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CONTAMINATION AT THE FIRE TRAINING FACILITY REMOVAL ACTION WORK PLAN AND CLOSURE PLAN INFORMATION AND DATA PACKAGE SEPTEMBER 1993

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WORK PLAN

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FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

Contamination at the Fire Training Facility

Removal Action Work Plan and Closure Plan Information and Data Package

FINAL

September 1993

U.S. DEPARTMENT OF ENERGY

277 9

CONTAMINATION AT THE FIRE TRAINING FACILITY

Removal Action Work Plan and Closure Plan Information and Data Package

FINAL

Fernald Environmental Management Project

September 1993

U.S. DEPARTMENT OF ENERGY

01

CONTENTS

Page

EXECUTIVE SUMMARY ES-1

1.0 INTRODUCTION 1-1
1.1 BACKGROUND 1-1
1.2 PURPOSE 1-2
1.3 EXCLUSIONS 1-6
1.3.1 Mixed Radioactive and Hazardous Wastes 1-6
1.3.2 CERCLA Remedial and Removal Action Requirements for FEMP RCRA Closures 1-7
1.3.3 Financial and Liability Exemption 1-8

2.0 FACILITY DESCRIPTION 2-1
2.1 HWMU DESCRIPTION 2-1
2.1.1 Site History 2-1
2.1.2 Existing Structures and Areas 2-2
2.1.3 Geology and Hydrology 2-6
2.2 WASTE INVENTORY 2-13
2.2.1 Surface Radiological Surveys 2-13
2.2.2 Boring and Soil Sampling 2-16
2.2.3 Organic Soil Vapor 2-17
2.2.4 Groundwater Sampling 2-21
2.3 CURRENT USE 2-26
2.4 SECURITY 2-26
2.5 FTF AREA OF CONTAMINATION 2-26
2.6 REMOVAL ACTION JUSTIFICATION 2-26

3.0 CLOSURE AND REMOVAL ACTION INFORMATION 3-1
3.1 OBJECTIVES 3-1
3.1.1 Scope 3-2
3.1.2 Related Actions 3-2
3.2 CLOSURE METHODOLOGY 3-6
3.2.1 Support Activities 3-6
3.2.2 Field Activities 3-10
3.3 SAMPLING AND ANALYSIS 3-25
3.3.1 Sampling and Analysis Objectives 3-25
3.3.2 Sampling Procedures 3-32
3.3.3 Analytical Procedures 3-42
3.3.4 Quality Assurance/Quality Control 3-46
3.4 WASTE DISPOSAL AND MANAGEMENT 3-52

02

4779

CONTENTS (continued)

Page

3.4.1 Waste Minimization and Management Responsibility 3-53
3.4.2 Existing Programs 3-53
3.4.3 Work Activities Producing Waste 3-53
3.4.4 Assumptions Made Regarding Waste 3-54
3.4.5 Categories of Waste 3-55
3.5 HEALTH AND SAFETY 3-60
3.6 QUALITY ASSURANCE 3-60
3.7 ARARs ANALYSIS 3-61

4.0 CLOSURE CERTIFICATION 4-1
4.1 RCRA CLOSURE STANDARDS 4-1
4.1.1 Standard of Clean for Soil Samples 4-1
4.1.2 Decontamination Verification of the FTF Components 4-2
4.2 CERTIFICATION INSPECTIONS 4-2
4.3 CERTIFICATION DOCUMENTS 4-5
4.4 STATEMENT OF CERTIFICATION 4-6
4.5 POST-CLOSURE PLAN 4-6
4.6 NOTICE IN DEED 4-6

5.0 SCHEDULE 5-1

6.0 REFERENCES 6-1

ATTACHMENT 1 REMOVAL SITE EVALUATION
ATTACHMENT 2 ANALYTICAL SUPPORT LEVELS
ATTACHMENT 3 HEALTH AND SAFETY PLAN (FTF HAZARD ANALYSIS FORM)
ATTACHMENT 4 QUALITY ASSURANCE PROJECT PLAN
ATTACHMENT 5 IDENTIFICATION OF POTENTIALLY APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
ATTACHMENT 6 SOP 20-C-916 CLEANING SUMP SYSTEMS
ATTACHMENT 7 1993 SOIL GAS SURVEY
ATTACHMENT 8 FTF AREA OF CONTAMINATION
ATTACHMENT 9 RCRA CLOSURE GUIDANCE CHECKLIST

03

TABLES

Page

2-1 Wells 1887 and 1890 list of analytes 2-23
3-1 Minimum requirements for health and safety monitoring 3-28
3-2 Summary of measurement and sample types 3-31
3-3 Summary of samples to be collected for laboratory analysis 3-33
3-4 General procedure for soil sampling with a drive tube sampler 3-38
3-5 General procedure for soil sampling with a split-spoon sampler 3-41
3-6 Decontamination levels for sampling equipment 3-43
3-7 Surface, verification, and sub-surface soil sample contaminants of concern and analytical procedures 3-47
3-8 Contaminants of concern procedures for critical surface, perched and subsurface water samples 3-48
3-9 Background concentrations of selected metals in FEMP surface soil 3-49
3-10 Summary of waste minimization activities 3-56
3-11 Regulatory requirements for the removal and closure of the Fire Training Facility 3-62
4-1 Decontamination action levels 4-3
5-1 Milestones for the removal action schedule 5-2

FIGURES

Page

1-1 Master grid site map 1-3
1-2 Map of Fire Training Facility 1-5
2-1 Generalized stratigraphic column of the FEMP region 2-8
2-2 Fire Training Facility perched water piezometers and monitoring wells 2-9
2-3 Nearby monitoring wells and groundwater flow orientation 2-10
2-4 Summary of surface radiological survey results 2-14
2-5 February 1993 soil gas survey sample locations and results 2-19
3-1 Location of contaminated areas 3-20
3-2 Location of source area soil borings and shallow soil borings 3-23

4779

ACRONYMS

AOC	area of contamination
ARAR	applicable or relevant and appropriate requirement
ASL	analytical support level
CAM	constant air monitor
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
C.F.R.	Code of Federal Regulations
cm	centimeter
CPID	Closure Plan Information and Data Package
cpm	counts per minute
CRU-3	CERCLA/RCRA Unit 3
CRU-5	CERCLA/RCRA Unit 5
D&D	decontamination and decommission
DOE	U.S. Department of Energy
dpm	disintegrations per minute
DQO	Data Quality Objective
ECD	election capture device
EE/CA	engineering evaluation/cost analysis
FEMP	Fernald Environmental Management Project
FERMCO	Fernald Environmental Restoration Management Corporation
FFCA	Federal Facilities Compliance Agreement
FID	flame ionization detector
FMPC	Feed Materials Production Center
FTF	Fire Training Facility
gpm	gallons per minute
HASP	Health and Safety Plan
HSL	Hazardous Substance List
HWMU	hazardous waste management unit
LLW	low-level waste
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
mg/kg	milligrams per kilogram
mg/l	milligrams per liter
msl	mean sea level
NPL	National Priorities List
NTS	Nevada Test Site
O.A.C.	Ohio Administrative Code
OEPA	Ohio Environmental Protection Agency
OSHA	Occupational Safety and Health Administration
OU-3	Operable Unit 3, former production area facilities operable unit

06

ACRONYMS (continued)

OU-5	Operable Unit 5, environmental media surrounding and underlying OU3
PAS	portable air sampler
PASA	Production and Additional Suspect Area
PCB	polychlorinated biphenyl
PCE	tetrachlorethene
pCi	picocuries
pCi/g	picocuries per gram
PID	photoionization detector
ppbv	parts per billion volumetric
ppm	parts per million
QA	quality assurance
QC	quality control
RAWP	Removal Action Work Plan
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
RSE	Removal Site Evaluation
SACD	Stipulated Amendment to the Consent Decree
SAP	Sampling and Analysis Plan
SCQ	Sitewide CERCLA Quality Assurance Project Plan
SOP	Standard Operating Procedure
SVOC	semi-volatile organic compound
TCA	1,1,1-Trichloroethane
TCE	Trichloroethene
TCLP	Toxicity Characteristic Leaching Procedure
TSD	treatment, storage and disposal
μg/kg	micrograms/kilogram
USEPA	U.S. Environmental Protection Agency
UTL	upper tolerance level
VOC	volatile organic compound

EXECUTIVE SUMMARY

The Fire Training Facility (FTF) was declared to be a hazardous waste management unit (HWMU) based on 1) knowledge of past facility operations that led to releases of hazardous and radioactive materials to the environment, and 2) on actual environmental sampling data as described in the Removal Site Evaluation (RSE) (Attachment 1). The FTF 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 the RCRA Part B Permit Application submitted in October 1991. In response to OEPA and U.S. Environmental Protection Agency (USEPA's) comments, Resource Conservation and Recovery Act (RCRA) Part A and Part B permit applications were most recently submitted to these agencies in March 1993. In August 1991, the FTF was identified as an HWMU in the RCRA compliance schedule submitted pursuant to the Consent Decree negotiated between the state of Ohio and the U.S. Department of Energy (DOE) (State of Ohio 1988).

This combined Removal Action Work Plan (RAWP) and Closure Plan Information and Data (CPID) package provides 1) a response to a RSE and DOE letter DOE-0854-93, "Proposed Phase IV 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 Code of Federal Regulations [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 perform closure of the FTF are identified in this document. As detailed in Section 3.2.2, activities will include:

1) Survey and mark HWMU boundaries
2) Conduct site preparations and equipment staging
3) Remove ponded surface water
4) Remove structures
5) Remove contaminated surface soil
6) Conduct soil sampling and analysis
7) Backfill soil excavations
8) Prepare final report.

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 between the DOE and the USEPA. Specifically, Sections 2.5, Removal Action Justification; 3.2.1, Support Activities, including roles of the participants; 3.7, Applicable or Relevant and Appropriate Requirements (ARARs) Analysis; and Attachments 1 through 7, 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 RSE. 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]. 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. Attachment 7 provides a report of the soil gas survey conducted at the FTF. Attachment 8 presents the declaration of the FTF HWMU as an Area of Contamination (AOC). That declaration includes a map depicting the zone of contiguous contamination and AOC boundaries, and discusses the stockpiling and management of contaminated soils within the AOC. Attachment 9 cross-references the OEPA closure plan review checklist to the document sections containing the required information and data.

1.0 INTRODUCTION

The Fire Training Facility (FTF) was declared a hazardous waste management unit (HWMU) based on 1) knowledge of past facility operations that led to releases of hazardous and radioactive materials to the environment, and 2) on actual environmental sampling data (Attachment 1). The FTF was included in the list of HMWUs 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. Lastly, in August 1991, the FTF was identified as an HWMU in the RCRA compliance schedule submitted pursuant to the Consent Decree negotiated between the State of Ohio and the U.S. 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 FTF is identified as a removal action in the DOE letter DOE-0854-93, "Proposed Phase IV Removal Actions" (dated January 14, 1993), submitted to the U.S. Environmental Protection Agency (USEPA) pursuant to the Amended Consent Agreement (USEPA 1991). Under this proposal, a Removal Action Work Plan (RAWP) must be submitted to USEPA by June 30, 1993. The RAWP is intended to detail the steps necessary to safely remove contamination from the FTF at the Fernald Environmental Management Project (FEMP). The need for a removal action is documented in the Removal Site Evaluation (RSE) (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 USEPA in April 1990 to amend the provisions of the July 1986 Federal Facilities Compliance Agreement (FFCA). The amendments were necessary to meet the

10

requirements of Section 120 of Comprehensive Environmental Response, Compensation, and Liability Act (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 Code of Federal Regulations (C.F.R.) § 300.415, a number of removal actions have been identified to be implemented before final remediation. The DOE conducts and submits to the USEPA an annual review of the need for removal actions at the FEMP. The FTF was proposed as a Phase IV removal action (calendar year 1993) in the DOE letter DOE-0854-93, dated January 14, 1993.

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 FTF is located in Operable Unit 3 (OU-3) (Figure 1-1). A map of the FTF is shown in Figure 1-2. The FTF was constructed and operated as a training facility for the Fernald Site fire department and surrounding community fire departments from 1966 to 1990. The FTF was estimated to have been used an average of 60 days per year. During its use, various types of combustible substances were burned to practice fire fighting techniques; some of the waste solvents burned at the FTF may have been contaminated by radionuclides. A more detailed description of the HWMU is presented in Section 2.0.

1.2 PURPOSE

This plan for the FTF is intended to provide data and information consistent with the provisions 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 USEPA. Specific actions required to remove hazardous materials and verify closure of

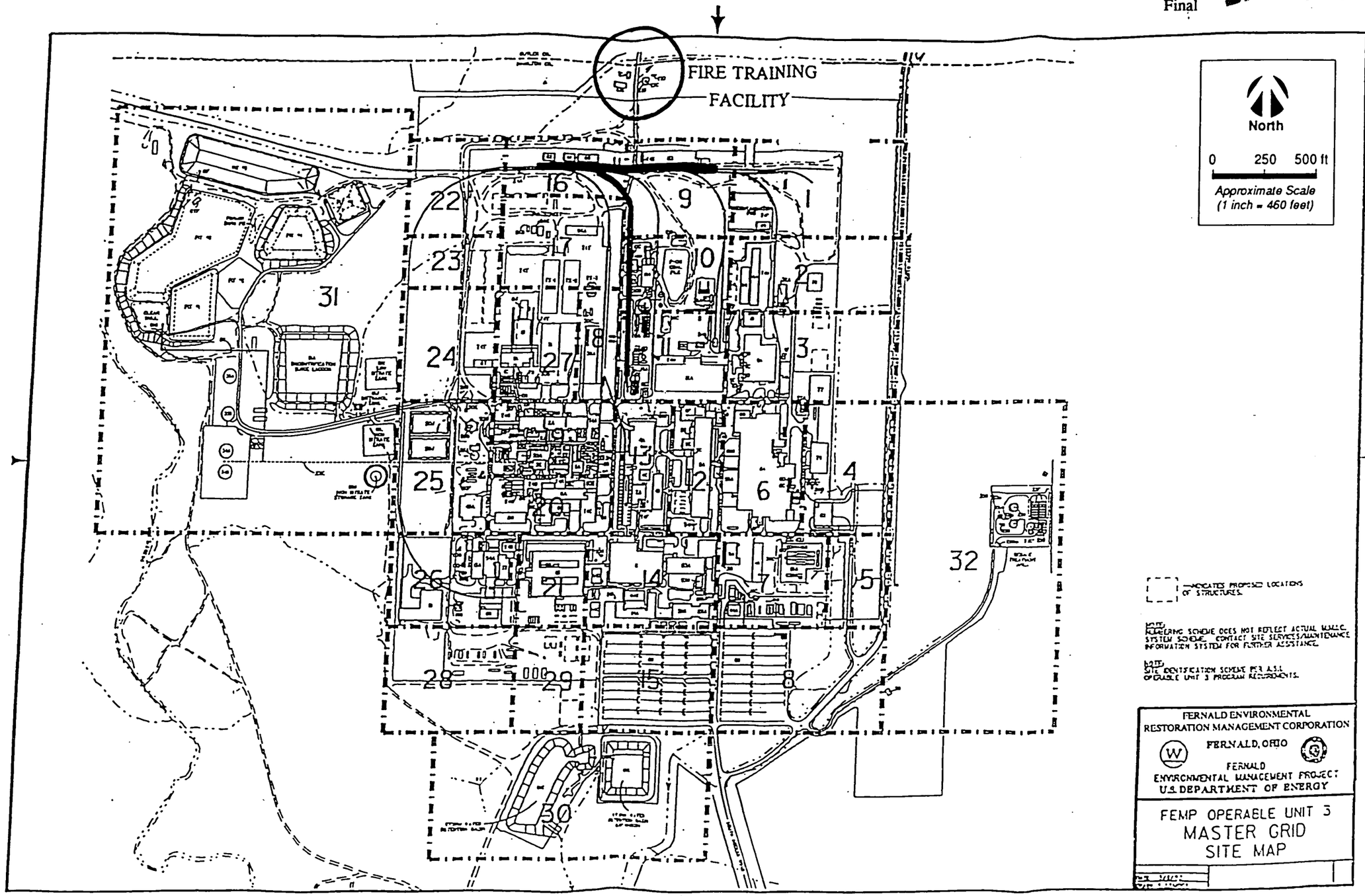

Figure 1-1. Master grid site map.

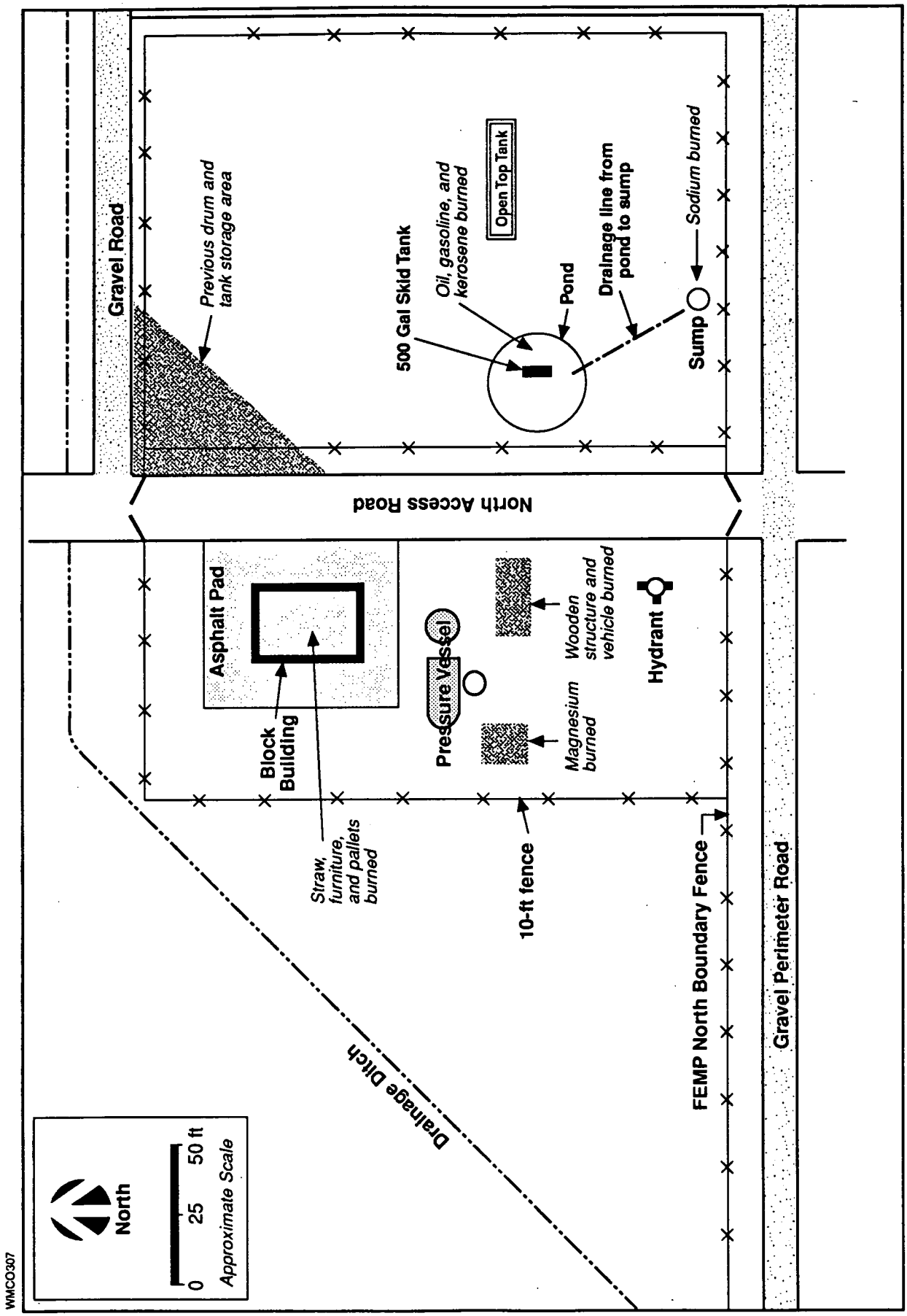

Figure 1-2. Map of the Fire Training Facility.

the FTF are identified in this document. Other information is included, in addition to that required for closure (Sections 2.5 and 3.7 and Attachments 1 through 5) to comply with the requirements for a RAWP in accordance with the Amended Consent Agreement. Section 3.7 (Table 3-10) and Attachment 5 of this plan provide a description of the applicable or relevant and appropriate requirements (ARARs) that must be considered in performing the removal action.

This removal action work plan and CPID demonstrates compliance with closure regulations and provides information required in the OEPA document, *Closure Plan Review Guidance* (OEPA 1991). This OEPA document contains checklists that specify applicable regulatory requirements for closure of different types of RCRA units. The checklist applicable to this document is Disposal Surface Impoundments. Attachment 9 includes this checklist with cross references indicating where information that addresses specific regulatory requirements located within this document.

