCP, 40 C.F.R. Part 300, require the selection of an appropriate removal action. Generally, a removal action is taken to abate, prevent, minimize, stabilize, mitigate or eliminate the release or threat of release of hazardous constituents. The removal action must to the extent practicable attain all ARARs under federal and state environmental laws. For removal actions, however, the urgency of the situation and the scope of the removal action dictate the extent to which ARARs must be complied with. In determining the appropriateness of a removal action, the following factors should be examined:

- Actual or potential exposure to nearby human populations, animals or food chains from hazardous pollutants
- Actual or potential contamination of drinking water supplies or sensitive ecosystem
- Hazardous substances contained in drums, barrels, tanks or bulk storage containers which pose a threat of release
- High levels of hazardous substances in the soil
- Weather conditions that may cause the hazardous substances to migrate
- Threat of fire or explosion

- The availability of other federal or state response mechanisms to respond to the release

- Other situations or factors that may pose threats to public health, welfare or environment (40 C.F.R. § 300.415[b][2]).

The federal regulations enumerate removal actions which, as a general rule, are appropriate for particular situations. The following are the general removal actions applicable to the Nitric Acid Tank Car and Area removal activities:

- Fences, warning signs, or other security or site control precautions—necessary where humans or animals may have access.

- Removal of bulk containers that contain hazardous substances—necessary to reduce likelihood of spillage, exposure to humans and the environment and fire or explosion.

- Containment, treatment, disposal or incineration of hazardous materials—necessary to reduce likelihood of exposure to humans or the environment. (40 C.F.R. § 300.414[d]).

The planned Tank Car action addresses the requirements enumerated in the NCP. Therefore, the removal action is considered "appropriate" under the regulations.

The CERCLA regulations, under 40 C.F.R. Part 302, stipulate that when a reportable quantity of a hazardous substance is released into the environment, the DOE must notify the National Resource Center. The reportable quantities for hazardous substances are enumerated in 40 C.F.R. §§ 302.4 and 302.5. Notification requirements are enumerated in 40 C.F.R. § 302.6. After removing the Tank Car, the DOE plans to determine if the Tank Car has released hazardous substances into the environment through nearby soil testing. If hazardous substances have been released in reportable quantities specified in the regulations, the DOE will need to notify the National Resource Center.

4.1.2 Atomic Energy Act

The AEA (42 U.S.C. § 2011 et seq.) establishes the framework for the federal government to control atomic energy and source, special nuclear and by-product materials. The Tank Car may have residual radioactive surface contamination. This surface contamination may be source material under the AEA because the Tank Car contains a liquid with concentrations of uranium and thorium. Management of the Tank Car before decontamination will need to comply with the AEA.

4.1.3 Resource Conservation and Recovery Act

The RCRA and EPA regulations implementing RCRA enumerate numerous action-specific requirements that may be ARARs for the Tank Car removal action and closure. Under RCRA, the EPA and its authorized states have the authority to regulate hazardous wastes. The RCRA is applicable to the Tank Car removal action and closure.

The Tank Car is subject to the RCRA management requirements because it does not meet the definition of an "empty" container. A container is "empty" under 40 C.F.R. § 261.7 if the following criteria are met:

a) All wastes have been removed that can be removed using the practices commonly employed to remove materials from that type of container, e.g., pouring, pumping and aspirating; and

b) No more than 1 inch of residue remain on the bottom of the container; or

c) (i) No more than 3 percent by weight of the total capacity of the container remains in the container if the container is less than or equal to 100 gallons; or

(ii) No more than 0.3 percent by weight of the total capacity of the container remains in the container if the container is greater than 100 gallons in size.

Based upon a visual inspection, the estimated quantity of nitric acid waste contained in the Tank Car exceeds the 0.3 percent by weight limit for containers greater than 100 gallons. Therefore, the Tank Car will need to be managed as a hazardous waste. However, once the nitric acid waste is extracted from the Tank Car, the Tank Car will no longer be a hazardous waste if it meets this definition of "empty."

The treatment, storage, or disposal (TSD) regulations for interim status facilities in 40 C.F.R. Part 265 are applicable to the management of the hazardous wastes from the Tank Car only if the wastes are stored at a FEMP TSDF. The interim status rules are relevant and appropriate because the FEMP TSDF has applied for RCRA Part A and Part B permits. Subpart B requires that a TSDF analyze the waste before treatment, storage or disposal. In addition, a TSDF must provide adequate security, inspections, and personnel training and take special precautions for ignitable wastes and incompatible wastes. Subpart E enumerates record keeping requirements for all hazardous wastes stored, treated or disposed of at the TSDF. Subpart F specifies requirements for conducting groundwater monitoring for releases of solid waste from the management units.

Subpart G enumerates the interim status closure requirements for hazardous waste management units. The Nitric Acid Tank Car and Area was identified as an HWMU in the FEMP Part A permit. The RCRA closure requirements are applicable to the closure of the Tank Car. The regulations require that an HWMU be closed in a manner which minimizes the need for further maintenance and controls and minimizes or eliminates the threat to human health and the environment (40 C.F.R. § 265.111). The regulations require that a written closure plan be drafted. The closure plan must identify the following steps to achieve partial or final closure:

- Describe how the hazardous waste management unit will be closed.
- Describe how final closure will be conducted and identify the operation that will remain unclosed during the active life of the facility.
- Provide an estimate of the hazardous wastes to be stored on site and describe the methods to be employed during closure to treat, store, and dispose of the hazardous wastes.

- Describe the steps needed to remove or decontaminate all hazardous waste and contaminated systems, components, structures, and soils (e.g., procedures for cleaning equipment, methods for sampling and analysis of soil, and criteria for determining the extent of decontamination necessary to close the facility).

- Describe other activities necessary to ensure closure complies with closure performance standards (e.g., groundwater monitoring, leachate collection, and run-off control).

- Provide a schedule for closure of each hazardous waste management unit (40 C.F.R. § 265.112).

The information contained in this plan is being submitted to OEPA and EPA to satisfy the written closure plan requirements. The regulations also require that all contaminated equipment, structures, and soils be properly disposed of or decontaminated before closure (40 C.F.R. § 265.114).

Subpart J enumerates standards for storing hazardous waste in tanks at TSD facilities (40 C.F.R. § 265.191 to 265.199). These standards are applicable because the hazardous waste from the Tank Car will be stored in a tank.

In addition to TSDF requirements, the RCRA regulations also enumerate analytic methods for determining whether a waste is hazardous. The appendices to 40 C.F.R. Part 261 specify methods for conducting sampling and analysis to determine TCLP exceedances. These methods are applicable to performing sampling and analysis during the removal action.

Under the RCRA regulations, miscellaneous units must obtain RCRA permits for the treatment, storage, or disposal of hazardous waste. The provisions of such permit must provide for the protection of human health and the environment; these terms may include requirements for the design, operation, detection, monitoring and response to releases of hazardous waste or hazardous constituents from the unit (40 C.F.R. Part 264, Subpart X). Although this action is being conducted under CERCLA, the treatment of

the Tank Car's contents in the UNH system will need to comply with the "substantive" requirements for permitting of miscellaneous treatment units; therefore, the 40 C.F.R. Part 264, Subpart X standards are relevant and appropriate to this action.

4.1.4 Land Disposal Restrictions, 40 C.F.R. Part 268

The LDR standards will apply to the Tank Car's contents and the wastes will be treated as appropriate, to meet LDR's standards contents once they are transferred to the UNH system. The contents of the Tank Car are prohibited from land disposal because it is a characteristic waste, EPA Waste Number D002 and toxic, EPA Waste Number D007. This waste can be land disposed after proper treatment. Table 2 of 40 C.F.R. § 268.42 requires that a waste which is hazardous due to its corrosivity characteristic be deactivated to remove the hazardous characteristic. Once this waste is properly treated to neutralize the corrosivity and remove the chromium to below toxicity levels (<5 mg/L), the waste can be managed as a radioactive waste.

Subpart E allows a TSDF to store a hazardous waste in a container for up to one year, if the facility can demonstrate that it is storing the waste solely for the purpose of accumulating sufficient quantities of waste to facilitate proper recovery, treatment or disposal. The storage of the contents of the Tank Car is subject to this one-year requirement.

4.1.5 Nuclear Regulatory Commission

The NRC regulations Subparts F, G, H, and J enumerate procedural requirements for surveying, monitoring and controlling access to radiological areas. These regulations are relevant and appropriate to the Nitric Acid Tank Car and Area action because this area is a radiological area. The NRC regulations require that personnel in restricted areas be monitored when they are likely to receive a dose in excess of 10 percent of the NRC standard (10 C.F.R. § 20.1502). Second, the regulations require that caution signs, labels, signals and controls be provided in radiological areas and on radioactive-contaminated containers (10 C.F.R. § 20.1601). Labels are not required if containers hold materials in quantities less than the limits listed in Appendix C or Table 3 of Appendix B of the regulations (10 C.F.R. § 20.1605). The radioactive concentration of

the Tank Car's contents for uranium is very low and therefore, the NRC labeling requirements most likely will not need to be met. However, prior to testing or decontamination, the Tank Car, which may be radioactively contaminated, should be labeled. Even if the Tank Car and its contents do not exceed the concentration values in the NRC regulations, it is good management practice to label any materials that have been potentially contaminated.

Subpart B specifies the method for determining external dose and internal exposure under Sections 20.1203 and .1204, respectively. Subpart H discusses the respiratory protection and control requirements employed to limit internal exposure to radiation.

4.1.6 Occupational Safety and Health Administration Standards

The OSHA standards were established to protect individuals in the workplace (29 C.F.R. Part 1910). The OSHA requirements are promulgated in 29 C.F.R. Part 1910. The requirements of 29 C.F.R. Part 1910 applicable to the Tank Car action are as follows:

- Subpart D specifies standards for walking and working surfaces.
- Subpart G enumerates requirements for ventilation, occupational noise exposure, ionizing radiation, and nonionizing radiation. The OSHA regulations adopt the NRC standards for occupational radiation exposure.
- Subpart H establishes worker safety standards for handling highly hazardous chemicals, toxics and reactives.
- Subpart I enumerates the appropriate personal protective clothing requirements, including eye and face protection, respiratory protection, head and foot protection, and electrical protective devices.
- Subpart L specifies the fire protection requirements in the workplace.
- Subpart N enumerates the requirements for materials handling and storage.

- Subpart P specifies the worker safety requirements for the use of hand- and portable-powered tools and other hand-held equipment.

4.2 STATE OF OHIO REQUIREMENTS

The state action-specific ARARs will guide the activities performed during the removal action. These ARARs provide standards for the sampling and analysis of hazardous waste and groundwater, the storage of hazardous and radioactive wastes, and the closure requirements for the HWMU.

4.2.1 Ohio Hazardous Waste Management Regulations

The state of Ohio Hazardous Waste Management Regulations are applicable to the Nitric Acid Tank Car and Area action. These regulations enumerate standards for sampling and analysis of hazardous waste; treatment, storage, and disposal; and closure of hazardous waste management units.

The hazardous waste TSDF regulations are applicable to the removal action only if the wastes are stored at a FEMP TSDF. The Tank Car's contents are a hazardous waste because the contents meet the corrosivity criteria and chromium concentration exceed the toxicity level. The Tank Car and its contents are subject to the RCRA management requirements because it does not meet the definition of an "empty" container. A container is empty under O.A.C. 3745-51-07(B)(1) if the following criteria are met:

a) All wastes have been removed that can be removed using the practices commonly employed to remove materials from that type of container, e.g., pouring, pumping and aspirating; and

b) No more than 1 inch of residue remain on the bottom of the container; or

c) (i) No more than 3 percent by weight of the total capacity of the container remains in the container if the container is less than or equal to 100 gallons; or

(ii) No more than 0.3 percent by weight of the total capacity of the container remains in the container if the container is greater than 100 gallons in size.

Based upon a visual inspection, the estimated quantity of nitric acid waste contained in the Tank Car exceeds the 0.3 percent by weight limit for containers greater than 100 gallons. Therefore, the Tank Car must be managed as a hazardous waste. However, once the nitric acid waste is removed from the Tank Car, it will no longer be a hazardous waste if it meets this definition of "empty."

Because the Tank Car's contents are a hazardous waste, the waste must be managed in accordance with the Ohio TSDF requirements only if the waste is stored at a FEMP TSDF. The FEMP TSDF where the waste will be stored is an interim status facility which has applied for RCRA Part A and Part B permits. The interim status TSDF standards are specified in O.A.C. 3745-65. Any waste treatment residue or nearby soils will need to be analyzed (O.A.C. 3745-65-13). The general waste analysis must detail the chemical and physical properties of the waste and, at a minimum, provide sufficient information to treat, store or dispose of the waste in accordance with the hazardous waste management regulations (O.A.C. 3745-65-13[A][1]). The analysis may include data generated to determine the characteristics of the waste under O.A.C. 3745-51 and any existing documentation. Because the waste may be ignitable, it must be separated and protected from sources of ignition: open flames, smoking, cutting, welding, hot surfaces, frictional heat, sparks, spontaneous ignition, and radiant heat (O.A.C. 3745-65-17[A]). The FEMP TSDF must also comply with security, inspection, and personnel training requirements (O.A.C. 3745-65-14, -15, and -16).

The FEMP TSDF must also comply with operational standards that require proper design, construction and maintenance of the facility; proper equipment and communication devices; proper testing and maintenance of equipment; adequate aisle space; and preparation of contingency plans (O.A.C. 3745-65-30 to 3745-65-56).

The Ohio Hazardous Waste Management Regulations also provide specifications for tank systems. The Ohio regulations, O.A.C. 3745-66-90 to 3745-66-96, enumerate requirements for the design and operation, containment and detection, operation,

inspection, and leak response for tank systems. Because the Tank Car's contents will be stored in a tank system, these regulations will apply.