1.3 EXCLUSIONS

1.3.1 Mixed Radioactive and Hazardous Wastes

The FTF will be managed as a potential source of mixed low-level waste. The soil and debris at the site are potentially both a hazardous waste, because of the known releases of "F" listed solvent wastes to the soil, and a radioactive waste because of low levels of uranium and thorium. The "F" listed solvent wastes are specified in Section 3.3.3.1 of this plan.

The USEPA 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, all wastes will be characterized prior to treatment, and all identified mixed wastes generated from the FTF removal action will be managed in accordance with RCRA regulations, DOE Orders, and Removal Action No. 17, Improved Storage of Soil and Debris (FEMP 1993).

1.3.2 CERCLA Remedial and Removal Action Requirements for FEMP RCRA Closures

On July 18, 1986, the USEPA and the DOE entered into the FFCA that provides for the continuation and establishment of environmental programs to ensure compliance with CERCLA, RCRA, the Clean Water Act, and the Clean Air Act. In September 1991, the DOE and USEPA negotiated an Amended Consent Agreement. Section IX.F.2 of the Amended Consent Agreement requires the DOE to submit a RAWP to support removal actions at the FEMP. The FTF removal action was identified in DOE letter DOE-0854-93, "Proposed Phase IV Removal Actions," dated January 14, 1993.

Because the FTF has released suspected 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 FTF removal action in accordance with CERCLA, the Amended Consent Agreement, and other appropriate regulations.

In addition, the closure of the FTF 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 Feed Materials Production Center (FMPC). A Stipulated Amendment to the Consent Decree (SACD) was signed January 22, 1993, and reflects DOE's updated Consent Agreement with USEPA. 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 FTF 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 following section describes the history, existing buildings and structures, geology, and geohydrology of the HWMU.

2.1.1 Site History

Prior to 1951, the land containing the FTF was undisturbed pasture. From 1951 to 1954, an unpaved parking lot and small buildings were constructed at the current location of the FTF. The parking lot was constructed for temporary offices located along the northern fence line of the FEMP (then designated the FMPC) 500 feet south of the FTF. The temporary office facilities were demolished in 1954. No known activities occurred at the site of the FTF from 1954 to 1965.

In 1966 the FTF was constructed as a training facility for the Fernald Site fire department. The FTF was operated from 1966 to 1990. During this period, the site was also routinely used for training exercises by fire departments from surrounding communities. In its operational life the facility was used intermittently for exercises which lasted several days to several weeks. The FTF was estimated to have been used an average of 60 days per year by both the Fernald Site fire department and off-site fire departments.

Various types of combustible substances were burned at the FTF to practice fire fighting techniques (RSE, Attachment 1). A list of some of the combustible substances thought to have been burned or stored at the FTF are as follows:

- Waste oil
- Kerosene
- Gasoline
- Wooden pallets
- Straw (from off-site source)

- Vehicle(s)
- Damaged office furniture
- Unusable household furniture
- Rubber tires
- Metallic sodium
- Magnesium
- Waste solvents.

Some of the materials from on-site sources burned at this site were contaminated by radionuclides, based on radiation surveys conducted in May 1989 and January 1993 (Section 2.2.1). Radiological surveys combined with soil borings indicate that radionuclides (primarily uranium and thorium based on the soil borings) are present in the surface soil at levels elevated above background concentrations. In addition, soil borings indicate some organic compounds are also present in elevated concentrations, and shallow wells show that drinking water standards are exceeded by some contaminants in the shallow perched water directly beneath the site. The January 1993 radiological survey filled in gaps for soil radiation between the gravel road and the open top tank and inside of the building and pressure vessel. The soil readings in these new areas indicate background concentrations, and localized elevated levels in the building and pressure vessel.

2.1.2 Existing Structures and Areas

The FTF is composed of the following structures and areas:

- Block building
- Skid tank/pond/sump
- Open top tank
- Horizontal pressure vessel
- Surface burn areas
- Former drum storage area.

The FTF structures and hardware are components of OU-3, while the soils and groundwater are elements of Operable Unit 5, OU-5. Boundaries for the HWMU are

the North Construction Gravel Road (Gravel Perimeter Road), and the newly installed FTF boundary fence.

The sections that follow provide physical descriptions of each structure or area within the FTF along with a description of past and present use. Each structure and area is shown in Figure 1-2.

Block Building

This two-story rectangular building is 18 feet, 8 inches wide by 35 feet, 4 inches long and is constructed of concrete masonry units (blocks). The building is sealed and no longer considered safe for use. The first and second story floors are constructed of reinforced concrete. The first story contains two interior block walls and the second story contains no interior walls. A ladder and portal provide access between the first and second story, and between the second story and the roof. The roof is constructed of wooden joist covered with plywood and an asphalt roofing. There is no indication that the building contains any asbestos material, nor is any suspected, based on process knowledge. No utilities are supplied to the building. The building is surrounded by an asphalt pad which is cracked in several places.

Combustible materials (straw, furniture, pallets) were placed in this building and set on fire for exercises in fire fighting techniques. Flammable liquids reportedly were used to reignite wet combustible materials during training to create repeated fires. Water ran out of the building onto the asphalt pad. The building is currently in fair condition, with all windows boarded and doors padlocked to control access. The west side of the building is covered with climbing ivy.

Recent radiological surveys of the FTF concrete block building were performed on October 9, 1992 (a summary is provided in Section 2.2.1.2). Those surveys detected localized spots of fixed contamination in the first and second floor concrete. There are two spots on the first floor that each read 1,000 dpm and a cluster of several spots, within proximity of each other (approximately 4 square feet), on the second floor that read between 1,000 dpm and 40,000 disintegrations per minute (dpm). No loose contamination was detected during the survey.

Skid Tank/Pond/Sump

The skid tank is constructed of carbon steel and is 5 feet, 4 inches in diameter by 9 feet long. The tank rests horizontally on two concrete pedestals spaced 9 feet apart. The concrete pedestals are 3 feet, 4 inches wide by 8 inches thick by 5 feet tall. The pedestals rest on a spread footing buried 2 feet below grade. The skid tank is surrounded by a shallow pond (6 inches deep) that is approximately 15 feet in diameter. Facility drawings show that the pond is connected to a sump located approximately 50 feet south of the pond.

During training exercises the skid tank pond was filled with waste solvents or fuel oil and set on fire to practice fire fighting techniques. The skid tank was only used as a backdrop to add realism to the training exercises, and was not used to contain combustible liquids. Water from the training exercises collected in the pond surrounding the tank.

The skid tank is badly corroded and is missing much of its bottom. The bottom of the pond is stained black and periodically contains water following periods of precipitation. An 8-foot by 10-foot area located on the north end of the pond is covered with a 5-mil plastic sheet. Surface radiation measurements taken around the perimeter of the pond showed contamination ranging from 1,500 to 16,000 dpm using a beta/gamma frisker (RSE, Attachment 1).

The sump is located just north of the FEMP North Boundary Fence, approximately 50 feet southeast from the skid tank. The sump was constructed to provide a mechanism for collecting overflow from the pond if necessary. A 4-inch diameter pipe extends from the edge of the pond to the sump, and operators indicate that while the sump did receive overflow from the pond, it was never pumped out. The sump, as it exists today, is an 8-foot diameter unlined hole that has been filled in with soil to within approximately 2 feet of the surrounding ground surface. This shallow depression occasionally contains temporary standing water after periods of heavy rainfall. There are several pieces of wood laying in the sump, and the overflow from the pond is not visible in the sump. It has been reported that the sump at one time contained a metal drum or bucket under the drainline. The current condition of the sump does not allow verification.

Open Top Tank

The open top tank is constructed of carbon steel, is rectangular in shape, and is 7 feet, 8 inches wide by 27 feet long by 4 feet, 6 inches deep. The top of the tank rests 1 foot, 6 inches above grade. The construction drawings indicate that the tank was taken from the Plant 6 No. 6 salt bath. During fire training exercises this open top tank was filled with waste oil or solvents and set on fire for practice of fire fighting techniques.

A radiation survey conducted in 1989 with a beta/gamma frisker found surface contamination on the tank ranging 3,500 to 132,000 dpm (RSE, Attachment 1, Figure 2).

Following periods of precipitation the tank fills to capacity (6,900 gallons) with a brownish liquid believed to be a mixture of oil and rainwater. During periods of high precipitation, the contents of the tank overflow onto the surrounding ground.

Horizontal Pressure Vessel

A cylindrical tank (former pressure vessel) is located 50 feet south of the block building. The tank is constructed of 1.5-inch plate steel and is 8 feet in diameter and approximately 50 feet long, and sits directly on the ground, with no support foundation. One of the tank's hemispherical ends has been cut off and is lying face up collecting rainwater. The tank is sloped to its open end such that any liquid collecting in the tank will drain out.

No fires are known to have been started in the tank. However, the tank was filled with smoke so that personnel could practice confined space egress and ingress under smoke-filled conditions. A radiation survey conducted in 1989 did not detect surface beta/gamma radiation (RSE, Attachment 1, Figure 2). The more recent radiological surveys of the horizontal pressure vessel performed on January 26, 1993 detected four localized spots of fixed contamination on the exterior surface approximately 1 foot up from the bottom of the vessel and one spot on the exterior surface of the lid. Fixed contamination levels on the vessel ranged from 1,000 dpm to 2,000 dpm and the one spot on the lid read 1,500 dpm. No loose contamination was detected on either the

vessel or the lid during the survey. Additional information on the 1993 survey may be found in Section 2.2.1.

Burn Areas

Combustible solids and metals were reportedly burned in three surface burn areas within the FTF. Field investigations verified the location of two burn areas located 20 feet south and 30 feet southeast of the horizontal pressure vessel, respectively. Magnesium was reported to have been burned at the south burn site which is approximately 6 feet in diameter and absent of vegetation. A vehicle and wooden structure were reported to have been burned at the southeast burn site which is approximately 10 feet wide by 20 feet long. No surface staining or stressed vegetation was found at this second burn site. Neither of these burn areas exhibited radiological or volatile organic compound (VOC) contamination during the surveys discussed in Section 2.2.

The third burn area is the skid tank pond sump located in the radiological contamination control zone on the east side of the FTF. The sump was used to collect overflow from the pond, and operators report that sodium metal was burned at this location by dropping the metal into the liquid filled sump pit. Recent visual inspections were unable to confirm this because the sump has filled with soil to within approximately 2 feet of its top.

Drum Storage Area

A temporary drum storage area is located in the northwest corner of the radiological contamination control zone on the east side of the FTF. However, recent surveys indicate this area is free from both radiological and volatile organic contamination. FTF operators report that this area was used to stage and temporarily store drums of flammable liquids prior to their use in fire training exercises.

2.1.3 Geology and Hydrology

The geology of the FEMP is described in detail in the *Fernald - Site Wide Characterization Report* (DOE 1992). Local facility information is available from soil borings associated with the installation of piezometers.

2.1.3.1 Geology

The FEMP lies in the Till Plains section of the Central Lowland physiographic province, characterized by structural and sedimentary basins and domes. The underlying bedrock in the region is shale and fossiliferous limestone of Middle and Late Ordovician age.

The FEMP is located within a 2- to 3-mile wide sedimentary basin known as the New Haven Trough. The basin formed as a valley during Pleistocene glaciation and subsequently filled with glacial outwash materials and till. The bedrock in the vicinity of the FEMP consists of predominantly flat-lying, olive-gray Ordovician shales with thin, interbedded layers of limestone. This shale forms the base and sides of the New Haven Trough.

Approximately 200 to 250 feet of regionally extensive Pleistocene glacial valley fill deposits unconformably overly the shales in the New Haven Trough. Figure 2-1 is a generalized stratigraphic column showing stratigraphic relationships of the Pleistocene sediments. The glacial outwash deposit is composed primarily of poorly sorted pebbles, cobbles, and boulders in a predominantly clay matrix. Contained within the glacial outwash deposit is a relatively continuous, low permeability clay interbed ranging from about 5 to 15 feet thick and approximately 150 feet below the surface. Beneath most of the FEMP and the FTF, glacial overburden deposits overlie the bedrock uplands and the outwash materials where they form the thick, unconsolidated sediment layers beneath the soil zone. This glacial overburden is predominantly composed of dense, silty clay. The glacial overburden also contains lenses of poorly sorted fine- to medium-grained sand and gravel, silty sand, and silt with layers of silty clay.

The boring logs from the piezometers installed in the vicinity of the FTF were reviewed to provide local stratigraphic information. The boring logs reviewed include piezometers 1508 to 1515, within the FTF as shown on Figure 2-2, and wells 3423, 2423, 2052, 1052, and 3678, outside the FTF as shown on Figure 2-3. Glacial overburden is approximately 40 feet thick in the study area and is comprised of silty clay and clayey silt with rare gravel and sand. It extends from the ground surface to approximately 550 feet mean sea level (msl). Shallow borings within the FTF (piezometers 1508 to 1515) indicate that the glacial overburden at the site is primarily

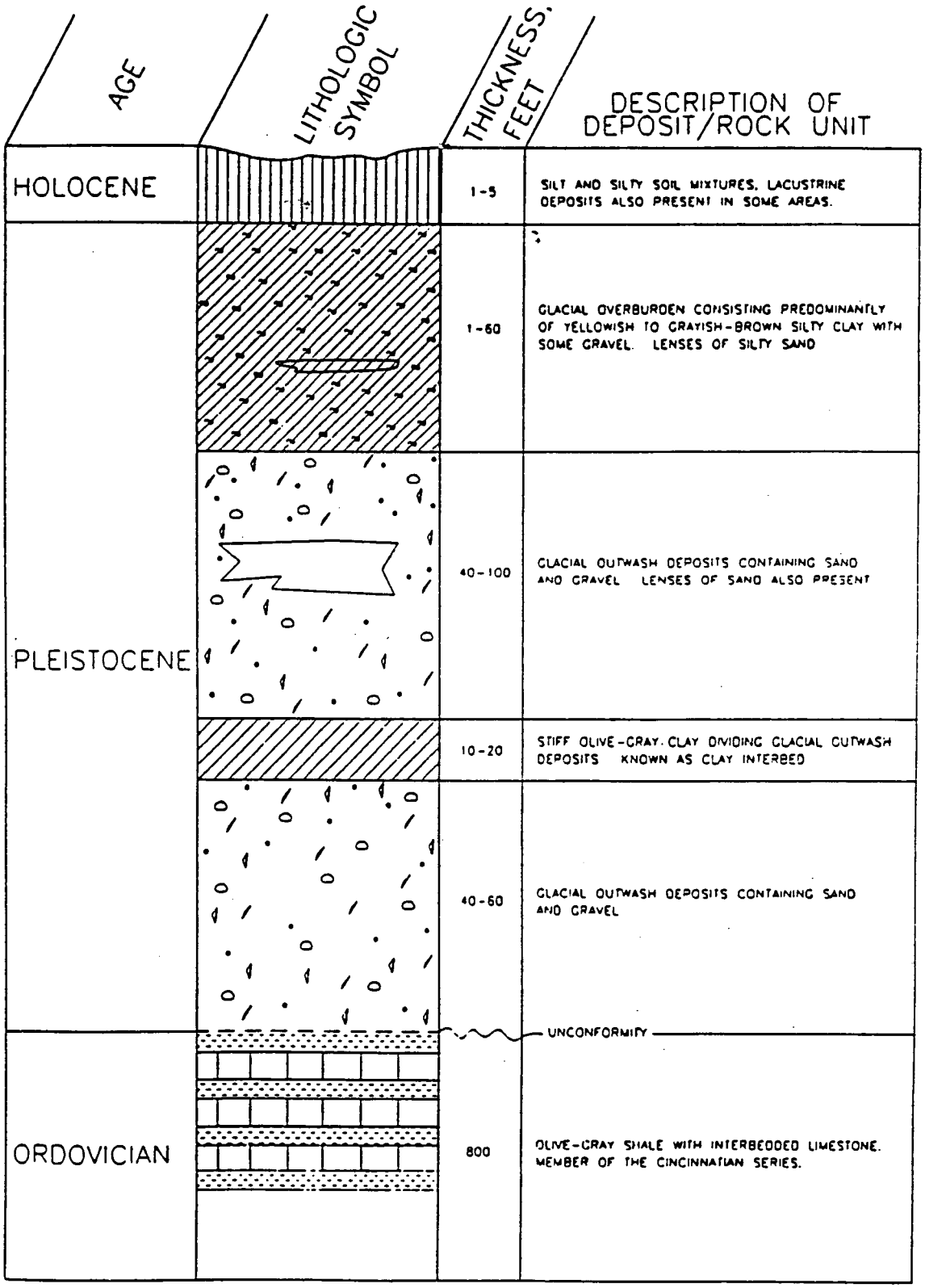

Figure 2-1. Generalized stratigraphic column of the FEMP region.

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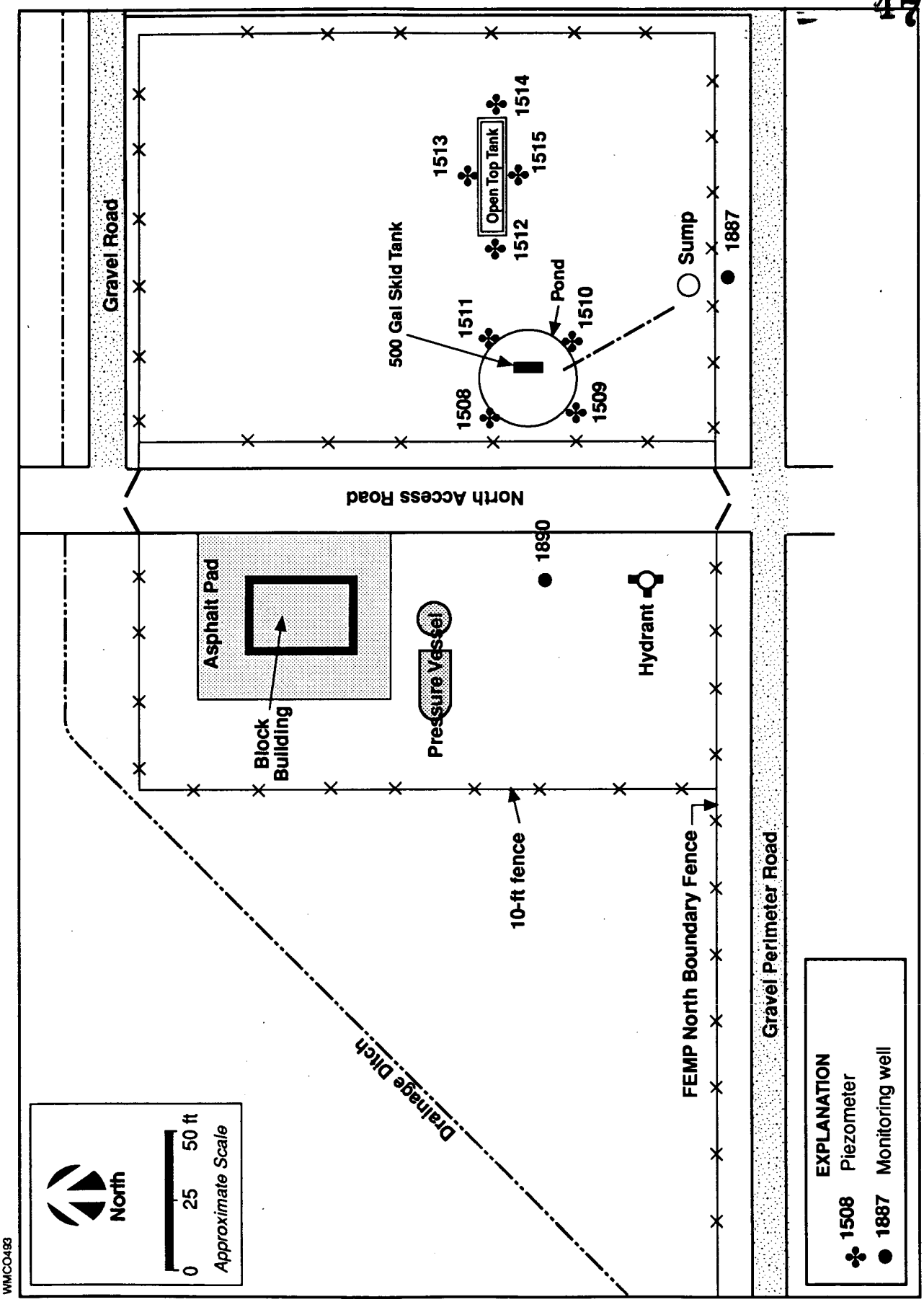

Figure 2-2. Fire Training Facility perched water piezometers and monitoring wells.

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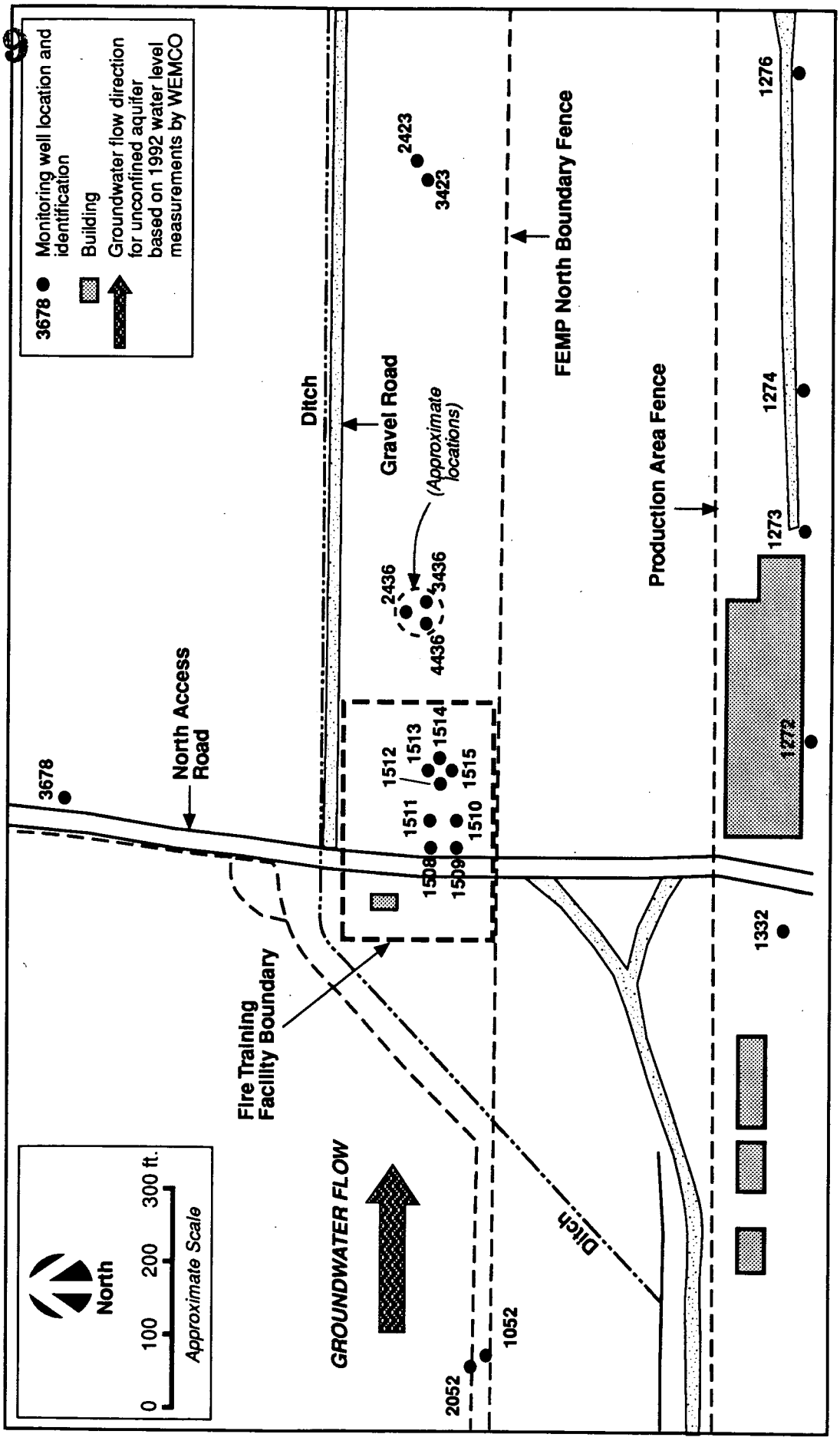

Figure 2-3. Nearby monitoring wells and groundwater flow orientation.

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silty clay with variable sand and gravel components and thin, discontinuous sandy silt and gravel-rich layers. The glacial outwash deposit is about 150 feet thick underlying the site and is comprised of gravelly sand, sand, and sandy gravel. Minor silt interbeds are also present in this interval. It extends from an elevation of 550 feet msl to approximately 400 feet msl. The bedrock shale lies approximately 200 feet below the surface. The shale crops out approximately 1,500 feet to the north of the FTF and was intersected in well 3678 at a depth of 133 feet (at elevation 462 feet msl), 500 feet north of the facility.

2.1.3.2 Hydrology

Two water bearing zones are present within the sediments underlying the FTF: perched water intervals of the glacial overburden deposits and the unconfined Great Miami aquifer. The perched water zone occurs within low permeability strata of the glacial overburden. The Great Miami aquifer is the principal aquifer within the FEMP and lies within the glacial outwash. The clay interbed occurs approximately 130 feet below the land surface, and where present, divides the aquifer into upper and lower sand and gravel units.

The glacial overburden overlies the aquifer throughout most of the FEMP property. This material has relatively low permeability, causing most of the precipitation falling on it to be lost to evaporation and surface water runoff. Limited infiltration occurs along the upper weathered portion of the overburden and isolated areas where more permeable deposits of silt, sand, and gravel are the primary overburden constituents; however, neither acts as a significant source of groundwater recharge.

Perched groundwater is separated from the aquifer by the relatively impermeable clay and silt components of the glacial overburden. Most of the perched zones occur within low-permeability units that can store groundwater and transmit it slowly downward from one zone to another. Wells constructed in these units generally yield very low flow rates, but may yield up to 50 gallons per minute (gpm) for short periods. Within the FTF, perched water was detected during fieldwork for the RSE in several borings. Near the skid tank, perched water was found on the northeast corner in boring 1511 during drilling at about 6.5 to 7 feet (Figure 2-2). At the open top tank, perched water was found in two boreholes during drilling (1512 and 1515) at a depth of about 3 feet in

both borings. In all three cases, the saturated zone was only 1 to 2 feet thick. All eight piezometers completed at the FTF have water in their casing. Some limited lateral flow is expected to occur within the perched water zone due to stratigraphic heterogeneities and the presence of low permeability horizons. Based on topography, the most likely direction of such lateral flow is to the south. However, the hydraulic gradient is downward and the overall trend of water movement in this zone is considered to be downward.

The Great Miami aquifer occurs within the glacial outwash deposits and is underlain by the aquitard formed by the Ordovician shale. The water table occurs 7 to 10 feet below the base of the glacial overburden. Wells constructed in the upper portion of the aquifer or where the clay interbed is not present can yield as much as 3,000 gpm. The lower portion of the aquifer beneath the clay interbed is classified as a semiconfined or leaky-confined aquifer, with well yields ranging form 100 to 500 gpm.

Groundwater elevation levels show a broad cyclic trend on a yearly basis. Maximum groundwater levels generally occur during the spring and early summer months, which are also the major groundwater recharge months. Minimum groundwater levels generally occur during the late fall and early winter months. For most years, the water table elevation experiences a fluctuation on the order of 4 to 5 feet. At the FTF, the water table elevation was measured at 521 feet msl in October 1991 and approximately 518 feet in May 1992.

Within the Great Miami aquifer, groundwater enters the FEMP study area from three separate flow systems: the Dry Fork Section of the New Haven Trough to the west, the Shandon Tributary to the north, and the Ross Section of the New Haven Trough to the northeast. Natural gradients cause the groundwater to exit the FEMP study area either by flowing east to the Great Miami River upstream from New Baltimore or by flowing south through the branch of the bedrock channel west of New Baltimore. In either case, the Great Miami River is the ultimate receptor of all groundwater. Groundwater flow in the unconfined portion of the Great Miami aquifer beneath the FTF occurs nearly due east (Figure 2-3). The gradient beneath the facility is 0.0007, or 3.5 feet per mile.

2.2 WASTE INVENTORY

From the best available information (RSE, Attachment 1) it was determined that the following materials were burned or stored in the FTF:

Waste Oil	Damaged Office Furniture
Kerosene	Unusable Household Furniture
Gasoline	Rubber Tires
Waste Wood Pallets	Metallic Sodium
Straw	Magnesium
Vehicles	Waste Solvents (some radiologically contaminated)

The lack of operational documentation prevents the identification of specific wastes disposed at the FTF. It is known that during routine fire training exercises, spent solvents were burned and allowed to seep into the soils at the FTF. This activity constitutes disposal of hazardous wastes which caused the soils at the FTF to contain hazardous waste constituents and "F" listed solvent wastes that are regulated under RCRA. Specific contaminants of concern identified through comprehensive soil and perched water sampling and analysis are listed in Section 3.3. The soils may also exhibit the toxicity characteristic as a result of burning used oil, rubber tires, and gasoline.

The following subsections present available data from past surface radiation surveys, soil gas surveys, soil sampling, and groundwater sampling programs conducted at the FTF.

2.2.1 Surface Radiological Surveys

Figure 2-4 identifies areas of surface radiological contamination greater than 1,000 dpm based on data from May 1989, October and December 1992, and January 1993 surface radiological surveys. The results of the surveys are discussed below.

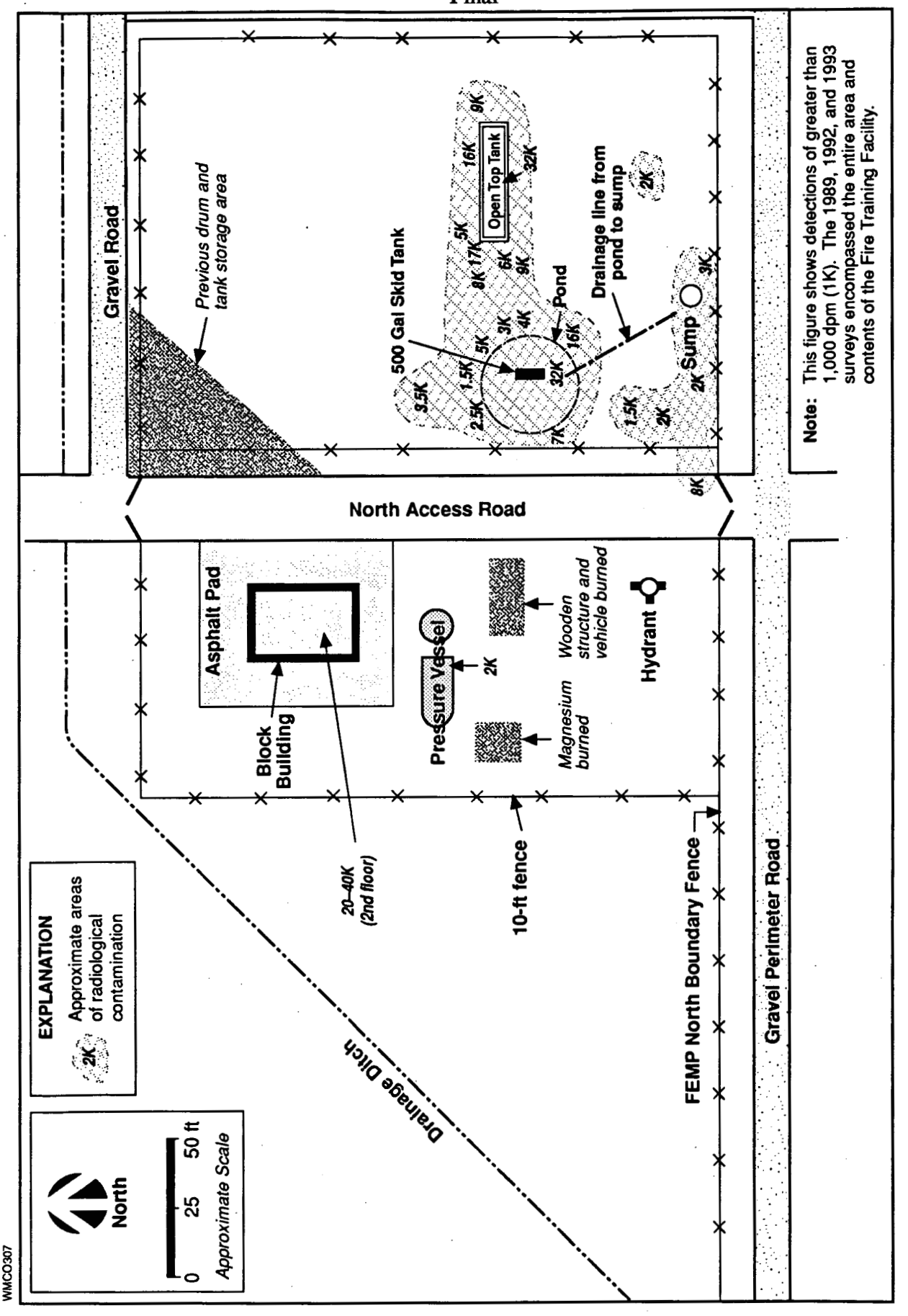


Figure 2-4. Summary of surface radiological survey results.

2.2.1.1 1989 Radiological Survey

In May of 1989, a radiation survey was performed using hand-held beta/gamma radiation survey instruments (RSE, Attachment 1). Consistent with FEMP standard operating procedures, the surveys were conducted using 1,000 dpm as the lower cutoff for the screening level survey. Radionuclide contamination was concentrated in the vicinity of the skid tank, sump, and open top tank. No radionuclide contamination of soil was indicated to the west of the old North Access Road. The area surrounding the block building and asphalt pad, as well as the area surrounding the pressure vessel, were below the quantitation limit of 1,000 dpm. Thirteen readings, ranging from <1,000 dpm to 16,000 dpm, were taken on the perimeter of the pond surrounding the skid tank. The highest reading was on the southeast corner of the pond, while the average reading for the entire area was 3,900 dpm. One reading on the southeast corner of the sump measured 3,000 dpm. Seventeen readings, ranging from <1,000 dpm to 69,000 dpm, were taken on the soil around the open top tank. The highest reading was recorded on the east side of the tank, while the average reading for the entire soil area was 14,000 dpm. The highest overall reading was 132,000 dpm on the surface of the tank.

2.2.1.2 1992 and 1993 Radiological Surveys

The radiological surveys conducted during October and December 1992 and January 1993 were conducted to fill data gaps in the May 1989 survey, and were conducted in a manner similar to the May 1989 survey. The October 1992 survey focused on the block building. Two floor area locations (approximately 4 square feet in size) exhibited fixed beta-gamma contamination of 40,000 and 20,000 dpm, respectively. All other areas of the building were found to be less than 1,000 dpm. The December 1992 survey concentrated on surface soil and above-ground support structures on the eastern half of the FTF area. All of the above-ground structures surveyed reported fixed plus removable concentrations above 1,000 dpm. The maximum contamination levels were found on wood pieces at 60,000 dpm. The only surface soil contamination found (6,000 to 9,000 dpm) was located between the pond and the open top tank. All other surface soil results were below 1,000 dpm. The January 1993 survey focused on the horizontal pressure vessel. The only fixed contamination found on the vessel was located 1 foot up on the outside of the tank with the results ranging from 1,000 to 2,000 dpm.

2.2.2 Boring and Soil Sampling

Eight piezometers have been installed in the FTF in accordance with the Production and Additional Suspect Area (PASA) Work Plan addendum in October 1989, with four surrounding the skid tank (numbers 1508 to 1511) and four surrounding the open top tank (numbers 1512 to 1515) (Figure 2-2). The borings are located in the most radiologically contaminated areas as indicated by the surface radiological survey results (Section 2.2.1). These borings ranged in depth from 9.0 to 20 feet and each was sampled at a depth of 2.5 feet for full Hazardous Substance List (HSL) parameters in the soil, and from the saturated zone for perched groundwater (Section 2.1.3.2). Organic contaminants detected in soil include the following for each borehole:

- 1508 Aroclor-1260 (240 micrograms per kilogram [μg/kg])
- 1509 1,2-dichloroethane (6 μg/kg), 1,1,1-trichloroethane (1 μg/kg), tetrachloroethene (2 μg/kg), toluene (2 μg/kg), and 1,2-dichloroethylene (2 μg/kg)
- 1512 Aroclor-1260 (2,700 μg/kg)
- 1513 Pentachlorophenol (240 μg/kg)
- 1514 n-Nitrosodiphenylamine (46 μg/kg)
- 1515 Pentachlorophenol (530 μg/kg), chloroform (2 μg/kg).

Several other organics were detected in the soil samples; however, the results are either below the reporting limit or were also found in the laboratory blank. The soil sampling results also indicated elevated levels of HSL metals including aluminum, calcium, iron, magnesium, manganese, sodium, and potassium. A background study (FERMCO 1993) reported that concentrations of aluminum, iron, magnesium, manganese, sodium, and potassium were naturally high in the FEMP area due to soil types and origin.

Soil samples were also analyzed for total uranium and total thorium, as well as isotopic distributions. Total thorium concentrations ranged from 7 milligrams per kilogram (mg/kg) to 136 mg/kg with an average concentration of 35 mg/kg. This compares with background total thorium soil concentrations of a mean of 9.1 mg/kg for a 0- to 6-inch depth and 6.6 mg/kg for a 48- to 54-inch depth, with upper 95 percent tolerance limits of 13.8 mg/kg for 0 to 6 inches and 13.3 mg/kg for 48 to 54 inches (FERMCO 1993). Total uranium concentrations ranged from 16 mg/kg to 68 mg/kg with an average of

32 mg/kg. This compares with total uranium background soil concentrations of a mean of 3.1 mg/kg for a 0- to 6-inch depth and 2.2 mg/kg for a 48- to 54-inch depth, with upper 95 percent tolerance limits of 3.9 mg/kg for 0 to 6 inches and 4.6 mg/kg for 48 to 54 inches (FERMCO 1993). RSE Appendix Table B-2 (Attachment 1) presents the radiological results for soil samples collected at boreholes 1508 to 1515. In general, total uranium concentrations decreased with depth and thorium concentrations showed little change with depth.

2.2.3 Organic Soil Vapor

Organic Soil Vapor Surveys have been performed on two occasions at the FTF and are described below.

2.2.3.1 Previous Survey

Environmental Monitoring-Site Media Sampling performed soil vapor and radiological activity field-screening analyses at the FTF (Gnoose 1992). A total of 27 shallow borings were completed to an approximate depth of 3 feet and soil samples were collected at 1-foot intervals. Borings were spaced at 50-foot intervals across a square grid that covered the facility. The survey was only conducted on the west side of the old North Access road. At each soil boring location, soil samples were collected and retained in 4-ounce glass jars. After screening the sample, it was allowed a period of 15 minutes for equilibrium of volatile compounds. The samples were then analyzed by inserting the probe of a hand-held photoionization detector (PID) survey instrument into the open jar and measuring the organic vapor concentrations. Because the results of this type of screening measurement are qualitative, and may be influenced by a number of environmental factors, they do not provide a conclusive basis for assigning organic vapor concentrations to FTF soils.

Each soil sample collected also underwent radiological field screening. In general, beta/gamma radiological activities for the soil samples collected ranged from 20 to 120 counts per minute (cpm). Background beta/gamma radiological activities of 40 to 80 cpm were observed.

2.2.3.2 February 1993 Survey

To identify the potential aerial extent of specific VOCs, a soil gas screening survey was conducted in February 1993 using a mobile laboratory for analysis. The Soil Gas Survey Report is presented in Attachment 7; the results are summarized here. The purpose of the survey was to identify the presence and extent of target analytes in the soil gas at the FTF, with less emphasis placed on quantifying concentrations. This survey analyzed soil gas samples collected from a depth of approximately 4 feet at 67 locations. The soil gas survey grid, shown on Figure 2-5, was established on approximately 50-foot centers, with higher density provided in the area of the skid tank, open top tank, and sump. Additional locations were added during the survey as necessary to provide more definition, and points 40 and 57 to 60 were dropped due to inaccessibility or lack of detections at the grid perimeter.

Samples were collected from a depth of approximately 4 feet to obtain soil gas from below the ground surface, but above the perched water. In a few locations, soil gas collection occurred below a thin perched water horizon. To collect samples, a solid steel probe was advanced to the sampling depth using a slide hammer, then withdrawn to allow driving of a hollow steel sampling probe to within 6 inches of the hole bottom. Three borehole volumes were evacuated using a hand-operated vacuum pump through an extraction tube assembly. Samples were then collected by inserting a 10-milliliter syringe into the tubing and withdrawing a 10-milliliter sample. Sample syringes were labelled and stored in a cooler until analyzed in a mobile laboratory. All samples were analyzed within 4 hours of sample collection.