Finally, the Ohio Hazardous Waste Management Regulations enumerate requirements for the closure of hazardous waste management units. The Nitric Acid Tank Car and Area is a "hazardous waste management unit" because the Tank Car and underlying soil are "a contiguous area of land on or in which hazardous waste is placed" (O.A.C. 3745-50-10[46]). The Tank Car was identified as a HWMU in the RCRA Part A and Part B permits and as such must comply with the requirements of "Closure Requirements for Interim Status Facilities," O.A.C. 3745-66. The Tank Car must be closed to minimize the need for further maintenance and to control and eliminate the escape of hazardous waste in protecting human health and the environment (O.A.C. 3745-66-11). The regulations require that a written closure plan be drafted. The closure plan must identify the following steps to achieve partial or final closure:

- Describe how the hazardous waste management unit will be closed.
- Describe how final closure will be conducted and identify the operation that will remain unclosed during the active life of the facility.
- Provide an estimate of the hazardous wastes to be stored on site and describe the methods to be employed during closure to treat, store, and dispose of the hazardous wastes.
- Describe the steps needed to remove or decontaminate all hazardous waste and contaminated systems, components, structures, and soils (e.g., procedures for cleaning equipment, methods for sampling and analysis of soil, and criteria for determining the extent of decontamination necessary to close the facility.
- Describe other activities necessary to ensure closure complies with closure performance standards (e.g., groundwater monitoring, leachate collection and run-off control).

- Provide a schedule for closure of each hazardous waste management unit (O.A.C. 3745-66-12).

The information contained in this plan is being submitted to OEPA and EPA to satisfy the requirements of the written closure plan under these regulations.

The closure regulations require that all contaminated equipment structures and soil be properly disposed of or decontaminated before closure (O.A.C. 3745-66-14). Finally, the closure regulations require that the owner or operator and a professional engineer (PE) certify that the closure action complies with the information contained in the written closure plan. The FEMP has agreed to provide certification that the closure of this HWMU was performed in accordance with this plan.

4.2.2 Radiation Protection

The Ohio Department of Health has established rules which require that radioactive areas be properly surveyed, monitored and posted (O.A.C. 3701-38-18 to O.A.C. 3701-38-22). In addition, the regulations require that containers storing radioactive materials be properly stored, tested, and disposed of (O.A.C. 3701-38-23 to O.A.C. 3701-38-29). Although federal facilities subject to the AEA are exempt from the Ohio rules, these regulations are relevant and appropriate to the removal action and should be considered. Because the Tank Car and its contents may have radiological contamination, before decontamination, the Tank Car should be properly labeled.

5.0 TO-BE-CONSIDERED CRITERIA

In addition to the potential ARARs presented, other federal and state criteria, advisories, and guidance are "To Be Considered" in determining the appropriate degree of remediation for the Tank Car action. The DOE Orders, which enumerate the contractual relationship between DOE and its contractors, and proposed draft DOE regulations are the most important TBCs for the Tank Car action. The DOE Orders, draft regulations, and other TBCs are summarized below.

5.1 DOE ORDER 5000.3A—OCCURRENCE REPORTING AND UTILIZATION OF OPERATIONS INFORMATION (DRAFT)

The DOE Order 5000.3A requires the establishment of a comprehensive system for the reporting of operations information. The Order requires the reporting of safety, health, environment, operations, security and property related occurrences.

5.2 DOE ORDER 5400.1—GENERAL ENVIRONMENTAL PROTECTION PROGRAM

The DOE Order 5400.1 requires that an environmental protection program be established for DOE facilities to guarantee compliance with applicable federal, state and local environmental protection laws and regulations. Chapter I enumerates the federal regulations, laws and executive orders with which DOE facilities must comply. Chapter II identifies the requirements for notification of environmental occurrences and for routine reporting of significant environmental protection information. Chapter III requires that an environmental protection program plan be drafted. Chapter IV enumerates requirements and guidance for environmental monitoring programs for ambient air, radiological, water, and groundwater.

5.3 DOE ORDER 5400.5—RADIATION PROTECTION OF THE PUBLIC AND ENVIRONMENT

The DOE Order 5400.5 establishes requirements for the protection of the environment and human health from radiation contamination present in the soil and air. These standards are established to shield the public and environment from undue risk from radiation.

The DOE Order 5400.5 mandates that radiation exposure to members of the public from all pathways during routine activities, which includes removal actions, shall not exceed an EDE of 100 mrem/yr. In addition, the Order adopts the NESHAP standard for radionuclide emissions from DOE facilities. Under this Order and 40 C.F.R. Part 61, Subpart H, the exposure to the public from all airborne radionuclide emissions shall not exceed 10 mrem/yr.

The DOE Order 5400.5 also requires that radionuclide exposure from all pathways remain as low as reasonably achievable (ALARA). The ALARA process requires DOE contractors to develop a program to minimize public exposure to radiation by considering various factors, including: the maximum dose to the public, collective dose to the public, alternative processes and technologies, doses from each process alternative, and the cost and societal impacts of the process alternatives.

Finally, the DOE Order 5400.5 provides guidance on the release of residual radioactive materials. Before radioactive materials are released, property must be surveyed to determine whether removable and total surface contamination meet the enumerated levels in Table 5-1. The limits apply to equipment and building components, but do not apply to the demolition of a building. Surface contamination of the Tank Car and any equipment used to remediate the site should comply with the surface contamination guidelines in Table 5-1.[1/] If residual radioactive materials exceed the limits in Table 5-1, then such material must be managed as a low-level radioactive waste. The Order

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1 These limits are based upon the NRC standards in Section 4 of "Decontamination of Release for Unrestricted Use," Regulatory Guide 1.86.

Table 5-1. Surface contamination guidelines.

Radionuclides[2/]	Allowable Total Residual Surface Contamination (dpm/100cm²)[1/]		
	Average[3/,4/]	Maximum[4/,5/]	Removable[4/,6/]
Transuranics, I-125, I-129, Ra-226, Ac-227, Ra-228, Th-228, Th-230, Pa-231	RESERVED	RESERVED	RESERVED
Th-Natural, Sr-90, I-126, I-131, I-133, Ra-223, Ra-224, U-232, Th-232	1,000	3,000	200
U-Natural, U-235, U-238 and associated decay product, alpha emitters	5,000	15,000	1,000
Beta-gamma emitters (radionuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above[7/]	5,000	15,000	1,000

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

2/ Where surface contamination by both alpha- and beta-gamma-emitting radionuclides exists, the limits established for alpha- and beta-gamma-emitting radionuclides should apply independently.

3/ Measurements of average contamination should not be averaged over an area of more than 1 m^2. For objects of less surface area, the average should be derived for each such object.

4/ The average and maximum dose rates associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/h and 1.0 mrad/h, respectively, at 1 cm.

5/ The maximum contamination level applies to an area of not more than 100 cm^2.

6/ The amount of removable material per 100 cm^2 of surface area should be determined by wiping an area of that size with dry filter or soft absorbent paper, applying moderate pressure, and measuring the amount of radioactive material on the wiping with an appropriate instrument of known efficiency. When removable contamination on objects of surface area less than 100 cm^2 is determined, the activity per unit area should be based on the actual area and the entire surface should be wiped. It is not necessary to use wiping techniques to measure removable contamination levels if direct scan surveys indicate that the total residual surface contamination levels are within the limits for removable contamination.

7/ This category of radionuclides includes mixed fission products, including the Sr-90 which has been separated from other fission products or mixtures where the Sr-90 has been enriched.

also establishes interim storage, interim management and long-term management for uranium, thorium and their decay products.