Target analytes for the soil gas survey were derived from detections of VOCs in soil and perched groundwater reported in the RSE and summarized in Section 2.2.2 of this plan. The six VOCs identified in the RSE for perched water samples were selected, along with five other indicator parameters that were detected in soil or perched water samples. The 11 analytes of the soil gas survey are:

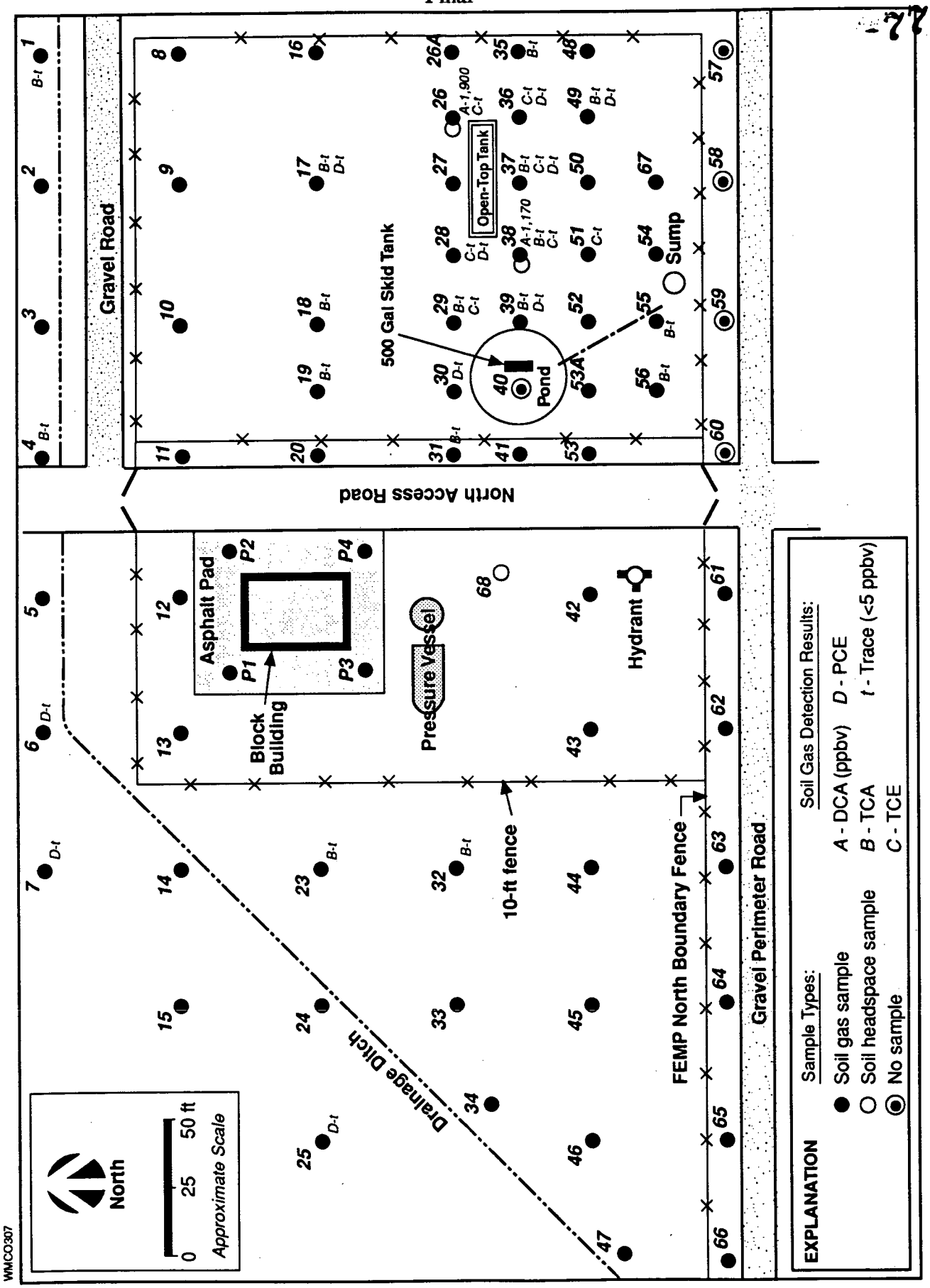


Figure 2-5. February 1993 soil gas survey sample locations and results.

1,2 Dichloroethane (DCA)	Acetone
1,1 Dichloroethene (DCE)	Benzene
Methylene chloride	Ethylbenzene
Tetrachloroethene (PCE)	Toluene
1,1,1-Trichloroethane (TCA)	Xylenes
Trichloroethene (TCE)	

Analysis of soil gas samples was conducted using a laboratory grade gas chromatograph configured to detect VOCs by using a PID and electron capture device (ECD) in a mobile laboratory stationed near the site. The detection limits were selected to provide reliable screening level data. The limit selected for quantification of results was 25 parts per billion volumetric (ppbv) for each VOC, with the exception of methylene chloride and DCA which had quantitation limits of 1,000 ppbv. In addition, any other detections of analytes below these limits was recorded but not quantified. As shown on Figure 2-5, the only detections above the quantitation limits for any analytes were for DCA at two locations. The presence of TCA, TCE, and PCE was identified at numerous locations for levels well below the quantitation limit. In these cases, TCA, TCE, and PCE were observed at 5 ppbv or less and are shown on Figure 2-5 as trace detections.

Soil samples also were collected from three sample points and analyzed through a headspace extraction for comparison to the soil gas samples. Soil samples were collected from 3.5- to 4-foot depths at points 26 and 38, which had detections of DCA, and point 68 (Figure 2-5). Soil samples were collected into 40-milliliter vials. Another 40-milliliter vial was partially filled with 10 milliliters methanol and 10 grams soil from the sample container, then shaken to extract volatiles from the soil and sampled for headspace gas through the vial septum. This method resulted in no additional detections in the three soil samples, but did confirm the very low VOC concentrations indicated by the direct soil gas analyses.

The distribution of soil gas detections indicates extremely low concentrations of only a few of the analytes in the area of the open top tank and the skid tank and pond. A few outliers of very low concentrations were also detected. The survey shows that concentrations of VOCs in the soil vapor are very low. The low-level detections generally correspond to locations of elevated radionuclide concentrations in the soil,

with the possible exception that VOCs extend somewhat further north of the open top tank and skid tank and pond. Since the perched water lies close to the surface, the soil gas survey has the potential to detect VOCs that may be present at high concentrations in perched water. Based on the data currently available, and the relationship of soil vapor to groundwater VOC contamination, the soil vapor results tend to indicate that VOCs in the perched water have remained in close proximity to the original release points.

2.2.4 Groundwater Sampling

Eight shallow piezometers shown on Figure 2-2 were installed at the FTF to conduct the RSE. The results of these analyses are presented in detail in the RSE (Attachment 1). The piezometers are screened to intercept perched water within the glacial overburden clays and silts. Because the piezometers are clustered, their results may not be indicative of perched water conditions across the FTF. The results indicate that well 1509 located to the southwest of the skid tank is the only location where appreciable concentrations of organic compounds were detected in the perched water. Organics detected in this location include acetone, xylenes, ethylbenzene, TCE, DCA, chloroethane, and phenols. Cadmium concentrations exceeded the MCL of 5 μg/l in 4 of the 8 piezometers. Concentrations reported for piezometers 1509, 1510, 1512, and 1515 ranged from 5.4 to 6.5 μg/l. The lowest concentration was 3.3 μg/l at piezometer 1508. Elevated levels of calcium, magnesium, and potassium were also reported in the perched water from these locations. These levels are consistent with upgradient background levels and are below MCLs for these inorganic elements.

The perched water samples were also characterized for a variety of radionuclides, as shown in Table B.1 of the Attachment 1 (RSE). Strontium-90 and technetium-99 analytical data for some of the monitoring well samples in Table B.1 were unavailable when the RSE was completed (July 1992). Subsequent receipt and review of those data indicates that all strontium-90 and technetium-99 samples were below detectable levels. The data presented in Table B.1 indicates elevated levels of uranium, thorium, and radium-226. Uranium was detected at elevated levels in all 8 of the sampling wells with a maximum value of 94.8 pCi/L at MW 1509 and a minimum value of 5.65 pCi/L at MW 1513. Thorium was detected at elevated levels in 5 of the 8 sampling wells. The maximum detected thorium concentration was 9.68 pCi/L at MW 1508 and the

minimum level was 1.28 pCi/L at MW 1514. Radium-226 was only detected in 2 of the 8 sampling wells. The sample from MW 1510 indicated a radium-226 concentration of 5.93 pCi/L and the sample from MW 1508 indicated a concentration of 3.37 pCi/L. In general, the sampling results indicate that the highest activity levels were detected in the piezometers near the above-ground skid tank even though the rectangular open topped tank has much higher activity levels at the surface. The wells were resampled for total uranium approximately 1 month after the initial sampling with similar results.

Two new wells (wells 1887 and 1890) were installed in the spring of 1993 to the south and southwest of the skid tank pond and existing piezometers (Figure 2-2). An additional well on the west side of the north gate (Boring 1886) was also planned, but the borehole was abandoned when no perched water was encountered after drilling to a depth of 20 feet. Wells 1887 and 1890 are intended to supplement existing wells in the perched water-bearing zone by characterizing possible perched groundwater contamination at locations likely to be downgradient of contaminant sources (i.e., downgradient of contaminant detections in piezometers 1508 through 1515). The wells also serve to help define the horizontal hydraulic gradient in the perched water-bearing zone at the FTF, although to date surveyed water levels in the new wells are not available. Analyses requested for samples collected from Wells 1887 and 1890 are shown in Table 2-1 (results are still pending).

Sampling results from two upgradient wells (wells 1052 and 2052) and two downgradient wells (wells 2423 and 3423) were used to assess the impacts of the FTF on groundwater quality in the Great Miami Aquifer. Both groups of wells appear to be along the general flow path that passes beneath the FTF, but are located over 600 to 800 feet from the facility (Figure 2-3). Groundwater samples collected from the downgradient wells did not indicate the presence of organic or radionuclide contamination. Inorganic ion concentrations in the downgradient wells are similar to the background levels observed in the upgradient wells, which includes elevated concentrations of aluminum, iron, magnesium, manganese, and total dissolved solids. One of the upgradient wells is screened in the glacial overburden (well 1052) and the other is screened at the water table (well 2052). One of the downgradient wells is screened at the water table in the Glacial outwash (well 2423) and the other well (3423) is screened just above the clay interbed which divides the Great Miami Aquifer.

Table 2-1. Wells 1887 and 1890 list of analytes.

Analyte	Analyte
1,1,1-Trichloroethane	4-Bromophenyl phenyl ether[1/]
1,1,2,2-Tetrachloroethane	4-Chloro-3-methylphenol[1/]
1,1,2-Trichloroethane	4-Chloroaniline[1/]
1,1-Dichloroethane	4-Chlorophenylphenyl ether[1/]
1,1-Dichloroethene	4-Methyl-2-pentanone
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin[1/]	4-Methylphenol
1,2,3,4,6,7,8-Heptachlorodibenzofuran[1/]	4-Nitroaniline[1/]
1,2,3,4,7,8,9-Heptachlorodibenzofuran[1/]	4-Nitrophenol[1/]
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin[1/]	Acenaphthene[1/]
1,2,3,4,7,8-Hexachlorodibenzofuran[1/]	Acenaphthylene[1/]
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin[1/]	Acetone
1,2,3,6,7,8-Hexachlorodibenzofuran[1/]	Aldrin[1/]
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin[1/]	Aluminum
1,2,3,7,8,9-Hexachlorodibenzofuran[1/]	Anthracene[1/]
1,2,3,7,8-Pentachlorodibenzo-p-dioxin[1/]	Antimony
1,2,3,7,8-Pentachlorodibenzofuran[1/]	Aroclor-1016[1/]
1,24-Trichlorobenzene[1/]	Aroclor-1221[1/]
1,2-Dichlorobenzene[1/]	Aroclor-1232[1/]
1,2-Dichloroethane	Aroclor-1242[1/]
1,2-Dichloroethylene	Aroclor-1248[1/]
1,2-Dichloropropane	Aroclor-1254[1/]
1,3-Dichlorobenzene[1/]	Aroclor-1260[1/]
1,4-Dichlorobenzene[1/]	Arsenic
2,3,4,6,7,8-Hexachlorodibenzofuran[1/]	Azinphosmethyl
2,3,4,7,8-Pentachlorodibenzofuran[1/]	Barium
2,3,7,8-TCDD[1/]	Benzene
2,3,7,8-TCDF[1/]	Benzo(a)anthracene[1/]
2,4,5-Trichlorophenol[1/]	Benzo(a)pyrene[1/]
2,4,6-Trichlorophenol[1/]	Benzo(b)fluoranthene[1/]
2,4-Dichlorophenol[1/]	Benzo(g,h,i)perylene[1/]
2,4-Dimethylphenol[1/]	Benzo(k)fluoranthene[1/]
2,4-Dinitrophenol[1/]	Benzoic acid[1/]
2,4-Dinitrotoluene[1/]	Benzyl alcohol[1/]
2,6-Dinitrotoluene[1/]	Beryllium
2-Butanone	Bromodichloromethane
2-Chloronaphthalene[1/]	Bromoform
2-Chlorophenol[1/]	Bromomethane
2-Hexanone	Butyl benzyl phthalate[1/]
2-Methylnaphthalene[1/]	CS-137
2-Methylphenol[1/]	Cadmium
2-Nitroaniline[1/]	Calcim
2-Nitrophenol[1/]	Carbon tetrachloride
3,3'-Dichlorobenzidine[1/]	Carbon disulfide
3-Nitroaniline[1/]	Chlorobenzene
4,4'-DDD[1/]	Chloroethane
4,4'-DDE[1/]	Chloroform
4,4'-DDT[1/]	Chloromethane
4,6-Dinitro-2-methylphenol[1/]	Chromium

Table 2-1. Wells 1887 and 1890 list of analytes.

Analyte	Analyte
Chrysene[1/]	N-Nitrosodiphenylamine[1/]
Cobalt	NP-237
Copper	Naphthalene[1/]
Cyanide	Nickel
Demeton[1/]	Nitrobenzene[1/]
Di-n-butyl phthalate[1/]	Octachlorodibenzo-p-dioxin[1/]
Di-n-octyl phthalate[1/]	Octachlorodibenzofuran[1/]
Diazinon[1/]	Pu-238
Dibenzo(a,h)anthracene[1/]	Pu-239-240
Dibenzofuran[1/]	Parathion, ethyl[1/]
Dibramochloromethane	Parathion, methyl[1/]
Dieldrin[1/]	Pentachlorodibenzo-p-dioxin[1/]
Diethyl phthalate[1/]	Pentachlorodibenzofuran[1/]
Dimethyl phthalate[1/]	Pentachlorophenol[1/]
Disulfoton[1/]	Phenanthrene[1/]
Endosulfan II[1/]	Phenol[1/]
Endosulfan sulfate[1/]	Potassium
Endosulfan-I[1/]	Pyrene[1/]
Endrin[1/]	Ra-226
Endrin ketone[1/]	Ra-228
Ethion[1/]	Ru-106
Ethylbenzene	Sr-90
Fluoranthene[1/]	Selenium
Fluorene[1/]	Silicon
GROSS ALPHA	Silver
GROSS BETA	Sodium
Heptachlor[1/]	Styrene
Heptachlor epoxide[1/]	Tc-99
Heptachlorodibenzo-p-dioxin[1/]	Th-228[2/]
Heptachlorodibenzofuran[1/]	Th-230[2/]
Hexachlorobenzene[1/]	Th-232[2/]
Hexachlorobutadiene[1/]	Th-total[2/]
Hexachlorocyclopentadiene[1/]	Tetrachlorethene
Hexachlorodibenzo-p-dioxin[1/]	Tetrachlorodibenzo-p-dioxin[1/]
Hexachlorodibenzofuran[1/]	Tetrachlorodibenzofuran[1/]
Hexachloroethane[1/]	Thallium
Indeno(1,2,3-cd)pyrene[1/]	Toluene
Iron	Total xylenes
Isophorone[1/]	Toxaphene[1/]
Lead	Tributyl phosphate[1/]
Mangnesium	Trichloroethene
Malathion[1/]	U-234
Manganese	U-235/236
Mercury	U-238
Methoxychlor[1/]	U-total
Methylene chloride	Vanadium
Molybdenum	Vinyl acetate
N-Nitroso-di-n-propylamine[1/]	Vinyl chloride

Table 2-1. Wells 1887 and 1890 list of analytes.

Analyte	Analyte
Zinc	bis(2-Ethylhexyl)phthalate[1/]
alpha-BHC[1/]	cis-1,3-Dichloropropene
alpha-Chlordane[1/]	delta-BHC[1/]
beta-BHC[1/]	gamma-BHC(Lindane)[1/]
bis(2-Chloroethoxy)methane[1/]	gamma-Chlordane[1/]
bis(2-Chloroethyl)ether[1/]	trans-1,3-Dichloropropene
bis(2-Chloroisopropyl)ether[1/]	

1/ Indicates that analyte was requested for MW 1887 only.
2/ Indicates that analyte was requested for MW 1890 only.

2.3 CURRENT USE

In 1990 the FTF was permanently closed as a training facility. Since its closure the FTF has undergone several remedial sampling surveys to quantify subsurface soil contamination, surface radiation and soil gas. Utilities provided to this facility are limited to water to a fire hydrant located south of the block building and electricity supplied to overhead lights mounted on a power pole.

2.4 SECURITY

The FTF is located outside the main security fence which encompasses the FEMP Site, but is surrounded by a separate 10-foot security fence. As part of their duties the site security patrols the perimeter security fence and visually inspects the FTF. Access to the block building is restricted by boarded windows and locked doors. The eastern half of the FTF, which contains the skid tank and open top tank, is enclosed with a yellow chain and is posted with danger and radiation warning signs.

The installation of temporary fencing will be required during remedial excavation activities to prevent inadvertent animal or human intrusion.

2.5 FTF AREA OF CONTAMINATION

In accordance with the provisions of the Removal Action No. 17 Work Plan, Improved Storage of Soil and Debris (FEMP 1993), the FTF fenced area is designated an area of contamination (AOC) based on contaminant determination. The establishment of the FTF AOC provides flexibility in staging excavated soils within the AOC (including soils containing hazardous constituents) pending final disposition. The FTF AOC is delineated based on the contiguous contamination present within that area. Further discussion of the FTF AOC is contained in Attachment 8.

2.6 REMOVAL ACTION JUSTIFICATION

A RSE completed in July 1992 (Attachment 1) concluded that a removal action for contamination at the FTF was justified. Radiological surveys and soil borings indicated that radionuclides (primarily uranium and thorium) were present in the shallow soil at

levels elevated above background concentrations. In addition, soil borings indicated some organic compounds were present in elevated concentrations and groundwater samples showed that drinking water standards were exceeded by some contaminants present in the perched water bearing zone directly beneath the site. 4779

The basis for the removal action justification was primarily the elevated radiological contamination found in FTF components and surface soils and secondly the organic compound contamination found in the FTF soil and perched water, both of which may migrate and spread contamination to the surface water, groundwater, and atmosphere. The DOE issued an action memorandum calling for a removal action to remove known contaminated material and potential contaminant sources and to contain further releases to the environment. An engineering evaluation/cost analysis (EE/CA) was subsequently prepared to support the proposed removal of contamination at the FTF, as well as 24 other contaminated structures at the FEMP. The EE/CA was performed to analyze removal action alternatives and to support the selection of the preferred alternative to decontaminate and decommission (D&D) these structures. This work plan implements the D&D removal alternative for the FTF.

3.0 CLOSURE AND REMOVAL ACTION INFORMATION

3.1 OBJECTIVES

This plan for the FTF 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 portions of the FTF to achieve surface source control.

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 approved RCRA Closure Plan Information and Data.

The objective for the FTF action will be clean closure pending completion of final sampling and analysis. In the event that these samples indicate the presence of F-listed constituents, a revised CPID will be submitted that describes final actions to complete closure of the FTF.

The steps necessary to achieve closure and surface contaminant source control at the FTF 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 be provided to the CERCLA/ RCRA Unit 5 organization (CRU-5). Final remediation of FTF soils, perched water, and groundwater will be addressed in the OU-5 Record of Decision (ROD).

4779

3.1.1 Scope

In accordance with this plan and to fulfill the requirements to achieve surface source control, the following actions will be taken during the FTF action:

1) Survey and mark HWMU boundaries
2) Conduct site preparations and equipment staging
3) Remove surface water
4) Remove structures
5) Remove contaminated surface soil
6) Conduct soil sampling and analysis
7) Backfill soil excavations
8) Prepare final report.

Final remediation of contaminated perched water beneath the FTF will be addressed by the OU-5 ROD. The goal of this action will be to achieve surface source control and closure of the FTF HWMU.

3.1.2 Related Actions

To the extent practicable, the FTF activity will use 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; the FEMP Soils Background Study; and Removal Action No. 1, Contaminated Water Beneath FEMP Buildings.

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. Existing FEMP procedures will be used in completing a number of FTF response action activities including: development of appropriate safety documentation;

preparation of Training Plan and Task-specific Lesson Plans; and review Standard Operational Procedures (SOPs) and updates.

It is anticipated that site personnel will assist in the performance of many activities necessary to complete the closure of the FTF. The Safe Shutdown Removal Action Work Plan contains approved procedures for conducting safe shutdown operations that also support the FTF action. Specific procedures contained in the Removal Action No. 12 supporting documentation (WEMCO 1991) that may be applicable to the closure of the FTF 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. The equipment and procedures associated with the waste water treatment system operated within the Plant 8 complex will be used to manage surface water removed from the FTF. A VOC treatment system was installed at Plant 8 as part of the time-critical pumping of contaminated perched water under Removal Action No. 1, Contaminated Water Beneath FEMP Buildings.

Pockets of contaminated perched groundwater were encountered in several of the borings installed in and around Plant 6 as part of the Contaminated Water Beneath FEMP Buildings Work Plan. This time critical removal action was initiated on November 6, 1989 to pump the perched water from these borings. Since that time additional pockets of contaminated perched water have been located near other FEMP buildings and additional pumping activities have been initiated. These pumping activities are all part of Removal Action No. 1.

The extracted perched groundwater is routed through the Plant 8 VOC Treatment System for the removal of organic contaminants with subsequent treatment for the removal of metals and radionuclides at the Plant 8 filtration operation. This treatment system is in place to support Removal Action No. 1 which is a remedial response under

4770

CERCLA and is, therefore, exempt from permit requirements. Water removed from the FTF is not expected to contain constituents that would be incompatible with the water treatment system components or processes. While the primary purpose and use of the Plant 8 VOC Treatment System is to support Removal Action No. 1, waters from other sources may be treated in this system after first receiving authorization by USEPA. Approval of the Fire Training Facility Work Plan by the USEPA would constitute authorization for use of the existing system to treat surface waters removed from the FTF.

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 a management tool for the management of soil and debris contamination and identifies options for 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 FTF activities. The sections of Removal Action 17 considered applicable to closure and removal of the FTF include:

Section 2.2 - Specifies that any material that contains polychlorinated biphenyls (PCBs) at concentrations that exceed 2 parts per million (ppm) will be containerized and stored (per the FEMP Sitewide CERCLA Quality Assurance Project Plan [SCQ]

Section 3.1.2 - Specifies 100 picocuries (pCi) of total uranium, 50 pCi of total thorium, and 5 pCi of total radium per gram of soil as the specific activity guidelines used to determine the storage disposition of soil sampling waste from the FTF.

47

Section 3.2.1 - Describes the segregation and disposition alternatives for waste soil and debris. Soil and debris that have similar hazardous constituents will be stored together. Petroleum-contaminated soils will be segregated from the hazardous soils so that it will not have to be treated/disposed as hazardous materials. PCB-contaminated soil will be managed in accordance with 40 CFR 761.125.

Section 3.4 - Describes the process of assessing contaminant levels in soil waste from the FTF.

Section 3.4.1 - Describes the establishment of an AOC in the event that a large quantity of soil containing hazardous waste is excavated.

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

Section 3.5.2 - Describes disposition of soils less than the total uranium, thorium, or radium specific activities that contain no hazardous waste components.

Section 3.5.3 - Describes the disposition of soils greater than total uranium, thorium, and radium specific activities that contain no hazardous waste components.

Section 3.5.4 - Describes the disposition of soils that contain hazardous waste components or mixed radioactive and hazardous waste components.

Section 3.5.5 - Describes the disposition of soils that contain petroleum contamination.

Section 3.5.6 - Describes the disposition of soils that contain PCB contamination.

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 USEPA and the yearly update of this compendium. The disposal of the FTF structures

and equipment may be governed by Removal Action 9 if decontamination efforts cannot remove this equipment from the low-level radioactive waste category.

In order to determine the effectiveness of soil removal actions at the FEMP, the background characteristics of the soils must be established. The Background Soils Study provides statistically valid characterization of the concentrations of metals and radionuclides naturally occurring in soils surrounding and underlying the FEMP. Background areas have been identified and samples collected as described in the Work Plan Addendum, Background Characteristics of Soils at the FEMP. Results are reported in the CERCLA/RCRA Background Soil Study Report (FERMCO 1993) with results applicable to the FTF action summarized in Section 2.2.2 of this plan.

3.2 CLOSURE METHODOLOGY

This plan presents the procedures that will be followed to accomplish the removal action and closure of the FTF HWMU. The methodology used to achieve this removal action and 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 preparatory efforts. These activities are required to render the work areas reasonably free of hazards to personnel and/or the environment. The FTF activities will be planned and conducted in a manner that minimizes the potential for injuries to on-site workers and accidental releases to 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.

- **Fernald Environmental Restoration Management Corporation (FERMCO)** is the site integrator and RCRA co-operator contracted to the DOE. FERMCO has operated the site since December 1992.

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

3.2.1.2 Project Management

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

Organization

The organizational structure for the personnel performing this removal action and closure will 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 FTF 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 FTF action, and shall ensure that the health and safety officer is notified of 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, conducting initial site safety training, and ensuring initial site safety training is conducted.

Planning

Included in this activity will be the preparation of detailed task listings and delineation of specific responsibilities. This plan encompasses all project planning that is not timing dependent, i.e., dependent upon the final approval of the plan. An example of timing dependent project planning is the training plan and schedule, which is driven by specific activities identified in the plan. It is expected that all project planning documentation will be incorporated into a task specific work package to establish a FERMCO/DOE control mechanism to ensure that the action is implemented to meet the scheduled milestones in Section 3.2.1.3.

Training of Personnel

FERMCO 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. 3745-65-16(A). Specific training requirements for this 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 site staff shall be required to complete the Occupational Safety and Health Administration (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. The detailed training plan and schedule will be prepared at a later date in conjunction with development of detailed work plans and procedures.

3.2.1.3 Milestones

A proposed milestone schedule for the FTF is presented in Section 5.0. This plan will be submitted to the USEPA and OEPA for review and approval. All subsequent activities and milestones are contingent upon this approval. The following identifies the main activities of the project for which milestones will be established. A schedule hold-interval may be exercised following work plan approval. This will be done, if necessary, to allow the field activities to coincide with the summer construction season.

In accordance with O.A.C. 3745-66-13(A)(1) and (2), the FEMP is requesting that the Director of the OEPA allow the FEMP the time necessary to complete the CERCLA response actions discussed in this plan. Because of the multifaceted scope of this closure/removal action and the additional considerations discussed in Section 5.0, Schedule, the activities outlined in this CPID/removal action work plan will take longer than 180 days to complete (see Table 5-1).

Identify Removal Organization and Prepare Final Design

Following work plan approval by USEPA, FERMCO CERCLA/RCRA Unit 3 (CRU-3) management will identify the organization and staff to perform the FTF action. It is anticipated that the action will be performed by on-site staff. If the removal organization is a subcontractor, it will be selected in accordance with Federal Acquisition Regulations. 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 the selection and design activities is 2 months.

4779

Perform Removal Preparations and Train Removal Staff

Following the selection of the removal organization, all site preparations will be completed. All staff will receive training (1 month duration) as specified in the training plan.

Perform Field Activities

An 11-month window from the time preparations are completed to the completion of site activities has been identified. This time period will allow for conducting all field activities, analyzing all samples, and validating laboratory data. Soil and debris wastes generated by demolition, excavation, and sampling will be managed in accordance with applicable sections of Removal Action No. 17, as described in Section 3.4 of this plan.

Final Report

A 6-month period is allowed to complete a final report detailing the 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 all contaminated structures, surface water, and surface soils such that immediate hazards and potential sources of contaminant migration are mitigated. The action will include the following steps:

1) Survey and mark HWMU boundaries
2) Conduct site preparations and equipment staging
3) Remove ponded surface water
4) Remove structures
5) Remove contaminated surface soil
6) Conduct soil sampling and analysis
7) Backfill soil excavations
8) Produce final report.

Residual contamination that may remain after completion of these actions will be addressed in the OU-5 ROD.

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 airborne contaminants. These requirements are detailed in the HASP (Attachment 3). It will be necessary to conduct supplemental environmental monitoring to ensure that this action does not produce unacceptable impacts on the environment as a result of airborne emissions during field activities.

3.2.2.1 Survey and Mark HWMU Boundaries

The boundary of the FTF HWMU is shown on Figure 1-2. Because the response actions described in this plan are actions pending final remediation of OU-5, the boundaries of the FTF HWMU must be preserved until the final response actions are completed and certified. Therefore, permanent survey monuments will be placed at the boundary corners to maintain the HWMU boundaries for final closure. A registered and licensed surveyor will establish the x and y coordinates relative to FEMP site benchmarks. This will be performed prior to the initiation of site activities.

3.2.2.2 Site Preparations and Equipment Staging

Access to the area and working spaces will be required for several items of equipment:

1) Crane
2) Tank truck
3) Backhoe
4) Truck
5) Truck-mounted auger
6) Welding machine/cutting torch (if required)
7) Air compressor
8) Portable generator
9) Diaphragm pump

10) Manual tools
11) Power tools.

Before work can be started, access to the FTF must be provided for the backhoe, crane and other equipment. This will require that any existing access barriers deemed unnecessary be removed, and the others be temporarily lowered or relocated: fences, chains, support stanchions, and warning signs. A contamination reduction zone consisting of decontamination stations shall be established. Overhead clearances are adequate for the proposed equipment and for hoisting the tanks. Vegetation that has grown through the asphalt pad surrounding the block building will be removed, and any other miscellaneous materials removed from the asphalt pad. The preparation of equipment laydown and work areas that may be required for subsequent field activities, are discussed in the sections that follow.

A bermed area will be prepared for the purpose of stockpiling of excavated soils. The berm will be formed with soil obtained from OU-3 stockpiles, lined and covered to prevent the spread of contamination by surface run-off. Temporary silt screens will be installed on the west and south sides of the block building and pad to prevent surface water run-off that could potentially occur in the event of heavy precipitation during demolition of the building and pad. The need for further run-off controls will be continuously evaluated during the course of field activities.

The appropriate quantity and type of waste containers required for the FTF action will be obtained and staged prior to initiation of field activities. Estimated quantities of wastes that may be generated during these actions are provided in Section 3.4 of this plan.

3.2.2.3 Surface Water Removal

Prior to demolition activities or soil removal, liquids will be removed from the open top tank, the skid tank pond, and the horizontal pressure vessel end piece. In the event that rain water has accumulated in the skid tank sump, a shallow depression in the soil located southeast from the pond (Section 2.1.2), it will also be pumped. Based on the presence of radiological and organic contamination on these components, the liquids are expected to contain concentrations of radionuclides and organic compounds that would

require treatment prior to disposal. An estimate of 7,500 gallons of liquid wastes was made based on September 1992 site conditions. The actual volume of liquid present in the pond and tank will vary seasonally in response to weather conditions.

Equipment work areas will be prepared by spreading impermeable heavy duty fire retardant ground coverings. These coverings shall be selected and deployed for spill control according to standard site management practices detailed in Removal Actions No. 12 and No. 17. These covered areas will include 1) the soil area around the open top tank, sump (to drain the skid tank pond), and horizontal pressure vessel end piece; 2) the area beneath the pump; and 3) the ground between these areas and the receiving tank over which the pump discharge lines will be routed.

Surface liquids will be removed using FEMP SOP 20-C-916 (Attachment 6). This procedure is used on the FEMP to empty and clean open- and closed-top sumps, and similar liquid collection systems. Surface liquids will be filtered to remove suspended solids and transported to the existing bermed storage area located near Plant 8. The Plant 8 storage area is bermed and will contain the two 5,000 gallon plastic tanks, which will be labeled in accordance with established FEMP SOPs. The surface water will be sampled prior to removal for characterization to verify compatibility with the perched water treatment system (organics removal) and the Plant 8 water treatment system as described in Section 3.1.2. The characterization analyses will be completed as described in Section 3.3, and evaluated prior to treatment. In the event that an oily surface layer is present, it will be removed first and segregated by positioning the pump suction line near the surface and discharging to a separate container. It will then be sampled and characterized. Final disposition of this material will be in accordance with FEMP Waste Management Procedures based upon results of this final characterization.

Following pumping, bags of absorbent material will be used to remove any remaining small quantities of unpumpable liquids. These absorbent materials will be managed as potential mixed wastes pending characterization. Temporary covers, if needed, will be placed over the horizontal pressure vessel end piece, open top tank, skid tank pond, and sump to prevent their refilling with rain water prior to their removal. The covers will be constructed of wood bracing covered with a tarpaulin.

3.2.2.4 Removal of Structures

This section discusses the demolition and removal of the following structures at the FTF:

- Block building and surrounding asphalt pad
- Skid tank and sump
- Open top tank
- Horizontal pressure vessel.

Block Building

The block building will be demolished following removal of the two radiological hotspots identified on the first and second floors (Section 2.2.1). These hotspots are located on the concrete floor slabs and each encompasses a total surface area of less than 2 square feet. The hotspots will be removed by chipping away the surface layer of concrete with a manual or electrically powered chipping tool. The spread of contaminated dust will be prevented by use of a disposable glove bag with semi-rigid frame that will be taped to the concrete slab covering the hotspot. Chipped material will be removed and bagged, and residual dust vacuumed. Radiation surveys will be performed as described in Section 3.3 of this plan to verify removal of the hot spots.

As described in Section 2.1.2, combustible materials (straw, furniture, wood pallets) were placed in the block building and ignited for exercises in fire fighting techniques. To permit repeat training exercises, flammable liquids were added to the combustible materials to facilitate their re-ignition. As a result, the concrete floors may have come into direct contact with the flammable liquids, that potentially included spent solvents, and are, therefore, considered to be potential hazardous or mixed waste debris. The wood/asphalt roof and masonry block walls of the building are unlikely to have come into direct contact with these materials, and are, therefore, considered to be potential low-level radioactive debris. Accordingly, the block building will be demolished in sections.

The roof and second story block walls will be pulled down and placed into a demolition dumpster to await disposition in accordance with guidance provided in the Removal

Action No. 17 and No. 9 Work Plans. A fine water mist will be utilized, as needed, to control airborne dust. The second floor concrete slab will be removed as a single unit by positioning steel beams beneath the slab, attaching cables to the beams, and lifting the slab off the supporting walls using the crane. The slab will be lowered onto a lined laydown area adjacent to the block building. The first floor masonry block walls will then be pulled down and placed into the demolition dumpster.

The building's first and second story concrete floor slabs will be treated by mechanically removing 0.6 centimeter (cm) of their top surfaces, or more if necessary, to achieve a clean debris surface. In any event, no less than 0.6 cm of the top surface layer will be removed. The material that is removed will be placed into appropriate containers and managed as potential mixed waste pending characterization through sampling and laboratory analysis.

The remaining concrete slabs, no longer considered to be potentially hazardous or mixed waste debris, and the asphalt pad surrounding the building, will be broken up (steel rebar will be cut as necessary). The debris will placed into a demolition dumpster to await disposition in accordance with guidance provided in the Removal Action No. 17 and No. 9 Work Plans.

Skid Tank and Sump

The skid tank and its concrete pedestal are substantially contaminated based on the results of surveys discussed in Section 2.2.1. Further radiological surveys of these components will be performed prior to and during their removal, as described in Section 3.3 of this plan.

The skid tank will be cut from its pedestal mounts. All hot work will be performed in accordance with SPR 2-57, Open Flame, Welding, and Hazardous Work Permits. The tank will be lifted and placed on a prepared laydown area where it will be cut into smaller pieces and placed in a storage/disposal container. The concrete tank pedestal will be broken into smaller pieces and placed in the same storage/disposal container. Fine water mists will be used as needed for dust control. The skid tank and pedestal, which are not expected to be amenable to decontamination and recycling, will be

transported to a site decontamination facility for final disposition based on FEMP procedures.

The sump will be manually excavated to remove the soil from around the sump inlet piping. Excavated soils will be stockpiled in a prepared area within the FTF AOC, as described in Section 3.2.2.5 of this plan. A liner will be placed beneath the inlet pipe to contain spillage of potential residual liquids not removed when the sump was emptied as described in Section 3.2.2.3 of this plan.

The inlet piping leading to the sump from the skid tank pond will be excavated in sections. The piping will be cut into appropriate lengths for handling and transported to a site decontamination facility for final disposition based on FEMP procedures.

Open Top Tank

The open top tank will be emptied of surface water as described in Section 3.2.2.3 prior to removal. A trench will be excavated around the perimeter of the tank to a depth of two feet to loosen the tank for removal. Holes will be drilled in the sides of the tank to attach a lifting bridle. A crane will lift the tank from the ground. Loose soil on the tank's outer surface will be brushed back into the excavation.

The tank will be decontaminated in the field or transported to a site decontamination facility for final disposition based on FEMP procedures.

Horizontal Pressure Vessel

As discussed in Section 2.1.2, isolated areas (total of 2 square feet) of radiological contamination were identified on the exterior of the horizontal pressure vessel. These hotspots will be removed prior to removal of the tank by removing the surface layer of metal with a manual or electrically powered grinding tool. A disposable glove bag will be taped to the tank to provide containment of the metal filings.

The pressure vessel will be lifted onto a trailer. The estimated weight of the vessel is 40 tons. Lifting holes will be cut into the tank walls if a lifting bridle cannot be passed

beneath the vessel. The horizontal pressure vessel will be the heaviest lift required during the FTF action.

The vessel will be decontaminated in the field or transported to a site decontamination facility for final disposition based on FEMP procedures.

3.2.2.5 Soil Excavation and Characterization

This section describes both soil excavation and soil characterization activities. As stated in Section 3.1, the objective for this action is clean closure of the FTF. The initial excavation of contaminated soil will be guided by field screening techniques discussed in the sections that follow. Excavated soils will be managed in accordance with Removal Action No. 17 interim management procedures. Following initial excavation, verification soil samples will be collected from the excavated areas.

Soil Excavation

During excavation, soils will be segregated into 3 primary categories: 1) PCB wastes, 2) mixed-wastes, and 3) hazardous wastes. Mixed waste soils will be further segregated based on the potential concurrent petroleum contamination. The procedures for removing and segregating these soils, and a discussion of the estimated soil volumes is provided below. Visual observations, PID measurements, and NaI measurements will be used to facilitate field screening and sorting of soils for interim storage in onsite stockpiles pending sampling and analysis. In the event that these field screening techniques identify unanticipated soil conditions, (e.g., petroleum staining) those soils would be segregated and separately characterized. Laboratory analyses will be the basis for final identification and classification of all wastes.

Surface soil expected to be classified as PCB wastes (i.e., soil containing greater than 2 ppm PCB contamination) is anticipated to be found only in the vicinity of piezometer No. 1512, at the west end of the open top tank. Analysis of soil samples collected during the installation of the FTF piezometers (Attachment 1) indicated approximately 3 ppm of Aroclor-1260 (2,700 μg/kg) in this boring at a depth of 2.5 feet. One other detection of PCB occurred in the sample from piezometer 1508, which indicated a level of approximately 0.2 ppm Aroclor-1260 (240 μg/kg).

Approximately 1.6 yd^3 of PCB soil will be removed and containerized by excavating 3.5 feet deep in a 4 feet diameter area centered on piezometer 1512. Two post excavation verification samples, one from the excavation base and one composite from the side-walls, will be collected from the area of probable PCB soil excavation. Additional excavation will be performed as necessary to achieve <2 ppm, based on analysis of these samples.

Mixed waste soils with concurrent petroleum contamination, are expected to be located within the skid tank pond. This soil is visually stained with a dark oily substance and has surface radiation readings measured from 1,000 to 16,000 dpm as summarized in Section 2.0 of this plan. The excavation of these mixed waste soils will be monitored by surveying for both organic and radiological contamination as discussed in Section 3.3 of this plan. The presence of radiological contamination will be monitored using a correlated NaI detector (of a type similar to the SPA-3 NaI detector used in the Sewage Treatment Plant Soils Removal Action No. 14) capable of detecting soils containing greater that 100 pCi of total uranium, 50 pCi of total thorium, and 5 pCi of total radium per gram of soil (the Removal Action No. 17 guideline for soils requiring controlled storage).

Organic contamination will initially be identified through visual observation of sludge and obviously stained soil. After the sludge and stained soils are excavated, the presence of organic contaminated soil requiring further removal and controlled storage (in accordance with Removal Action No. 17 interim management procedures) will be identified through the measurement of volatile organic vapors at the soil surface using PID or flame ionization detector (FID) instrumentation. An organic vapor reading greater than background (sustained for 30 seconds or longer) will be taken as an indication of organic contamination in the soil requiring further removal. An estimated 35 cubic yards of mixed waste with concurrent petroleum contamination is estimated to require removal from the skid tank pond based on an initial excavation depth of 12 inches.