Residual radionuclides in soil must comply with generic guidelines for thorium and radium. Other radionuclides must comply with background concentration levels. The residual guidelines in soil for Radium-226, Radium-228, Thorium-230, and Thorium-232 must meet the following criteria: 5 pCi/g (over the first 6 inches of soil below the surface) and 15 pCi/g (over 6 inch-thick layers of soil more than 6 inches below the surface). When the soil at the Tank Car removal area is tested, these concentration values should be considered in characterizing the soil.

5.4 DOE ORDER 5480.11—RADIATION PROTECTION FOR OCCUPATIONAL WORKERS

The DOE Order 5480.11 establishes the radiation protection standards for workers and program requirements for DOE and DOE contractor operations. The Order describes the process for determining the internal and external dose equivalents for radiation exposure. The Order sets forth the radiation exposure limits and air and water concentration requirements as follows:

- Exposure to radiation shall be maintained ALARA pursuant to Health Physics Manual of Good Practices for Reducing Radiation Exposure to Levels that are As Low as Reasonably Achievable, PNL-6577.

- Internal and external exposure for occupational workers shall not exceed the following rates: EDE of 5 rem/yr; EDE to the individual organs and tissue of 50 rem/yr, to the lens of the eye of 15 rem/yr, or to the whole body of 50 rem/yr.

- Different exposure standards are set for an unborn child or minors and students.

- Internal and external exposure for the public entering controlled area must not exceed an EDE of 0.1 rem/yr.

- The DAC shall meet the requirements set forth in Attachment 1 of the Order and the water concentrations for radionuclides in drinking water shall comply with the maximum contaminant level requirements in 40 C.F.R. Part 141.

The Order requires that workers be monitored through personal dosimetry and bioassay programs to demonstrate compliance with the radiation protection standards. The workplace must be monitored through ambient air monitoring and radiation monitoring. All radioactive areas, materials, and containers must be adequately identified.

As part of the contamination control program, the Order requires that equipment and materials contained in radiological areas be cleaned, as thoroughly as practical, before release into other controlled areas. The equipment used during remediation and the Tank Car should comply with these DOE standards prior to transport from the area. Before release from the radiological area, the materials must meet the standards in Table 5-1.

The Order also requires that radiological areas be posted and radioactive material and containers be labeled. The signs and labels must conform with ANSI N12.1-1971 and ANSI N2.1-1971. Areas where the surface contamination levels are greater than 10 times those specified in Table 5-1 must be clearly marked as radiological areas.

An entry control program must also be established for radiological areas. Signs, barricades, control devices at the entrance, conspicuous visual or audible alarms and any other administrative procedures should be developed to ensure entry into the area is controlled. Step-off pads and protective clothing must be provided for entry to the contaminated area.

Finally, the Order requires the maintenance of records on dosimetry, monitoring and personnel training.

5.5 DOE ORDER 5480.23—NUCLEAR SAFETY ANALYSIS REPORTS

The DOE Order 5480.23 provides the guidelines for establishing a uniform system for the preparation and review of safety analysis plans. The safety analysis should identify

the hazards, plan for the elimination or control of such hazards, assess the risks, and document management's authorization of operations at the facility.

5.6 DOE ORDER 5483.1A—OSHA PROGRAMS FOR DOE CONTRACTORS AT GOVERNMENT OWNED CONTRACTOR FACILITIES

The DOE Order 5483.1A requires DOE to comply with OSHA requirements at all DOE facilities. The OSHA requirements applicable to the Nitric Acid Tank Car and Area removal action are specified in Attachment 3.

5.7 DOE ORDER 5820.2A—RADIOACTIVE WASTE MANAGEMENT OF LOW-LEVEL WASTE

The DOE Order 5820.2A establishes polices, guidelines and minimum requirements for the management of radioactive waste, mixed waste and contaminated facilities. The Order requires that DOE contractors manage radioactive and mixed waste in a manner to protect the health and safety of the public, DOE and contractor employees and the environment. The Order establishes requirements for management of high-level, transuranic and low-level wastes. The requirements for management of low-level wastes are to be considered for the Nitric Acid Tank Car and Area Removal Action.

Chapter III of the Order requires that low-level radioactive waste be managed to ensure that releases into the environment not exceed an EDE of 25 mrem/yr and that releases into the atmosphere not exceed an EDE of 10 mrem/yr (40 C.F.R. § 61.92). First, the Order requires the characterization and segregation of low-level radioactive waste from uncontaminated waste [DOE Order 5820.2A, Chapter III, Section 3(c)]. The waste must be sufficiently described to allow proper segregation, treatment, storage and disposal. The waste characterization data must be recorded on a waste manifest which must include: 1) the physical and chemical characteristics of the waste; 2) volume of the waste; 3) weight; 4) major radionuclides; and 5) packaging date, weight and external volume. Second, the Order requires proper treatment and storage of the waste to meet the above-referenced dose requirements. Disposal of low-level radioactive waste must comply with the site's performance assessment plan. Finally, wastes containing radionuclides in concentrations below regulatory concern may be disposed of in a manner consistent with

solid waste regulations. Because no standard has been established for radionuclide concentrations below regulatory concern, the waste must be nonradioactive or have "nondetectable" concentrations of radiation before the waste can be disposed of as a solid waste. It is anticipated that the Tank Car will meet the "nondetectable" concentration criteria and, therefore, will be disposed of as a solid waste.

Chapter VI of the Order requires that operations dealing with the treatment, storage or disposal of radioactive waste comply with the site's waste management plan.

5.8 10 C.F.R. § 830.340—MAINTENANCE MANAGEMENT (PROPOSED RULE)

The DOE has proposed regulations which implement the standards in its DOE Administrative Orders (56 Fed. Reg. 64329, December 9, 1991). The proposed regulations, which should be considered for the Tank Car removal action, require that DOE contractors develop, implement, and conduct operations in accordance with a facility maintenance plan. These regulations would require that removal activities at the Tank Car comply with the facility maintenance plan.

5.9 10 C.F.R PART 835—RADIATION PROTECTION FOR OCCUPATIONAL WORKERS (PROPOSED RULE)

The DOE has proposed rules that implement the standards enumerated in its DOE Administrative Orders (56 Fed. Reg. 64334, December 9, 1991). The goals of the proposed rule are to codify the current DOE limits on maximum radiation doses that workers may receive during a year, to record and report all dose measurements, to train all workers at DOE facilities about radiological safety, and to establish comprehensive requirements for radiation measurements and entry controls in radiological areas. The proposed regulatory standards are guided by the standards set by the National Council on Radiation Protection and Measurements and the International Commission on Radiological Protection. The following is a summary of each subpart.

Subpart A defines the scope of the regulations and the general rule that all actions at DOE facilities must be consistent with the rules. Subpart B requires that DOE activity be

performed in compliance with a radiation protection program (RPP) and identifies the contents of an RPP. This subsection also requires internal audits every three years.

Subpart C establishes the radiation exposure limits for occupational workers, planned special exposures, unborn children, minors and students, and members of the public entering a controlled area. In addition, the regulation specifies the requirements for nonuniform exposure of the skin and enumerates concentration levels for radioactive material in workplace air and water. The occupational limits for workers are as follows: 1) stochastic effects must not exceed 5 rem/yr and 2) nonstochastic effects must not exceed 15 rem/yr to the lens of the eye, 50 rem/yr to the whole body, and 50 rem/yr for any organ or tissue. The concentration levels for air and water in the workplace must comply with the DAC values in Appendices A and C of the proposed rule.