The excavated mixed waste soil with petroleum contamination will be stockpiled within the FTF AOC in a bermed area and sampled for laboratory analyses to characterize chemical and radiological contaminants. Final disposition of these soils will follow the Removal Action No. 17 management guidelines, based on results of the laboratory

analyses. In accordance with Removal Action No. 17 guidelines, soils determined to contain petroleum or other hazardous constituent contamination will be containerized and placed into controlled storage. The bermed area will be lined and covered to prevent the spread of contamination. The materials used for the liner and tarpaulin will be selected in accordance with FEMP SOPs contained in the Removal Action No. 12 support document. The perimeter of the cover will be weighted with sand bags to protect against wind.

Surface soils considered to be mixed wastes without petroleum contamination are found in the areas around the open top tank and the sump, between the open top tank and skid tank pond, and beneath the skid tank pond after the upper layer of petroleum contaminated soil has been removed. These areas exhibited trace levels of "F" listed volatile organics in samples of soil vapor (Section 2.2.3.2) that may also be present in the soil. Pending additional sampling and laboratory analysis, soils from these areas will be considered to be potential mixed waste and handled accordingly. In the event that subsequent sampling and analysis of soils do not detect hazardous constituents in these soils, they may be re-classified as low-level waste (LLW) soils.

The area of potential mixed waste soils will be defined by a radiological walkover survey, as described in Section 3.3 of this plan. The survey technician will install flags to establish the bounds of radiological contamination. A 12-inch layer will be excavated from the surveyed area. The excavation site will be re-surveyed and remaining radiological contamination will be excavated in 12-inch layers until soil concentrations are determined to be below the Removal Action No. 17 management guidelines for total uranium, thorium, or radium per gram of soil, or perched groundwater is encountered.

Using the limited existing contamination data, a total of 200 cubic yards of mixed waste soil has been conservatively estimated to be produced from this action, assuming an excavation depth of 12 inches over the areas of contamination shown in Figure 3-1. This soil will be stockpiled within the FTF AOC in a bermed area and sampled to characterize potential chemical and radiological contaminants. Final disposition of these soils will follow the Removal Action No. 17 management guidelines, based on results of the laboratory analyses. In accordance with Removal Action No. 17 guidelines, soils determined to contain hazardous constituent contamination will be containerized and placed into controlled storage. The bermed area will be lined and covered to prevent

4779

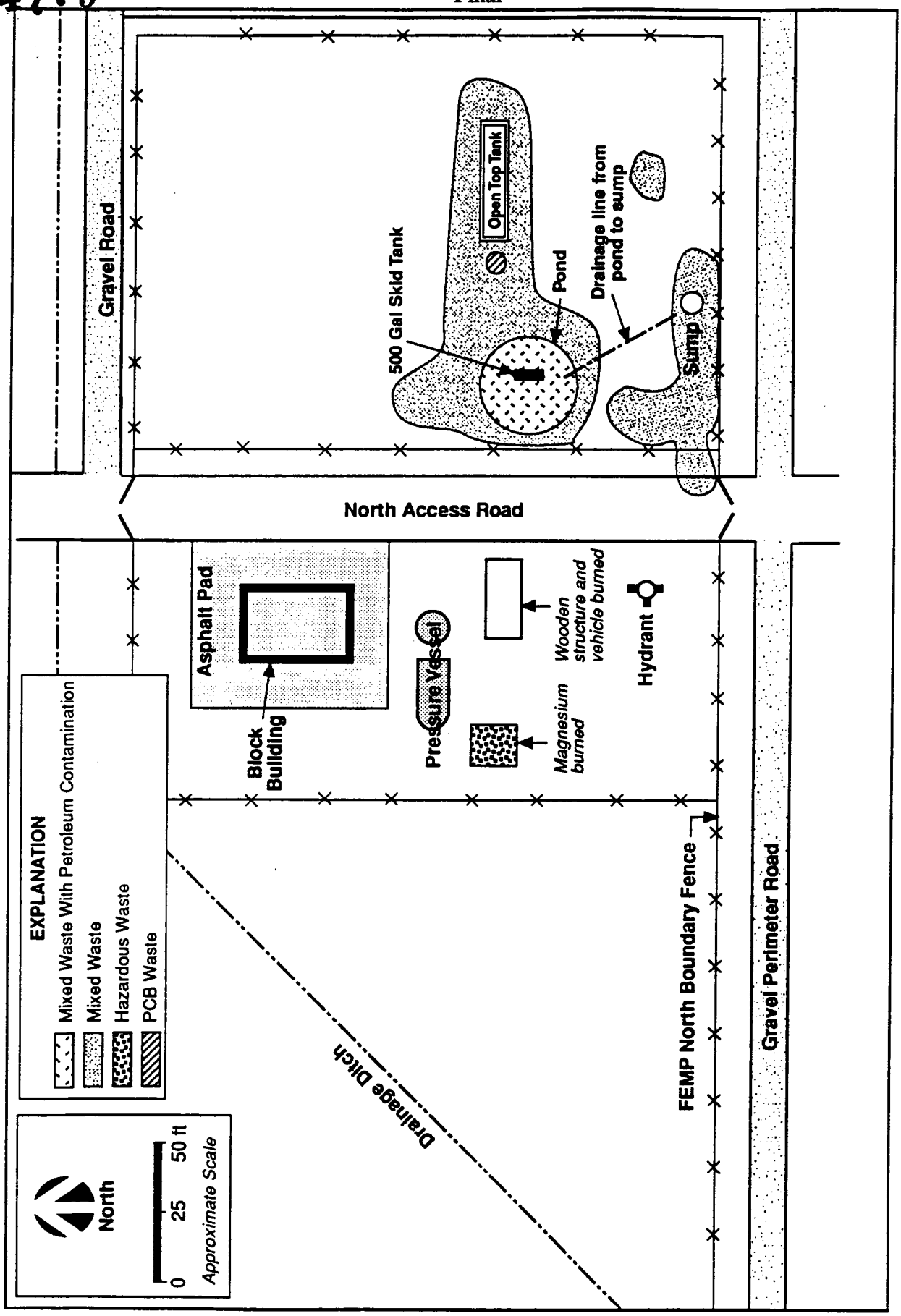


Figure 3-1. Location of contaminated areas.

63

the spread of contamination. The materials used for the liner and tarpaulin will be selected in accordance with the FEMP SOPs contained in the Removal Action No. 12 support document. The perimeter of the tarpaulin will be weighted with sand bags to protect against wind.

The magnesium burn area, shown in Figure 3-1, may potentially contain soils contaminated with hazardous constituents from the burning of magnesium metal. This location is visible as a burn area with ash-colored material at the surface. An estimated 3 cubic yards of potential hazardous waste soil will be excavated and stockpiled or drummed. Stockpiled or drummed material will be sampled to characterize potential chemical and radiological contaminants, as described in Section 3.3. Final disposition of these soils will follow the Removal Action No. 17 management guidelines, based on results of the laboratory analyses. In accordance with the Removal Action No. 17 guidelines, soils determined to contain hazardous constituent contamination will be containerized and placed into controlled storage.

All open excavations will be covered until they have been backfilled, in a manner that prevents the accumulation of rainwater. Large excavations such as the skid tank pond will require the use of a wood braced frame to prevent ponding on the tarpaulin.

Post-Excavation Soil Characterization Sampling

Two post excavation verification samples, one from the excavation base and one composite from the mid point of the side-walls, will be collected from the area of PCB soil excavation. Samples will be collected from 0 to 6 inches, in stainless steel sleeves using a drive sampler following the procedures described in Section 3.3.2.3.

Post excavation verification samples will also be collected following excavation of mixed waste soils. Soil samples will be collected from 0 to 6 inches from the base of the excavation on an approximate 50-foot spacing. Based on the initial areas of excavation, identified from results of soil vapor and radiological surveys, and depicted in Figure 3-1, this will result in 8 soil samples to be analyzed for the FTF contaminants of concern discussed in Section 3.3.3.1, Analyses. Samples will be collected in stainless steel sleeves using a drive sampler following the procedures described in Section 3.3.2.3.

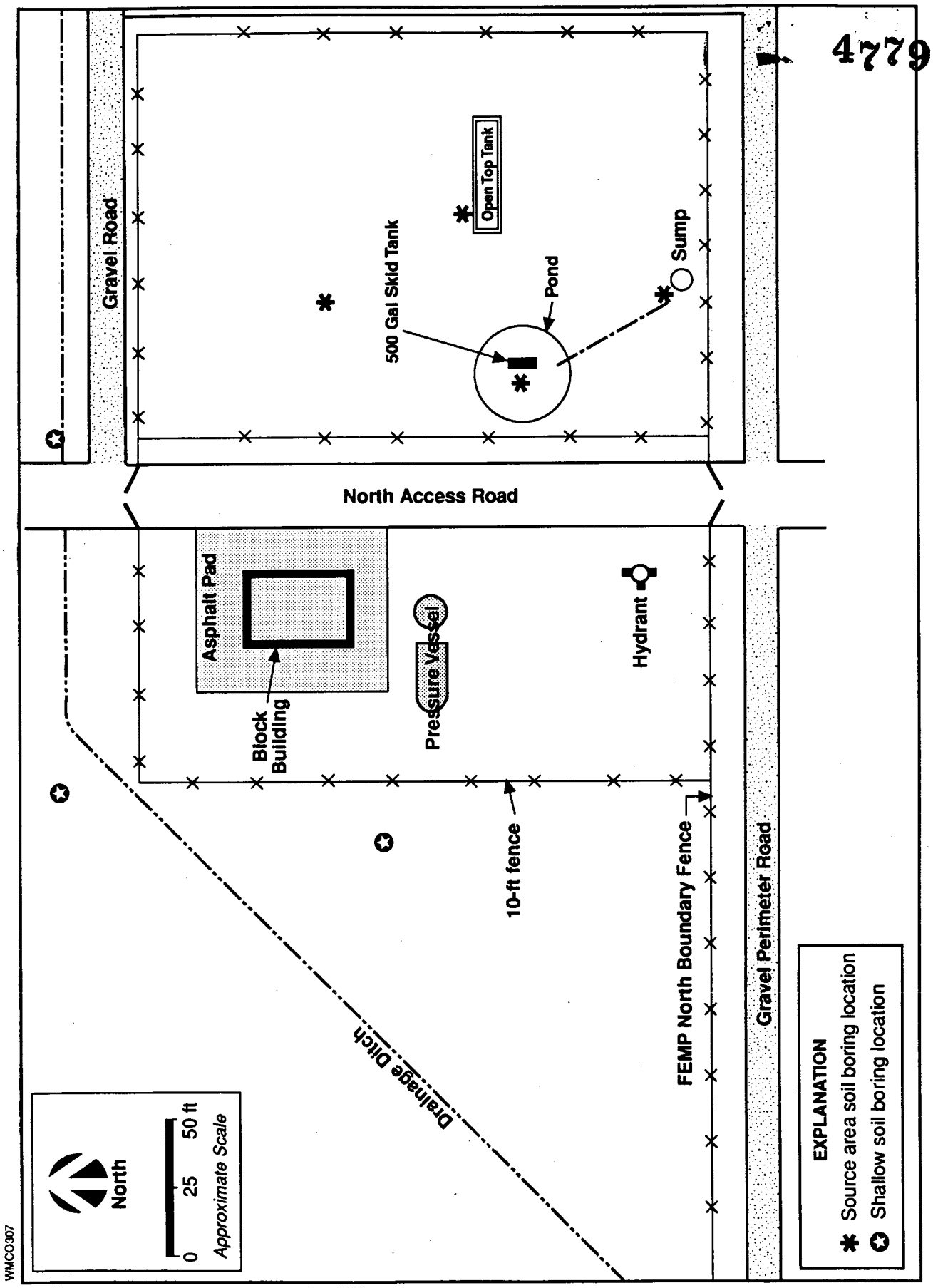
4779

In the magnesium burn area, two post excavation verification samples, one from the excavation base and one composite from the mid point of the side-walls, will be collected. Samples will be collected from 0 to 6 inches, in stainless steel sleeves using a drive sampler following the procedures described in Section 3.3.2.3.

To provide further characterization of contaminants remaining in soil at depth following the surface source-area removal, four source area borings will be made in the eastern half of the FTF site. Boring locations, shown on Figure 3-2, are selected based on the results of radiological and soil gas surveys. Soil samples collected from source area borings will extend to approximately 19 feet, with 5 samples collected from each boring. Two-foot long core samples will be collected at intervals beginning at approximate depths (below original grade) of 2.5, 5.0, 7.5, 12.5, and 17.5 feet. Sample depths are chosen to provide two samples in the unsaturated zone (2.5- and 5.0-foot sampling depths), one sample near the top of the perched water-bearing zone (7.5-foot sampling depth), and two more at 5-foot intervals (12.5- and 17.5-foot sampling depths). The sample intervals will provide information on vertical variability within both the unsaturated zone and the water-bearing zone as well as allow comparison between the two zones. Samples from the borings also will be collected for the purpose of logging the stratigraphy, and a geologist will record observations on a boring log.

Soil boring samples will be analyzed for hazardous and radioactive contaminants as described in Section 3.3.4. Borings will be grouted upon completion with a cement/bentonite or bentonite slurry and capped with concrete. Soil cuttings from the borings will be containerized and handled as described in Section 3.4. Methods for soil boring drilling and borehole abandonment will follow standard FEMP practice, as identified in the SCQ.

To characterize organic compound detections made in the soil gas survey in areas outside of identified source areas (see Figures 2-5 and 3-1), three shallow soil borings will be made to provide for collection of soil samples. The shallow soil borings will be conducted in the same manner as source area soil borings except that continuous soil samples will be collected to a depth of 8 feet. Sample sleeves will be field screened at their ends for the presence of volatile organics by use of a PID. Two sample intervals from each shallow boring will be selected to submit for laboratory analysis based on the PID screening. If the PID screening cannot distinguish between the sample intervals,



4779

Figure 3-2. Location of source area soil borings and shallow soil borings.

66

then the intervals of 2.5 to 3.5 feet and 5 to 6 feet will be selected. Samples will be analyzed for VOCs, semi-volatile organic compounds (SVOCs), Toxicity Characteristic Leaching Procedure (TCLP) metals, and PCBs.

3.2.2.6 Excavation Backfill

Excavations will be backfilled in accordance with Removal Action No. 17 once laboratory analysis of verification samples indicates that sufficient soil has been removed. Fill material will be compacted with a backhoe. Based on the rough estimates in Section 3.2.2.5 for soil to be excavated, approximately 250 cubic yards of fill material will be required. The surface of the backfilled area will be sloped to enhance lateral run-off and reduce vertical infiltration of rain water. After the backfill is complete, the area will be re-seeded with native vegetation.

3.2.2.7 Monitoring Well Installation and Sampling

Two new monitoring wells (wells 1887 and 1890) were installed in the spring of 1993 that supplement existing wells in the perched water-bearing zone to investigate and characterize the contamination of this zone (Figure 2-2). These correspond to FEMP site 1,000-series wells for the perched zone. An additional well was planned for the west side of the north gate entrance, but the boring was abandoned when no perched water was encountered to a depth of 20 feet. The monitoring network for the FTF will consist of the eight existing wells completed in source areas of the perched zone (wells 1508 to 1515), and the two new wells (wells 1887 and 1890) in the perched zone at locations that are potentially downgradient of identified sources. In addition, two existing 2000-series wells serve to monitor the site in the Great Miami aquifer. These include well 2052, which will serve as an upgradient well, and well 2436 (currently scheduled for installation), which will serve as a single downgradient well. No new wells will be installed across the water table in the Great Miami aquifer. Instead, the single downgradient well may provide an indication of contaminant transport, if it is occurring, but is not envisioned as a complete monitoring network for the site. These locations have been selected for areas considered to be beyond the area of soil contamination at the HWMU. In addition, if piezometers 1509 to 1510 are present after soil excavation has been completed, the two of these will be sampled to confirm the results presented in the RSE (Attachment 1).

4779

Perched water sampling will be conducted at four locations (1887, 1890, 1509, and 1510), and groundwater sampling from two wells at the top of the Great Miami aquifer (Wells 2052 and 2436). Monitoring wells will be sampled for two consecutive quarters for the same analytes identified for source area borings. Sampling will follow procedures identified in the SCQ. Sampling of existing wells will be coordinated with ongoing site monitoring (e.g., RCRA monitoring program). Water from well sampling will be containerized and handled as described in Section 3.4.

3.2.2.8 Survey Wells and Sampling Locations

All new monitoring wells and sampling locations will be surveyed by a registered and licensed surveyor. The tops of well casings will be surveyed for x, y, and z coordinates, along with the ground surface elevation. Soil borings and sampling locations will be staked after completion of sampling to allow for surveying of x and y coordinates.

3.3 SAMPLING AND ANALYSIS

A number of direct measurements and sampling and analysis activities will be required as part of the FTF action. The primary requirements for measurements and analytical data are associated with 1) health and safety monitoring, and 2) demonstration of compliance with regulatory criteria (ARARs).

To ensure that the data needs for each of these areas are adequately addressed during the FTF action, and that the data are sufficient in terms of both quantity and quality, this Sampling and Analysis Plan (SAP) has been prepared in accordance with the applicable requirements of the FEMP SCQ. Worker Health and Safety, ARARs, and sampling and analysis objectives are discussed in detail in the sections that follow.

3.3.1 Sampling and Analysis Objectives

The objective of FTF sampling and analysis efforts is to provide information on chemical and radiological contamination levels consistent with requirements of the identified data uses. However, data collected during the course of this action will also be of sufficient quality to be made available to the CRU-5 organization for use in the

4779

OU-5 RI/FS. The two identified data uses associated with the FTF action are: 1) monitoring for health and safety support and 2) demonstrating compliance with ARARs. This section discusses each data use within the context of its specific data needs and identifies the necessary data quality objectives (DQOs) required to ensure that the data is of sufficient quantity and quality.

A review of existing data from previous sampling and analysis campaigns was conducted to define the extent of additional sampling required to meet specific data needs and to identify additional target analytes. Analytical results from samples obtained during previous radiological and chemical sampling campaigns, and historical information and process knowledge concerning items burned during FTF exercises, were used to further identify contaminants of potential concern. Existing sampling results are discussed in Section 2.2 of this document.

3.3.1.1 Health and Safety Monitoring

Real-time monitoring for Health and Safety evaluations will be conducted to detect radiological or chemical contamination in the soil, air, and water of the FTF as well as on equipment, construction debris, and personnel. The objective of the sampling and analyses of the FTF debris/equipment, soil and air is to determine if radiological or chemical contamination is present. Contamination levels will provide health and safety personnel with the required information to choose the appropriate personnel protective equipment for each specific removal or excavation.

Real-time monitoring will be conducted by trained FEMP Radiation Technicians under the supervision of a Health Physicist/Industrial Hygienist. The Radiation Technicians will also be responsible for ensuring the maintenance and calibration of all monitoring equipment. The results of the real-time sampling will be summarized in a daily health and safety report.

Air samples will be obtained with either grab sampling methods or continuous air samplers to ensure that potential worker exposure to airborne contaminants is maintained within acceptable levels. Because of the nonspecific nature of field survey instrumentation, health and safety survey data are considered to be semiquantitative, at best. All health and safety monitoring will be performed in compliance with the HASP

(Attachment 3), the appropriate FEMP SOP and the FEMP Environmental Safety and Health manual.

The monitoring data required to support the health and safety program for the action must be of sufficient quality to assure that potential risks to employees are adequately controlled during the action. Monitoring data will be collected in a manner that provides early notification of impending unsafe conditions.

Radiological contamination and dose rate surveys during the remediation action must be capable of detecting alpha, beta, and gamma emitting radionuclides. Industrial Hygiene surveys during the remediation must be cable of detecting organic vapors. Specific detector types that are acceptable for these purposes are:

Type	Detector Type
Alpha Particles	Proportional
Beta Particles	Geiger-Mueller
Gamma Photons	Geiger-Mueller
Dose Rate	Thermal Luminescent Dosimeter (TLD)
VOCs	Photo Ionization Detector (PID) and/or Flame Ionization Detector (FID)

Specific procedures for performing radiological and industrial hygiene surveys are included within the scope of the qualification program for the individuals responsible for performing them. Additional requirements for performing radiological and industrial hygiene surveys are found in the FEMP SCQ. The frequency of collecting survey data during the action is a function of location and work activity, subject to the professional judgment of the Industrial Hygienist or Health Physicist. Minimum health and safety monitoring requirements are summarized in Table 3-1.