Subpart E requires that the workplace and individuals be monitored to comply with the radiation dose rates, to document radiological conditions in the workplace, to detect changes in radiological conditions, and to detect gradual build-up of radiation in the workplace. The specific monitoring requirements for individuals and the workplace are contained in Sections 835.402 and 835.403, respectively. The rules also require monitoring of surface radioactive contamination. Table 5-2 enumerates the limits for removable and fixed surface contaminants. If contamination levels exceed the limits for removable surface contaminants enumerated in Table 5-2, ad hoc controls will be required to decontaminate the materials. The levels of fixed surface contamination in Table 5-2 may be exceeded in areas within buildings. Outside the radiological area, the levels can be exceeded only where protective measures are provided. Before moving or disposing of the Tank Car, this unit will meet the limits enumerated in Table 5-2. Any area which exceeds the limits in Table 5-2 must post caution signs and must control entry, monitor personnel and provide protective clothing.

Subpart F enumerates the requirements for an entry control program in radiological areas. Signs, barricades, control devises at the entrance, conspicuous visual or audible alarms and any other administrative procedures should be established to ensure entry into the area is controlled.

Table 5-2. Surface radioactivity values.[1/]

Nuclide	Removable[2/,4/] (dpm/100 cm^2/)	Fixed + Removable[2/,3/] (dpm/100 cm^2/)
U-natural, U-235, U-238, and associated decay products	1,000	5,000
Transuranics, Ra-226, Ra-228, 14Th-230, Th-228, Pa-231, AC-227, I-125, I-129	20	300
Th-natural, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	200	1,000
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above[5/]	1,000	5,000
Tritium organic compounds; surfaces contaminated by HT and metal tritide aerosols		

1/ The values in this appendix apply to radioactive contamination deposited on, but not incorporated into, the interior of the contaminated item. Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides apply independently.

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

3/ The levels may be averaged over one square meter provided the maximum surface activity in any area of 100 cm^2 is less than three times the value specified. For purposes of averaging, any square meter of surface shall be considered to be above the activity value G if: 1) from measurements of a representative number (n) of sections it is determined that $1/n\Sigma_n S_r > G$, where S_r is the dpm 100 cm^2 determined from measurement of section i; or 2) it is determined that the sum of the activity of all isolated spots or particles in any 100 cm^2 area exceeds 3G.

4/ The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. (Note—The use of dry material may not be appropriate for tritium.) When removable contamination on objects of surface area less than 100 cm^2 is determined, the activity per unit area should be based on the actual area and the entire surface should be wiped. Except for transuranics and Ra-228, Ac-227, Th-228, Th-230, and Pa-231 alpha emitters, it is not necessary to use wiping techniques to measure removable contamination levels if direct scan surveys indicate that the total residual surface contamination levels are within the limits for removable contamination.

5/ This category of radionuclides includes mixed fission products, including the Sr-90 which is present in them. It does not apply to Sr-90 which has been separated from the other fission products or mixtures where the Sr-90 has been enriched.

Subpart G requires radiological or potentially radiological areas and containers be posted and labeled. DOE must approve the signs and labels and the signs must be placed in a clear and conspicuous manner. Subpart H specifies that documents must be maintained to comply with the dose, monitoring, employee training and facility design controls required under these regulations.

Subpart I requires that exposure records be available to employees. Subpart J requires that occupational and radiation workers be adequately trained. Subpart K specifies that the facility design and controls be established to maintain exposure to radiation ALARA.

Subpart L enumerates the requirements for releasing materials and equipment from radiological areas for use in controlled areas. Equipment and materials shall not be released if they exceed the levels enumerated in Table 5-2 or if prior use suggests that the contamination levels on inaccessible surfaces exceed the specified levels. Contaminated equipment or materials that exceed the specified levels can be released temporarily from one radiological area to another if monitoring and control requirements are met. Records must be maintained describing the property, the date of the last monitoring operation, the identity of the person who performed the monitoring, the type and identification number of the instrument, and the results of the monitoring. It is anticipated that the Tank Car and any equipment used during remediation will meet the surface radioactivity values.

Subpart M specifies the requirements for accidental and emergency occupational exposure to radiation.

5.10 OHIO EPA GUIDANCE—"CLOSURE PLAN REVIEW GUIDANCE"

This OEPA guidance identifies current interpretations of the Ohio regulations regarding closure of HWMUs in Ohio. This guidance has been considered in developing this plan and will be used to conduct the removal and decontamination of the Tank Car and adjacent area. This OPEA guidance enumerates the items that should be included in a hazardous waste facility closure plan. The information contained in this document guided the development of this plan. This documents specifies procedures for the decontamination of hazardous waste and its residues from tanks. In the plan, the owner or operator must specify that reasonable means to clean or decontaminate tanks will be

used. These methods include solvent washing, pressure washing, scraping, and scarification. Specifically, the guidance requires that the following rinseate standards be met before the structure is "clean."

i) Fifteen times the public drinking water maximum contaminant level (MCL) for hazardous waste constituents as promulgated in 40 C.F.R. § 141.11 and O.A.C. 3745-81-11 for inorganics and 40 C.F.R. § 141.12 and O.A.C. 3745-81-12 for organics;

ii) If an MCL is not available for a particular contaminant, then fifteen times the maximum contaminant level goal (MCLG) as promulgated in 40 C.F.R. § 141.50 shall be used as the clean standard; or

iii) If the product of fifteen times the MCL or MCLG exceeds 1 mg/1 or if neither an MCL nor an MCLG is available for a particular contaminant, 1 mg/l shall be used as the clean standard.

6.0 CONCLUSION

Under the NCP, the EPA and the OEPA require that removal actions under CERCLA attain ARARs to the extent practicable under the circumstances. For removal actions, in determining whether attainment of ARARs is necessary, the agencies will examine the urgency of the situation and the scope of the removal action. In addition, CERCLA actions under § 121 (d)(4), which specifies requirements for remedial actions, provide six reasons to waive ARARs:

- The remedial action is an interim measure, where the final remedy will attain ARARs upon completion.
- Compliance will result in greater risk to human health and the environment than will other options.
- Compliance is technically impracticable.
- An alternative remedial action will attain the equivalent performance of the ARAR.
- For state ARARs, the state has not consistently applied (or demonstrated the intention to consistently apply) the requirements in similar circumstances.
- For CERCLA-financed actions under Section 104, compliance with the ARAR will not provide a balance between the need for protecting public health, welfare, and the environment at the facility, and the need for fund money to respond to other sites (this waiver is not applicable).

The need to comply with ARARs will be determined by the OEPA and EPA pursuant to the Consent Agreement and Consent Decree signed by the parties.

ATTACHMENT 6
SOP 20-C-916 CLEANING
SUMP SYSTEMS

NITRIC ACID TANK CAR AND AREA
Removal Action Work Plan and
Closure Plan Information and Data Package

Fernald Environmental Management Project

January 1993

Fernald Environmental Management Project WESTINGHOUSE ENVIRONMENTAL MANAGEMENT COMPANY OF OHIO SITE SERVICES DOCUMENT PROGRAM		Page 1 of 14 Revision No. 0 Revision Date: N/A
SITE SERVICES PROCEDURE	CLEANING SUMP SYSTEMS	SOP 20-C-916 Area: As applicable
Authorization: R. L. Gardner, Facilities & Warehousing Manager	Supersedes: None	Issue Date:

1.0 PURPOSE

The purpose of this document is to provide the procedure for cleaning sumps and sump systems.