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

Area/Operation	Instrument	Frequency[a]
Personnel Monitoring	According to the requirements of the Radiation Work Permit and the FTF Health and Safety plan	Continuous while in the exclusion zone or in a radiological control area
Exclusion Zone: Excavation	Hand held alpha/beta-gamma survey instruments	As soil is excavated
	Photoionization detector (PID) Flame Ionization Detector (FID)	As soil is excavated measurements to be taken in the breathing zone
	Alpha/beta-gamma CAMS	As soil is excavated
Equipment or material transfers from the exclusion zone	Hand held alpha/beta-gamma survey instruments	As equipment is removed from the exclusion zone
Drilling	Hand held alpha/beta-gamma survey instruments	Each soil sample and cuttings
	PID/FID	Each soil sample, cuttings, and breathing zone of driller.
Liquid Pump-out	Hand held alpha/beta-gamma survey instruments	Liquid prior to pumpout; containers during pumpout
Subsurface Soil Sampling	Hand held alpha/beta-gamma survey instruments	During drilling or digging and collection of soil samples
Groundwater Sampling	Hand held alpha/beta-gamma survey instruments	During the extraction of groundwater samples
	PID/FID	During the opening of the well cap and the extraction of groundwater samples
Tank Removal	Hand held alpha/beta-gamma survey instruments	Surfaces prior to removal; surfaces once packaged
	PID/FID	Inside the tank prior to removal
Building Decon and Demolition	Hand held alpha/beta-gamma survey instruments	During concrete chipping activities
	PID/FID	During initial entry and during concrete chipping activities
	Alpha/beta-gamma CAMS	During concrete chipping activities
Contamination Reduction Zone	Hand held alpha/beta-gamma survey instruments	At the beginning of the day; prior to lunch; at the end of the shift
	PID/FID	At the beginning of the day; prior to lunch; at the end of the shift

a Background samples shall be taken prior to the commencement of work in a new exclusion zone.

3.3.1.2 ARARs

The ARARs that govern the FTF action include specific performance criteria that the action must meet from the standpoint of the health and safety of the worker, waste disposal, equipment disposition, and the protection of the environment. The ARARs for the FTF Action are detailed in Section 3.7 and Attachment 5.

ARARs criteria will be met through direct measurements and sample collection for laboratory analyses. Categories of ARARs addressed include worker exposure levels as well as total exposure to radioactive and hazardous materials; quantities of hazardous and radioactive materials released to the atmosphere; residual levels of contaminants on materials to be released for recycle or disposal, and the types and concentrations of contaminants in hazardous, radioactive, and mixed wastes potentially generated during this action.

Specific data required to demonstrate compliance with the ARARs include data on the radiological and/or chemical contaminant levels from the following FTF areas:

- Internal and external surfaces of the block building walls, floors, ladder, ceilings, and roof
- Soil underneath, and exterior surfaces of the asphalt pad surrounding the FTF block building
- Interior and exterior surfaces of the skid tank and exterior surfaces of the skid tank pedestals and footings
- Water, soil, and sludge from the pond surrounding the skid tank
- Soils surrounding the drain line and sump as well as interior and exterior surfaces of the drain line and sump
- Soils surrounding, and water contained within the open top tank, as well as interior and exterior surfaces of the open top tank

- Water contained in the hemispherical end of the horizontal pressure vessel, as well as interior and exterior surfaces of the vessel

- Soil from the metal burn area

- Soil samples and source area borings selected from the results of the radiological and soil gas surveys

- Soil samples from shallow borings selected from the results of the soil gas survey

- Groundwater from monitoring wells.

The specific types of measurements and sampling necessary to fulfill these data needs are 1) direct measurements of total radiological contaminant levels (fixed and removable) on various surfaces, 2) collection and analysis of swipe samples from various surfaces for radiological contaminants, 3) collection and analysis of airborne particulate samples for radiological and chemical contaminants, 4) direct measurements of uranium contaminant levels in soils, 5) collection and analysis of soil, sludge, and sediment samples for radiological and chemical contaminants, and 6) collection and analysis of surface water and groundwater samples for radiological and chemical contaminants. These measurements and samples are summarized in Table 3-2.

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 analytical support levels (ASL) A, B, C, D, and E as a major component of the DQOs. The FEMP ASL levels are described in Attachment 2. The FEMP ASLs associated with the FTF action are:

Health and Safety Support. The monitoring data required to support the health and safety program for this action shall be of sufficient quality to assure that risks

Table 3-2. Summary of measurement and sample types.

Measurement/Sample Type	Data Use	Measurement/Sample Location	ASL
Radiological Verification contamination surveys	Health and Safety	1. Working areas and surfaces 2. Access/egress to Exclusion Zone 3. Equipment from Exclusion Zone and 4. Personnel	A
	ARARS	1. Material to be removed from the FTF -Block building components -Asphalt pad -Skid tank -Skid tank supporting pedestals -Open top tank -Horizontal pressure vessel 2. FTF soil areas prior to excavation activities 3. Soil excavation surfaces	A A A
Surface Contamination Large Area Wipe Samples and Smear Samples	Health and Safety	1. Equipment from Exclusion Zone	A
	ARARs	1. Material to be removed from the FTF -Block building components -Asphalt pad -Skid tank -Skid tank supporting pedestals -Open top tank -Horizontal pressure vessel	A
Air Monitoring	Health and Safety	1. Working areas	A
	ARARs	1. FTF site boundary	C
Radiological Soil Surveys	ARARs	1. Entire FTF HWMU 2. Excavated areas	A
Subsurface Soil Sampling	ARARs	1. Source area borings 2. Shallow soil borings	C/D C/D
Soil Sampling Verification	ARARs	1. Excavation areas	C/D
Water Sampling	ARARS	1. From pond beneath skid tank (if water is present) 2. From within open top tank (if water is present) 3. From within horizontal pressure vessel end cap (if water is present) 4. From within sump (if water is present) 5. Monitoring wells (upgradient and downgradient)	C/D

to employees are adequately controlled during the action. The ASLs necessary to achieve the required data quality are Level A, C, D for radiological and chemical contaminants and concentrations. The ASLs necessary to achieve the required data quality are Level A for both radiological and organic field vapor field surveys. The final assessment of worker safety will be provided by the FEMP program through the collection and laboratory analysis of bioassay samples (ASL C).

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 FTF area and on or in materials removed from the FTF. Based on the ASL 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 analysis. Furthermore Level D analyses will only be performed on a fraction of these samples to provide a confirmation of the lower level analyses. Radiological release analysis for surface contaminated materials (e.g., horizontal pressure vessel), will be performed by direct survey techniques (ASL A).

3.3.2 Sampling Procedures

As discussed in Section 3.3.1, the data needs associated with the FTF action require a number of direct measurement and sample collection activities. The various types of direct measurements and samples to be employed in filling these data needs were summarized in Tables 3-1 and 3-2. As illustrated in Table 3-2, certain measurements and samples will fulfill data needs associated with both worker health and safety, and ARARs. Each of these measurement and sampling activities, and the roles they play in fulfilling health and safety and ARARs data needs, are discussed separately in the sections that follow. The minimum number of samples that will be collected for laboratory analysis is summarized in Table 3-3.

3.3.2.1 Surface Contamination Surveys

Direct measurements on potentially contaminated surfaces and measurements of large area wipe samples collected from potentially contaminated surfaces will be performed to determine if contamination is present. In the event that surface contamination is

Table 3-3. Summary of samples to be collected for laboratory analysis.

Sample Location	Media	Type	Minimum Number	Analytes	ASL
Surface Water	Water	Grab	4[a]	Radionuclides, VOCs[b], SVOCs[c], PCBs, HSL Metals, Dioxins	C/D
Contaminated Surface	Surface	Large area wipe	1 per $10m^2$ of surface area	Gross Alpha, Beta/Gamma	A, C/D[d]
NaI Detector Correlation	Soil	Grab	20	Total Uranium, thorium, radium	B,C/D[e]
Excavation Verification	Soil	Grab	12	Radionuclides, VOCs, SVOCs, PCBs, Metals[g]	C/D
Source Area Contamination (Borings)	Soil	Grab	20 (4 borings in 5 intervals)	Radionuclides, VOCs, SVOCs, PCBs, Metals[g], Dioxins	C/D
Other Area Contamination (Shallow Borings)	Soil	Grab	6 (2 samples each from 3 borings)	VOCs, SVOCs, PCBs, Metals[g]	C/D
Groundwater-Perched	Water	Grab	6 (each round for two rounds)	Radionuclides, VOCs, SVOCs, PCBs, Metals[g], Dioxins	C/D
Groundwater-Great Miami Aquifer	Water	Grab	2 (each round for two rounds)[f]	Radionuclides, VOCs, SVOCs, PCBs, Metals[g]	C/D
Soil Stockpile and Debris Characterization	Soil and Debris	Composite	4 (1 per Stockpile)	Radionuclides, VOCs, SVOCs, PCBs, Metals[g], Dioxins	C/D
Continuous Air Monitoring	Filter	Continuous	1 CAM/day	Gross Alpha, Beta/Gamma	A, C/D[d]

Notes: [a] - Minimum number if water is present in 1) skid tank pond, 2) sump, 3)open top tank, and 4) pressure vessel end piece. In the event that an oily surface layer is present on the open top tank water, it will be collected and analyzed separately, requiring a fifth sample.
[b] - Includes the following: Acetone (F003), Chloroform, 1,2-dichloroethane, 1,2-dichloroethylene, Ethylbenzene (F003), Methylene Chloride (F002), tetrachloroethene, Trichloroethylene, toluene (F005), trichloroethylene (F002), 1,1,1-trichloroethane (F002), Xylene (F003)
[c] - Includes the following: n-nitrosodiphenylamine, pentachlorophenol
[d] - Samples will be submitted to lab only if field screening (ASL A) indicates elevated levels that require characterization.
[e] - Isotopic total U is ASL C/D, inorganic total U is ASL B.
[f] - May be unnecessary if sampling is conducted under ongoing program (e.g., RCRA monitoring).
[g] - Includes the following: Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Nickel, Selenium, Silver.

detected, a followup smear sample will be collected to quantify the amount of removable contamination per unit surface area. This real-time sampling will be used to guide removal and excavation activities, as well as identify packaging requirements and disposition options. Real-time monitoring of radioactivity will be conducted before each step of the removal process is implemented. Hand-held field instruments will be used to perform radiological surveys and chemical vapor screening prior to and during soil excavation and debris removal operations.

The number, frequency, and location of contamination measurements will be determined by site specific conditions and the judgment of health and safety personnel, but at a minimum will include the surveys specified in Table 3-2. Survey methods include direct reading survey instruments equipped with detectors specific for alpha or beta/gamma-emitting radionuclides and volatile organics. All measurements will be performed in accordance with FEMP SOPs, and the FEMP Environmental Safety and Health Plan.

Screening for radiological constituents involves performing large area wipe surveys for loose contamination and direct "frisking" surveys for fixed contamination. Large area wipes will be taken and counted with an alpha/beta-gamma proportional counter or appropriate field instrumentation as long as the counting system has sufficient sensitivity to detect contamination below the levels specified in the FEMP Environmental Safety and Health Plan. Items will be considered contaminated if they exceed the levels specified in the FEMP Environmental Safety and Health Plan. Large area wipes will be used only to determine the presence of alpha/beta-gamma contamination while smear samples over a measured surface area will be used to quantify contamination levels. Surveys will also be performed for fixed contamination on equipment and debris or on media not conducive to large area wipe and smear surveys (i.e., asphalt, concrete) via frisking with both a hand held alpha and beta-gamma survey meter. Items will be considered contaminated if fixed readings exceed the levels specified in the FEMP Environmental Safety and Health Plan.

3.3.2.2 Air Monitoring

Ambient air monitoring will be performed in areas with the potential to exceed 1.0% of any DAC level listed in DOE Order 5480.11 and the DOE Radiological Controls

Manual. Constant air monitors (CAMs) or portable air samplers (PAS) will be used to monitor the air effluent in and around excavation and removal operations.

A PID; (e.g., an HNu) or a flame ionization detector (e.g., Foxboro organic vapor analyzer) will be used as a field screening technique to detect the presence of organic constituents in the soils that require removal. If the PID or FID detects elevated levels of VOCs above background for a sustained 30 second time interval, this will be taken as a positive indication that VOCs are present.

The number, frequency, and location of air monitoring and sampling activities will be determined by site specific conditions. Minimum requirements for these measurements are detailed in Table 3-2. Calibration of organic vapor analyzers, and hand-held radiological survey instruments will be performed in accordance with the FEMP SCQ. Monitoring for organic vapors will be conducted as a screening technique only.

3.3.2.3 Soil Sampling

Soil sampling will be conducted to 1) verify the extent of surface source area soil excavations, 2) characterize soils that have been excavated and stockpiled within the FTF AOC, and 3) characterize subsurface soils.

Verify The Extent of Excavation

Two post excavation verification samples, one from the excavation base and one composite from the mid point of the side-walls, will be collected from the area of PCB soil excavation. Samples will be collected from 0 to 6 inches, in stainless steel sleeves using a drive sampler following the procedures described in Table 3-4.

Post excavation verification samples will also be collected following excavation of mixed waste soils. Soil samples will be collected from 0 to 6 inches from the base of the excavation on an approximate 50-foot spacing. Based on the initial areas of excavation, identified from results of soil vapor and radiological surveys, and depicted in Figure 3-1, this will result in 8 soil samples to be analyzed for the FTF contaminants of concern discussed in Section 3.3.3.1, Analyses. Samples will be collected in

stainless steel sleeves using a drive sampler following the procedures described in Table 3-4.

In the magnesium burn area, two post excavation verification samples, one from the excavation base and one composite from the mid point of the side-walls, will be collected. Samples will be collected from 0 to 6 inches, in stainless steel sleeves using a drive sampler following the procedures described in Table 3-4.

The area to be excavated for mixed waste soils outside the area of petroleum contamination, as described in Section 3.2 of this plan, will be identified through direct in situ measurements with a correlated NaI radiation detector. This detector and approach are consistent with the equipment and procedures applied in the removal of soils adjacent to the Sewage Treatment Plant (Removal Action No. 14). The extent of excavation for potential hazardous waste soils from the magnesium burn area will be accomplished through sample collection and analysis. The procedures for each of these soil sampling activities are described in the following sections.

Before the start of removal activities, the entire FTF HWMU will be surveyed with a NaI radiation detector to identify the soil areas contaminated with uranium, thorium, and radium in excess of 100 picocuries/gram (pCi/g), 50 pCi/g, and 5 pCi/g of soil, respectively. Soil samples collected in conjunction with this survey will be used to develop an FTF site-specific correlation with soil concentrations. Excavation areas will be adjusted as appropriate based on the site-specific correlation.

- The FTF area will be sectioned into appropriately sized grids, marked with survey flags.

- A serpentine walkover survey will be performed with a shielded 2-inch by 2-inch NaI radiation detector and rate meter/scaler, to determine areas of radiological activities above normal background levels. The field measurement procedure is composed of the following steps:

    - Check proper operation of the detector and its associated ratemeter/scaler according to manufacturer's instruction.

- Perform daily source checks with a known source and record the response.

- Perform daily background checks at the selected background area and record the response.

- Survey the FTF area with a shielded detector by walking at a steady rate across the area in a serpentine manner.

- Each data point will be logged and the results placed on the established grid map.

- The process of developing the site-specific correlation of the NaI detector will be accomplished through the collection of a series of surface soil samples (approximately 20) from the locations within the study area representing a range of instrument readings consistent with the correlation procedure contained in the Removal Action No. 14 Work Plan.

- Soil samples will be taken (from a depth of 0 to 4 inches) from each selected location and analyzed for total uranium and thorium, and total radium. Uranium and thorium isotopic analyses will also be performed for any samples that indicate greater than 90 pCi of total uranium or 40 pCi of total thorium per gram of soil. Soil samples will be collected with a drive sampler following the procedures identified in Table 3-4 and the FEMP SCQ.

- A plot will be developed depicting instrument response in counts per minute versus total activity concentrations in pCi/g. Samples exhibiting significant activity concentrations of other gamma emitting radionuclides will be excluded from consideration.

- A curve will be fit against the plotted data. This curve will establish the basis for correlation on the NaI detector and rate meter scaler measurements to 100 pCi/g total uranium.

Table 3-4. General procedure for soil sampling with a drive tube sampler.

Sampling Device:	Sampling from the excavation for volatile organics and radionuclides, and inaccessible locations requires the use of a slide hammer drive tube sampler with a 6-inch sampling shoe and a stainless steel brass insert sleeve to hold the sample.

The following are the steps for sample collection:

1) Make sure sampling equipment has been properly decontaminated according to procedures in the FEMP SCQ and assemble sampler with sleeve insert.

2) Drive sampler a full 6 inches and remove from the ground. Repeat with second sleeve(or more if necessary) at the same location if VOCs and other analytes are to be requested so that VOCs may have a separate sleeve.

3) Remove sampler sleeve from sampler

4) Immediately cover the ends of the sleeve with teflon tape to seal the sample

5) Cap each end of the sleeve with plastic caps

6) Label the sample container as described in the FEMP SCQ.

7) Place the sample in the cooler with frozen "blue ice" or equivalent for temporary storage.

8) Follow the procedures in the FEMP SCQ regarding chain of custody, sample analysis requests, and packaging and shipping.

- Additional surveys of the area will be performed using a thin-crystal NaI detector to supplement the 2-inch by 2-inch survey.

Excavation activities will begin based on the correlation curve developed for the FTF. Areas that were surveyed and have instrument readings that initially correlate to concentrations greater than Removal Action No. 17 guidelines will be excavated and stockpiled within the FTF AOC. At each excavation interval (approximately 1-foot of excavation depth) the excavation area will be surveyed with the NaI detector and, based on the site-specific correlation, any areas determined to still exceed guidelines will be excavated further. This process will continue until soil activity is less than guidelines or perched water is encountered.

Characterize Excavated Soil

Areas that have been determined to be contaminated will be excavated and the excavated soils stockpiled within the FTF AOC. These excavated soils will be characterized through the collection of composite samples using the sampling procedures described in the Removal Action No. 17 Work Plan.

Characterize Subsurface Soil

Subsurface soil sampling will be conducted following excavation in four source area borings and three shallow borings (Figure 3-2). Source area borings will be conducted using a hollow-stem auger drill rig or other appropriate method. Samples will be collected by use of a split-spoon sampler with stainless-steel sleeve inserts that is driven ahead of the auger bit into undisturbed soil. General procedures for sampling by split spoon are described below, with details provided in the SCQ, Appendix G.

At each boring location, samples will be collected from five intervals. The sample intervals will be 2 feet long beginning at depths of 2.0, 4.5, 7.0, 12.0, and 17.0 feet. Shallow samples may be omitted if soil to that depth has been excavated or if the location is immediately adjacent to previous boreholes with analysis at that depth. Four sample sleeves will be collected from each sample interval, with the bottom three used for samples submitted for analysis and the top sleeve used for lithologic logging. Each soil sample will be field screened (from the end of the sample sleeve) using a PID for

4779

volatile organic compounds and alpha and beta/gamma detection instruments. For each sample interval, sleeves will be submitted for analyses as specified in Table 3-3. Split-spoon samples will be collected following procedures identified in Table 3-5.

To characterize organic compound detections made in the soil gas survey in areas outside of identified source areas (see Figures 2-5 and 3-1), three shallow soil borings will be made to provide for collection of soil samples. The shallow soil borings will be conducted in the same manner as source area soil borings except that continuous soil samples will be collected to a depth of 8 feet. Sample sleeves will be field screened at their ends for the presence of volatile organics by use of a PID. Two sample intervals from each shallow boring will be selected to submit for laboratory analysis based on the PID screening. If the PID screening cannot distinguish between the sample intervals, then the intervals of 2.5 to 3.5 feet and 5 to 6 feet will be selected. Samples will be analyzed for VOCs, SVOCs, metals and PCBs.

3.3.2.4 Water Sampling

Water sampling will be conducted for surface water that has accumulated, such as in tanks and sumps, and for groundwater sampling via monitoring wells. Analyses to be performed on water samples are described in Table 3-3.

Surface Water and Sump Water Sampling

Surface water sampling will be conducted after water has been removed from the pond surrounding the skid tank, the skid tank sump, and the open top tank. One grab sample will be obtained from each of the containers used to hold this water pending treatment. Surface water sampling will follow the requirements specified in the FEMP SCQ.

Groundwater Sampling

Existing monitoring wells and piezometers will be used to investigate and characterize groundwater in the perched water-bearing zone and Great Miami aquifer. Groundwater sampling will be conducted for two consecutive quarters (3 month separation) for six monitoring wells to determine concentrations of analytes. The monitoring network will include two existing source area piezometers, two new shallow wells outside the existing

Table 3-5. General procedure for soil sampling with a split-spoon sampler.

Sampling Device: Sampling from the subsurface using a hollow stem auger drill rig will use a 2-inch ID split-spoon sampler with a 6-inch stainless-steel sleeve liners. The split spoon will be 24 inches in length and hold 4 sleeves.

The following are the steps for sample collection:

1) Make sure sampling equipment has been properly decontaminated according to the procedures in the SCQ and assemble sampler with sleeve insert.

2) Drive split-spoon sampler a full 24 inches (or to the point of refusal) and bring to surface.