2.0 APPLICABILITY

This procedure is applicable to all sump systems located at the FEMP.

3.0 RESPONSIBILITIES

3.1 Supervisors shall be responsible for the following:

3.1.1 Coordinating with support organizations when assistance is required.

3.1.2 Ensuring that sump systems are emptied in accordance with this procedure.

3.1.3 Ensuring that material removed from sumps and sump systems is disposed of in accordance with this procedure.

3.1.4 Ensuring that personnel are qualified per the established training requirements identified by the Department/Staff Manager.

3.1.5 Obtaining material and equipment required to clean sumps and dispose of removed material.

3.1.6 Contacting Industrial Hygiene or Radiological Safety to determine the appropriate respiratory protection and/or protective clothing/equipment required for the process being performed.

3.1.7 Issuing the required respiratory protection to operators.

3.1.8 Ensuring that empty rinse drums are cleaned and stored for reuse or disposition.

3.1.9 Obtaining and posting "Radiation Work Permits" and "Confined Space Entry Permits" when required.

3.1.10 Ensuring that work areas are surrounded by barriers when necessary.

3.1.11 Reviewing applicable "Material Safety Data Sheets" (MSDS) with operators.

3.1.12 Ensuring that sump liquid and sludge characterization has been performed prior to starting work.

3.0 **RESPONSIBILITIES** (cont.)

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3.1.13 Establishing a "Satellite Accumulation Area" if a temporary storage location is required for the material removed from the sump.

3.2 **Site Services** shall be responsible for the following:

3.2.1 Obtaining a final disposition sample.

3.2.2 Obtaining a sample for analysis of radionuclides.

3.2.3 Moving containers and SACs to and from pumping operations per section procedure PO-S-06-001.

3.3 **Environmental Compliance & Quality Assurance (EC/QA)** shall be responsible for the following:

3.3.1 Ensuring compliance with applicable regulations, including requirements specified by the Environmental Protection Agency, Ohio State Fire Marshall, Department of Energy, and the FEMP.

3.3.2 Providing EPA and UN numbers.

3.4 **Industrial Hygiene** shall be responsible for the following:

3.4.1 Monitoring air contaminant concentration while material is being removed from the sump systems.

3.4.2 Issuing "Confined Space Entry" permits when required.

3.5 **Radiological Safety** shall be responsible for the following:

3.5.1 Radiological surveys.

3.5.2 Issuing "Radiation Work Permits" (RWP) when required.

3.5.3 Specifying personnel protective equipment before operators work in or around a radiologically contaminated area.

4.0 **DEFINITIONS**

4.1 Compatible Container - A drum that has been approved for the material to be accumulated.

4.2 Hazardous Waste - A material which is listed on the EPA Hazardous Waste List or exhibits ignitability, corrosivity, reactivity, or exceeds Toxicity Characteristic Leaching Procedure (TCLP) limits. Both "listed" and "characteristic" wastes are regulated under RCRA.

4.3 Collection Container - A drum that is used to transfer material from a sump system to a designated location.

4.4 Release - Any unplanned event involving overflowing, sloshing, spilling, leaking, pumping, pouring, injecting, escaping, emitting, emptying, leaching, releasing, dumping, discharging, or disposing of hazardous onto the ground, into water, or into the air, within or beyond the boundaries of the FEMP.

4.0 **DEFINITIONS** (cont.)

4.5 Resource Conservation and Recovery Act (RCRA) - The Congressional Act which establishes safe and environmentally acceptable management practices for specific wastes.

4.6 Satellite Accumulation Area (SAA) - A defined area approved for waste accumulation at or near the waste generation point.

4.7 Satellite Accumulation Container (SAC) - A portable polyethylene container that holds one 55-gallon drum and contains material that may be released.

4.8 Three-Day Rule - A RCRA regulation requiring the transfer of containers in an SAC are transferred to an approved storage facility within three days from the date the container is filled.

5.0 **REFERENCES**

5.1 SOP 1-C-101, "Sampling Residue and Waste Material"

5.2 SOP 20-C-605, "Control of Satellite Accumulation Areas"

5.3 SOP 20-C-606, "Hazardous Material Spill Cleanup"

5.4 RM-0005, "FEMP Lot Marking and Color Coding System"

5.5 Section Procedure PO-S-06-001, "Movement of Hazardous Waste"

5.6 SSOP-0002, "Completing the Material Evaluation Form"

6.0 INDUSTRIAL HEALTH AND SAFETY REQUIREMENTS

6.1 A defined safety system is not involved.

6.2 Safety glasses shall be worn unless other eye protection is specified by the supervisor, IRS&T, or posted signs.

6.3 Respiratory protection issued by the supervisor shall be worn when required by IRS&T.

6.4 Face shields and goggles shall be worn when removing lids or bungs from drums containing liquids and when a possibility exists of being splashed with liquids.

6.5 A rubber apron or splash suit shall be worn if there is a possibility of being splashed with caustic, acids, or other hazardous chemical.

6.6 Leather-palm gloves shall be worn when handling containers, operating equipment, and when handling rough, sharp-edged, or contaminated materials.

6.7 Neoprene rubber gloves shall be worn when handling hazardous chemical material.

6.8 Any release of hazardous waste shall be reported to the supervisor and handled per SOP 20-C-606.

6.0 INDUSTRIAL HEALTH AND SAFETY REQUIREMENTS (cont.) 4042

6.9 Personnel safety equipment (eyewash, fire extinguishers, safety showers) shall be operational and readily available for emergencies.

6.10 Operators shall have reviewed, and be familiar with, MSDSs for hazardous material/chemicals that may be used or encountered.

6.11 Any circumstance which could have resulted in an intake of radioactive/hazardous waste materials by inhalation, ingestion, or absorption shall immediately be reported to a supervisor or, in the supervisor's absence, to the AEDO. The supervisor shall immediately report the circumstance of possible radioactive materials intake to Industrial Hygiene, Medical, and Radiological Safety for evaluation and any immediate action such as decontamination. The involved employees shall report to Medical Services at the end of their shift or as directed to submit a urine sample, and again report at the start of their next scheduled shift to submit another-urine sample.

NOTE: Warnings, cautions, and notes precede the Item or Step to which they apply.

7.0 PROCEDURE

7.1 Emptying Sump Systems

7.1.1 If not already done, prepare a "Material Evaluation Form" per SSOP-0002 for the material in the sump to be cleaned.

7.1.1.1 If sampling is required, proceed per SOP 1-C-101.

NOTE: The supervisor shall complete a "System Content Removal Checklist - Supervisors Daily Startup Checklist."

7.1.2 Complete the following forms:

(A) "Daily Sump System Activity Verification Checklist," (See Figure 1)
(B) "Sump System Content Removal - Equipment Checklist," (See Figure 2)
(C) "Sump System Content Removal - Drumming Area Checklist," (See Figure 3)
(D) "Sump System Content Removal - Drum Activity Completed Checklist," (See Figure 4)

7.1.3 Erect barricades around the work area.

7.1.4 Post warning and area entry requirement signs at the barricades.

NOTE: Before delivery to removal site, containers shall be tare weighed, and the weight recorded on a Form FS-F-1945-XX, "Item Production/ Certification/Identification."

7.1.5 Check to ensure that drums have been tare weighed.

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7.0 PROCEDURE (cont.)

NOTE: The supervisor shall arrange to have the drums weighed.

7.1.5.1 If not, notify the supervisor.

7.1.6 Contact the supervisor to ensure that the flash point of the sump liquid has been determined.

NOTE: The dike area shall be established so that the pump intake hose can reach the bottom of the sump.

7.1.7 Using a metal trough or Herculite material, construct a dike for the collection container and pumping equipment.

7.1.8 Place a SAC inside the diked area.

7.1.9 Install a collection container in the SAC.

7.1.10 Remove the lid/bung from the container.

CAUTION

The pump shall be specified (by hazard code or a combination of hazardous codes) for the material being transferred.

NOTE: Each pump shall be labeled with the hazard code for which the pump is used.

7.1.11 Check the pump to be used.

7.1.11.1 If the pump is not acceptable (due to the hazard code or a combination of hazard codes) for the material to be transferred, notify supervisor.

CAUTION

The power source shall not exceed the rated air or electric capacity of the pump.

7.1.12 Check the pump electric or air rating.

NOTE: The supervisor shall obtain a pump that is rated for the power supply.

7.1.12.1 If the power supply exceeds the rating, notify the supervisor.

7.1.13 Place the pump inside the diked area.

NOTE: Plant electric or air supply may be used if in close proximity to pumping operation. A generator or air compressor will be needed if a remote operation is performed.

7.1.14 Connect the pump to the power source.

7.1.15 Connect hoses to the pump intake and discharge.

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7.0 **PROCEDURE** (cont.)

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NOTE: Industrial Hygiene shall monitor for air contaminant concentrations prior to and after the sump is opened.

7.1.16 Remove or open the sump cap/cover.

7.1.17 Place pump intake hose into the sump and ensure that the hose reaches the sump bottom.

7.1.18 Place the pump discharge hose into the collection drum bung opening.

7.1.19 Ensure that air or electrical connections and hose connections are tight.

CAUTION

The pump shall be operated at a moderate speed to avoid splashing. If compressed air operation is used, the air supply nozzle shall be opened slowly until pump is primed.

7.1.20 Start the pump.

CAUTION

Containers that start to bulge shall not be filled.

7.1.21 Check the drum while filling.

NOTE: Bulging containers shall be handled under direct supervisi of the Area Supervisor and IRS&T.

7.1.21.1 If the drum starts to bulge, shut off the pump and notify the supervisor.

7.1.22 When the sump is empty or material in the drum reaches three inches from the top, shut off the pump.

7.1.23 When the sump is empty, remove the intake hose from the sump.

7.1.24 Check the sides and bottom of the sump for solid residues.

NOTE: Solids shall be removed using manual tools (such as shovels and spud bars).

7.1.24.1 If solids remain, remove and drum the material.

7.1.25 Close the sump.

7.1.26 Drain the pump and both hoses into the receiving drum.

7.1.27 Install the bung plug in the receiving container.

7.1.28 Clean and store pump and hoses per Item 7.2.

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7.0 PROCEDURE (cont.)

7.1.29 Complete "Item Production/Certification/Identification" cards, form FS-F-1945-XX (See Figure 5) for the material in the receiving and wastewater containers.

NOTE: The label/stencil shall include the "Declared Full" date.

7.1.30 Label and/or stencil the collection and rinse containers per RM-0005.

7.1.31 Complete forms that are required by SOP 20-C-605.

NOTE 1: The supervisor shall arrange to have the collection and rinse containers/SACs transferred to the applicable building or warehouse for weighing and storage.

NOTE 2: The "Three-Day Rule" is applicable to RCRA material.

NOTE 3: If material being pumped is declared RCRA, dispose of cleaning substances in same fashion as pumped material.

7.1.32 Inform the supervisor that cleaning is completed.

7.1.33 Dispose of spill containment equipment as follows:

7.1.33.1 If no releases occurred, remove and store spill containment equipment in the specified location.

7.1.33.2 If a release has occurred, handle and clean spill containment equipment per SOP 20-C-606.

7.2 Cleaning and Storing the Pump

NOTE: The supervisor shall have a drum of rinse solution and a collection drum moved into the diked area and placed in SACs.

7.2.1 Inform the supervisor that the pump is ready for cleaning.

7.2.2 Remove the bung plugs from the drums.

7.2.3 Place the pump intake hose into rinse drum below the liquid level.

7.2.4 Place the pump discharge hose into the collection drum.

CAUTION

The pump and hoses shall be cleaned at a moderate speed to prevent the detergent from splashing or bubbling. If air operation is performed, the air supply nozzle shall be opened slowly until pump is primed.

7.2.5 Start the pump.

7.2.6 When the rinse container is empty, shut off the pump.

7.2.7 Drain the hoses and pump into collection drum.

7.2.8 Disconnect the pump from the power source.

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7.0 **PROCEDURE** (cont.)

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7.2.9 Carefully remove hoses from rinse and collection drums.

7.2.10 Install caps on the ends of the hoses.

7.2.11 Disconnect the hoses from the pump.

7.2.12 Cap the hose ends.

7.2.13 Install bung plugs in the rinse and collection drum.

7.2.14 Remove pump/hoses from the diked area

7.2.15 Store the pump/hoses in the specified location.

8.0 **APPLICABLE FORMS**

8.1 "Daily Sump System Activity Verification Checklist"

8.2 "Sump System Content Removal - Equipment Checklist"

8.3 "Sump System Content Removal - Drumming Area Checklist"

8.4 "Sump System Content Removal - Drum Activity Completed Checklist"

8.5 FS-F-1945-XX, "Item Production/Certification/Identification"

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DAILY SUMP SYSTEM ACTIVITY VERIFICATION CHECKLIST

This set of checksheets comprise a document to provide daily verification of Procedural and Task or Project Specific Health and Safety Plan & SOP Compliance.

Work Location: _____ **Sump System:** _____ **Date:** _____

Activity of Day:

Content Removal _____ Purging _____

Closure _____ Dismantling _____

Work Crew Members:

Name:	Badge Number:
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Cognizant Supervisor: _____ **Badge No.:** _____

Comments or Additions:

_____

_____

DAILY SUMP SYSTEM ACTIVITY VERIFICATION CHECKLIST
FIGURE 1

SUMP SYSTEM CONTENT REMOVAL - EQUIPMENT CHECKLIST

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Work Location: _____ Sump System: _____ Date: _____

Items to Check:	Verifier's Badge No.:
1. Air Compressor Checksheet/OPR 2414	_____
2. Pneumatic Pump and Hoses	_____
3. Safety Equipment:	
Pigs	_____
Absorbent Pads	_____
Respirators	_____
Eye Wash	_____
Gloves	_____
PPE	_____
-	_____
4. Forklift - Checksheet/OPR 2414	_____

5. List of Materials Requiring Restocking:

_____

_____ _____

_____

SUMP SYSTEM CONTENT REMOVAL - EQUIPMENT CHECKLIST
FIGURE 2

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SUMP SYSTEM CONTENT REMOVAL - DRUMMING AREA CHECKLIST

Work Location: _____ Sump System: _____ Date: _____

Items to Check:	Verifier's Badge No.:
1. Condition of Sump System	_____
2. Presence of Absorbent Pads	_____
3. Area Barrier in Place (Tarp)	_____
4. Drums Available and Coded	_____

Comments: _____

_____

_____

SUMP SYSTEM CONTENT REMOVAL - DRUMMING AREA CHECKLIST
FIGURE 3

SUMP SYSTEM CONTENT REMOVAL - DRUM ACTIVITY COMPLETED CHECKLIST

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Work Location: _____ Sump System: _____ Date: _____

Items to Check:	Verifier's Badge No.:
1. Material characterize	_____
2. Drums Generated	_____
3. Coding Checked	_____
4. Number of Drums Transferred	_____
Filled	_____
Transferred	_____
Weighed	_____
Stored	_____
5. Checklist of Pneumatic Pump and Storage of Equipment.	_____

Comments: _____

_____

_____

SUMP SYSTEM CONTENT REMOVAL - DRUM ACTIVITY COMPLETED CHECKLIST
FIGURE 4

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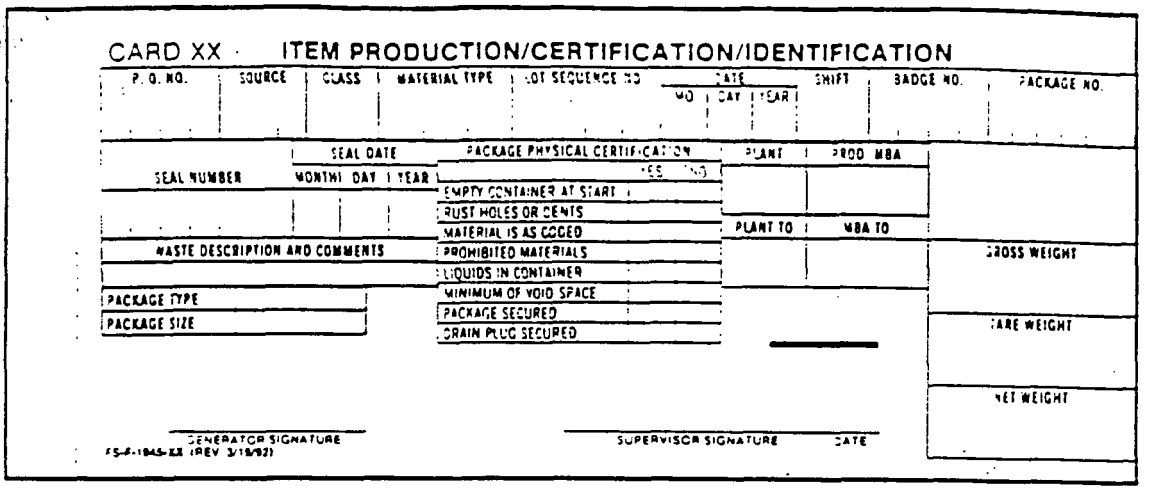

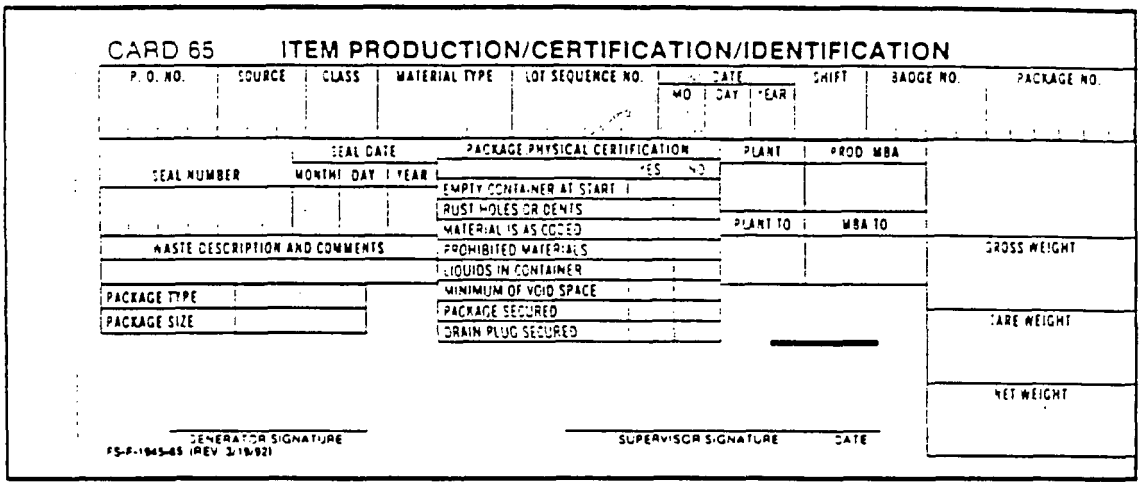

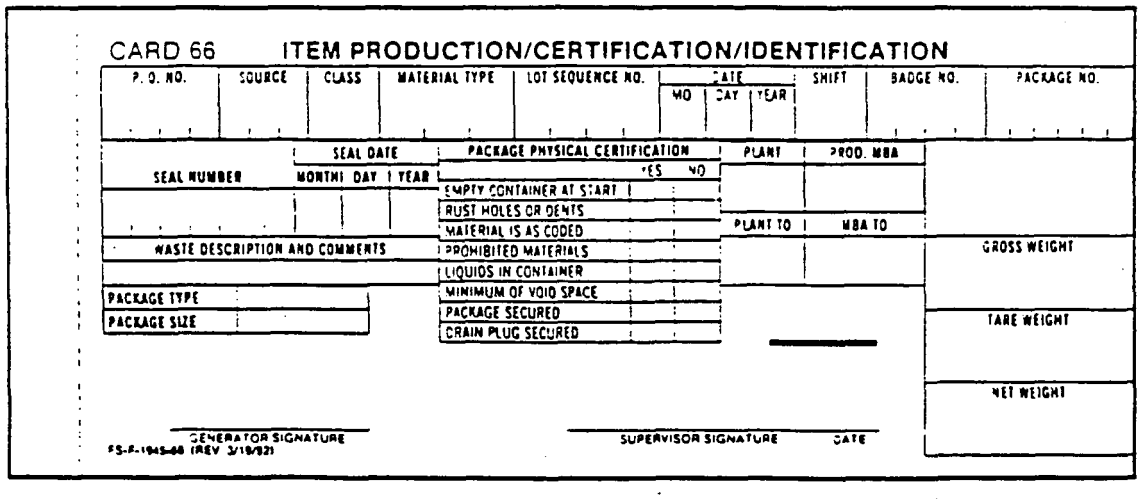

ITEM PRODUCTION/CERTIFICATION/IDENTIFICATION
FS-F-1945-XX
FIGURE 5

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RECORD OF ISSUE/REVISIONS

4042

DATE	REV. NO.	DESCRIPTION AND AUTHORITY
Draft	0	Procedure for cleaning sump systems required per Request P92-143 initiated by J. Ogg.