3) Open sampler and perform radiological and PID of FID field screening in gaps made between sleeves.

4) Immediately cover the ends of the bottom sleeve (for VOC analysis) with teflon tape and plastic cups to seal the sample, noting soil types showing at sleeve ends.

5) Note lithologies visible at ends of remaining sleeves and empty the top sleeve to view for lithologic logging before sealing and capping remaining sample sleeves.

6) Label the sample container as described in the FEMP SCQ, noting the actual sample depths for each sleeve in the log book and assigning the three sleeves the same sample identification while indicating the requested analyses on each.

7) Place the sample in the cooler with frozen "blue ice" or equivalent for temporary storage.

8) Follow procedures in the FEMP SCQ regarding chain of custody, sample analysis requests, and packing and shipping requirements.

source area, and two existing wells screened across the water table outside the source area. Existing piezometers 1509 and 1510 in the source area will be sampled to verify the results reported in the RSE. These piezometers, or two of the other existing source area piezometers, will be sampled only if they remain in place following soil excavation. Shallow wells outside the source area include two new downgradient wells (1887 and 1890). Wells screened across the water table on the Great Miami aquifer will include well 2052 as an upgradient well and well 2436 as the downgradient well. Water levels and depth of wells will be measured, and wells will be purged following the FEMP SCQ. Field parameters to be measured are pH, specific conductance, and temperature. Measurement of field parameters will follow the FEMP SCQ. Existing wells 2052 and 2436 may already be scheduled for sampling under the RCRA monitoring program and will not be duplicated if data will be available.

3.3.2.5 Decontamination Procedures

Decontamination procedures for all drilling, soil sampling, and water sampling equipment will follow those described in Appendix K.11 of the FEMP SCQ. In all cases, equipment to be placed down a monitoring well will be decontaminated prior to use. Equipment shall be decontaminated to limit introduction of contaminants from equipment to sampled media, limit cross-contamination between sampling points, and protect worker health and safety. Generation of hazardous waste and excessive volumes of waste solutions will be discouraged. Use of improperly decontaminated equipment will be prohibited. Table 3-6 contains the decontamination requirements for the sampling equipment. Procedures for decontamination of equipment and material to be removed from the exclusion zone are discussed in Attachment 3 to this plan.

3.3.3 Analytical Procedures

This section defines the analytical procedures to be employed for analysis of target analytes. Current guidance is contained in Appendix G of the FEMP SCQ. The listed methods are consistent with those required or prescribed by the USEPA. A laboratory qualified to perform work under the USEPA's Contract Laboratory Program will be used.

4779

Table 3-6. Decontamination levels for sampling equipment.[a]

Equipment	Level of Decon	Frisk Frequency
Auger	Level II	Pre and Post Decon
Drill rig	Level I when removed from area	Pre and Post Decon
	No decon necessary when remaining in the control zone	Pre and Post Decon
Split spoons	Level II Level III (if gross contamination present)	Post Decon
S.S. Bowls and spoons, drive tube sampler and sleeves	Level II Level III (if gross contamination present)	Post Decon
Backhoe	Level I when removed from area	Pre and Post Decon
	No decon necessary when remaining in the control zone	Pre and Post Decon
Waste Containers	None	None
Bailers	Level II	Post Decon

a Appendix K.11 of the SCQ

86

3.3.3.1 Analyses

Samples will be collected in the form of wipe samples from structures and equipment; surface water from the open top tank, skid tank pond and sump, and the pressure vessel end cap; soil from removal verification and correlation samples; soil from source area borings and test pits; and water from perched groundwater and groundwater monitoring wells. The number and frequency of analyses are identified in Table 3-3, and analytical methods required for each sample media are discussed in the sections that follow.

Standard analytical procedures for radiological and non-radiological analyses are provided in Appendix G of the SCQ. Analyses are described separately below for radiological and non-radiological contaminants of concern.

Required quantification limits for analyses are identified in the FEMP SCQ. Sample container and preservation requirements and QA/QC analyses are also identified in the FEMP SCQ Appendix.

Radiological Analyses

Selected soil samples collected for removal verification and soil borings will be analyzed for the following contaminants of concern:

- Isotopic uranium (^{234}U, ^{235}U, ^{238}U)
- Isotopic thorium (^{228}Th, ^{230}Th, ^{232}Th)
- Isotopic radium (^{226}Ra).

Other soil samples will only require total uranium, total thorium, and total radium analysis.

Large area wipe and smear samples will be collected for analysis to determine the following constituents:

- Alpha/beta-gamma gross contamination.

4770

Non-Radiological Analyses

Verification soil samples, soil boring samples, and water samples collected from surface water and groundwater will be submitted for organic and inorganic analysis to determine the following groups of constituents (hazardous waste codes are identified for listed hazardous wastes):

- VOCs
  - Acetone (F003)
  - Chloroform
  - 1,1-Dichloroethene
  - 1,2-Dichloroethane
  - 1,2-Dichloroethylene
  - Ethylbenzene (F003)
  - Methylene Chloride (F002)
  - Tetrachloroethene
  - Trichloroethene
  - Toluene (F005)
  - Trichloroethylene (F002)
  - 1,1,1-trichloroethane (F002)
  - Xylene (F003)
- SVOCs
  - 2,4-Dimethylphenol
  - n-nitrosodiphenylamine
  - Pentachlorophenol
  - Bis(2-ethylhexel)-phthalate
- PCBs
- Metals
  - Arsenic
  - Barium
  - Cadmium
  - Chromium
  - Lead
  - Mercury
  - Nickel

83

4779

- Selenium
- Silver

- Dioxin (surface water, perched groundwater, source area borings, and soil characterization only).

As indicated above, Dioxin analyses will only be performed on samples collected from locations that may have been directly effected by the combustion process and may contain combustion process and may, therefore, contain combustion by-products. Table 3-7 summarizes the contaminants of concern for surface soil, verification soil, and sub-surface soil. Shown in Table 3-8 are the surface water, perched water, and groundwater contaminants of concern. Table 3-9 lists the background concentrations of metals in FEMP soils, determined by the FEMP background soil study (FERMCO 1993). Background concentrations of organics are assumed to be zero.

3.3.4 Quality Assurance/Quality Control

Field and laboratory quality assurance/quality control (QA/QC) requirements and protocols are presented throughout this plan and Attachment 4 (Quality Assurance Project Plan) with the reference to the SCQ. Work conducted under this plan will comply with all applicable aspects of the quality assurance program.

3.3.4.1 QA/QC Samples and Equipment Calibration

Sampling activities will follow requirements for QA/QC samples specified in the FEMP SCQ. For soil samples, QA/QC samples shall include trip blanks, rinsate blanks, duplicate samples, and container blanks. For water samples, QA/QC samples will include trip blanks, field blanks, rinsate blanks, duplicate samples, preservative blanks, and container blanks. These QA/QC samples will be collected as follows:

- Trip blanks - daily (only on days when samples are sent in for VOC analysis), one trip blank per cooler sent to laboratory. Analyzed for HSL Volatile Organics only.

83

4779

Table 3-7. Surface, verification, and sub-surface soil sample contaminants of concern and sample media.

Analyte	Media
Total/Isotopic Uranium	Sludge/Soil
Total/Isotopic Thorium	Sludge/Soil
Total/Isotopic Radium	Sludge/Soil
Total/Isotopic Uranium	Rinsates/Extracts
Total/Isotopic Thorium	Rinsates/Extracts
Total/Isotopic Radium	Rinsates/Extracts
Gamma Spectrometry	Rinsates/Extracts
Gross Alpha/Beta	Rinsate
VOCs[a]	Sludge/Soil/Rinsates/Extracts
SVOCs[b]	Sludge/Soil/Rinsates/Extracts
PCBs	Sludge/Soil/Rinsates/Extracts
Metals[c,d]	Sludge/Soil/Rinsates/Extracts
Dioxin	Sludge/Soil

a Includes the following: Acetone (F003), Chloroform, 1,1-dichloroethene, 1,2-dichloroethane, 1,2-dichloroethylene, Ethylbenzene (F003), Methylene Chloride (F002), tetrachloroethene, Trichloroethylene (F002), toluene (F005), 1,1,1-trichloroethane (F002), Xylene (F003)

b Includes the following: n-nitrosodiphenylamine, pentachlorophenol

c Includes the following: Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Nickel, Selenium, Silver

d To be performed as a total metals analysis. In the event that the total metal result is greater than the TCLP regulatory level, an extraction will be performed on the original sample and the extract analyzed for direct comparison to the regulatory level.

90

4779

Table 3-8. Contaminants of concern for surface, perched, and subsurface water samples.

Analyte	Media
Total/Isotopic Uranium	Water
Total/Isotopic Thorium	Water
Total/Isotopic Radium	Water
Total/Isotopic Uranium	Rinsates/Extracts
Total/Isotopic Thorium	Rinsates/Extracts
Total/Isotopic Radium	Rinsates/Extracts
Gamma Spectrometry	Rinsates/Extracts
Gross Alpha/Beta	Rinsate
VOCs[a]	Water/Rinsates/Extracts
SVOCs[b]	Water/Rinsates/Extracts
PCBs	Water/Rinsates/Extracts
Metals[c]	Water/Rinsates/Extracts
HSL Metals[d,e]	Water
Dioxin	Water

a Includes the following: Acetone (F003), Chloroform, 1,1-dichloroethene, 1,2-dichloroethane, 1,2-dichloroethylene, Ethylbenzene (F003), Methylene Chloride (F002), tetrachloroethene, Trichloroethylene (F002), toluene (F005), 1,1,1-trichloroethane (F002), Xylene (F003)

b Includes the following: n-nitrosodiphenylamine, pentachlorophenol

c Includes the following: Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Nickel, Selenium, Silver

d Full HSL metals will be analyzed for the surface water samples because FTF surface water has not been previously characterized.

e To be performed as a total metals analysis. In the event that the total metal result is greater than the TCLP regulatory level, an extraction will be performed on the original sample and the extract analyzed for direct comparison to the regulatory level.

Table 3-9. Background concentrations of selected metals in FEMP surface soil.

	Soil Concentration - mg/kg[a]		
Metal	Mean	Std. Dev.	Mean + 2 x SD
Arsenic	5.197	1.702	8.601
Barium	69.990	52.263	174.516
Cadmium	0.364	0.210	0.784
Chromium	10.737	2.783	16.303
Lead	17.787	4.749	27.285
Mercury	0.071	0.043	0.157
Nickel	10.708	5.1126	20.933
Selenium	0.386	0.080	0.546
Silver	1.285	0.062	1.409

a Concentrations in surface soil (0-6 in.) (FERMCO 1993).

- Field blanks - one per twenty samples per each type of sample collection method or one per sampling round, whichever is more frequent. Analyzed for all radiological and non-radiological constituents, where appropriate.

- Rinsate blanks - one per twenty samples of a type of equipment cleaned by a specific decontamination method or one per sampling event, whichever is more frequent. Analyzed for all radiological and non-radiological constituents, where appropriate.

- Preservative blanks - one per each container batch or one per sampling event, whichever is more frequent. Analyzed for all non-radiological constituents, where appropriate. Preservative blanks are performed by submitting deionized water and preservative in an appropriate container to determine the quality of sample preservatives.

- Container blanks - one per each container batch or one per sampling event, whichever is more frequent. Analyzed for all radiological and non-radiological constituents, where appropriate. Container blanks are performed by submitting an unpreserved container to the laboratory to determine the quality and integrity of containers used in matrix sampling.

- Duplicate samples - one per every ten samples per media matrix or one per sampling event per media matrix, whichever is more frequent. In addition, duplicate samples will be analyzed for all radiological and non-radiological constituents, where appropriate.

Field Screening Equipment Calibration and Documentation

Calibration of test and measuring equipment will be in accordance with the SCQ and equipment manufacturer's recommendations. Field screening instrumentation, such as radiation detection and PID/FID devices, will be checked on a daily basis for proper operation. Any equipment that fails calibration or becomes inoperable will be tagged and taken out of service. Such equipment will be repaired and recalibrated before reuse.

Radiation detection devices will be checked before each use to ensure that the date of required calibration has not been exceeded. The NaI detector and associated rate meter will not only be checked for required calibrations; correlation curves will also be developed according to the requirements of Section 3.3.2.3. PID/FID devices will be calibrated, on a daily basis prior to use, to a known concentration of volatile gas in air mixture (i.e., isobutylene, benzene, etc.). Subsequent to completion of field activities, on a daily basis, the PID/FID instrument will be checked by analyzing the respective gas-air mixture used for calibration. Field screening instrumentation checks and calibration will be recorded in bound field logbooks or field activity daily logs and instrument-specific calibration logs.

Laboratory QA/QC Samples

The following laboratory QA/QC samples will be analyzed:

- Method blanks - one per twenty samples or one per sample batch, whichever is more frequent.

- Matrix spike - one per twenty samples or one per analytical batch, whichever is more frequent.

- Matrix spike duplicate - one per twenty samples analyzed or one per analytical batch, whichever is more frequent.

- Surrogate spike - one per each analytical and QC sample prior to analysis. Surrogate spikes will be performed for non-radiological analyses only.

Analytical Instrumentation/Equipment Calibration and Documentation

Analytical laboratory instrument and equipment calibration procedures are provided in the FEMP SCQ. The contracted analytical laboratory facility will be responsible for ensuring that all analytical instrumentation and equipment is operating properly and is within prescribed calibration limits.

Quality Control Checks and Procedures

Laboratory QC checks and procedures for inorganic, organic, and radiological analyses are provided in the FEMP SCQ. The contracted laboratory facility will be responsible for adherence to these QC checks and procedures.

3.3.4.3 Documentation

Site field activities will be fully documented. Documentation will be consistent with procedures identified in the FEMP SCQ.

4779

Field activities will follow the procedures identified in this plan. In cases where field changes are necessary to conduct activities, a Document Change Request will be completed prior to implementing the change in accordance with FEMP SCQ. Field personnel shall keep a daily log of project activities in accordance with the FEMP SCQ. It shall be a written record of activities and measurements conducted on a given date and may include daily field activity logs, boring logs, well-construction logs, media-specific sampling logs, photographs, and sketches. The log shall be in a bound book with sequentially numbered pages. Daily log entry requirements are specified in the SCQ.

Activity-specific logs (e.g., subsurface boring logs, water sampling logs, sediment sampling logs) shall be generated to document field activities as specified in the SCQ. These logs are considered part of the daily log. At least weekly, copies of daily log forms shall be sent by field personnel to the FEMP project manager or representative. Originals of field records shall be maintained in the project central file.

3.4 WASTE DISPOSAL AND MANAGEMENT

This section discusses the methods that will be used for this action to minimize and manage waste generated during the course of the FTF removal 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 tank wastes, soil sampling waste, liquid waste, building demolition 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. Material originating within the OU-3 process area, and the FTF, are presumed to be radiologically contaminated until surveys demonstrate otherwise.

95

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 generation of additional contaminated components, soils, or water. Specific actions designed to minimize additional wastes include strict limitations for preventing surface water run-on and covering noncontaminated areas to prevent contamination through spills or releases.

Due to the potentially 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) (FEMP 1993), which received conditional approval by the USEPA in December 1992, has been prepared and specifically addresses this issue. The primary criteria for reuse of the soils are: 1) the soil has maximum limits on total uranium, thorium, and radium of less than or equal to 100 pCi/g, 50 pCi/g, or 5 pCi/g respectively; and 2) the soil is not contaminated with non-radiological regulated waste materials. A more thorough discussion of Removal Action No. 17 and how this action interfaces with it is contained in Section 3.1.2.

3.4.3 Work Activities Producing Waste

Several work activities associated with this action will produce wastes of differing composition, contamination and disposal requirements; the specific waste produced is dependent upon the activity but can be categorized as follows:

- Sampling activities
- Contaminated liquid removal
- Contaminated soil removal
- Demolition activities
- Other activities.

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 removal and conduct pre-removal characterization of the FTF site.

3.4.4 Assumptions Made Regarding Waste

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

- All soils, liquids, tanks and demolition waste will be treated as radiologically and chemically contaminated until determined otherwise through sampling and analysis as described in Section 3.3.

- Decontamination wastes will be treated in a manner consistent with the contaminants potentially present on the item being decontaminated.

- Material decontamination will be performed as necessary at the work site and/or the decontamination facility.

- Following removal of a 0.6 cm surface layer from the block building floor slabs or more if necessary to achieve a clean debris surface, the remaining concrete slabs will be treated as nonhazardous.

- Mixed and LLW will be segregated prior to and during shipment to a treatment or disposal facility, or for storage on site.

- Demolition debris found to be free of radiological and hazardous contamination will be salvaged or sent to a construction landfill for disposal.

3.4.5 Categories of Waste

This removal action will produce both clean and contaminated wastes. The FTF action will produce the following categories of wastes:

1. Sampling wastes
2. Liquids wastes
3. Contaminated soils
4. Demolition wastes (includes tanks)
5. Other solid wastes.

Of these categories, some will be determined to be clean while others will be contaminated. Clean wastes are those items that are determined free of radioactive and hazardous constituents. Clean wastes will be disposed of by one of the following: 1) sold as scrap for salvage, 2) sent to a solid waste landfill, and 3) discharged to a sewage treatment plant.

Contaminated wastes require special handling and may require treatment and or disposal in an approved facility if they can not be decontaminated. Contaminated wastes can be further subdivided into LLW, hazardous wastes, and mixed wastes. LLW wastes contain only radioactive constituents above regulatory limits. Mixed wastes contain a mixture of hazardous and radioactive constituents above regulatory limits. Hazardous wastes contains chemical constituents that exceed regulatory limits or contain constituents that are specifically "listed" in the USEPA and OEPA regulations.

A goal of this removal action is to minimize the volume of contaminated waste produced by providing separate storage to prevent mixing of the wastes or contain constituents that are specifically "listed" in the USEPA and OEPA regulations.

Table 3-10 provides a list of these categories, the initial waste classification, volumes, waste minimization techniques, and disposition of the materials.

Table 3-10. Summary of waste minimization activities

Category of Waste	Initial Class	Volume Estimated	Waste Minimization Techniques	Disposition
Sampling Wastes	Mixed[1/]	0.5 yd^3	1) Minimize the number of samples 2) Prevent spread of contamination	If returned from lab handle as contaminated waste
Contaminated Soils	Mixed with petroleum[1/]	200 yd^3	Minimize mixing with other soils	R.A. #17
	Mixed[1/]	35 yd^3	Minimize mixing with other soils	R.A. #17
	Hazardous[3/]	3 yd^3	Minimize mixing with other soils	R.A. #17
	PCB	1.6 yd^3	Minimize mixing with other soils	R.A. #17
Contaminated Liquids	Mixed[1/]	7,500 gal	1) Control surface run-on 2) Cover with tarpaulins	Send to Plant 8 waste water treatment system
Demolition Waste	Clean	30 yd^3	Identify zones	Recover per R.A. #17
	LLW[2/]	5 yd^3	Prevent mixing with clean wastes	Disposition of in accordance with R.A. #17
	Mixed[1/]	1 yd^3	Prevent mixing with clean wastes	Disposition of in accordance with R.A. #17
Other Solid Wastes	LLW[2/]	2-55 gallon drums of mixed waste	Minimize the number of personnel and equipment in the exclusion zone	Disposition in accordance with FERMCO Standard Operating Procedures

1/ Wastes that contain a mixture of hazardous and radioactive constituents above regulatory limits. Hazardous wastes either contain chemical constituents which exceed regulatory levels or contain chemicals which are specifically "listed" in the regulations.
2/ Wastes that contain only radioactive constituents above regulatory limits.
3/ Wastes that contain hazardous but no radioactive constituents above regulatory limits.

3.4.5.1 Soil Sampling Activities

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 soils clinging to the sampling equipment as it is retracted from the soil sampling location, 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 0.5 cubic yards. 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 SAP described in Section 3.3 of this document, identifies the number of samples required.

Each sample taken will initially be screened with appropriate radiological and organic vapor survey instrumentation. A NaI gamma scintillation radiation monitoring instrument will be used for the radiological screening. For the organic vapor survey, a FID or PID with the highest level lamp (typically 11.7 eV) will be used.

All sample waste will be labeled and stored in approved containers until characterization is complete. Sample waste as result of characterization will be handled in accordance with Removal Action No. 17.

3.4.5.2 Contaminated Liquids

In total approximately 7,500 gallons of contaminated liquids will be generated from the draining of the pond surrounding the skid tank, the skid tank drain line, the skid tank sump, and the open top tank and decontamination of equipment and personnel.

This liquid will be placed into portable tanks and transferred to Plant 8 for treatment. The liquid will be processed by the perched water treatment system (organics removal) followed by the Plant 8 wastewater treatment system as described in Section 3.1.2.

4779

3.4.5.3 Contaminated Soil Removal

The entire FTF area is designated an AOC prior to removal action activities (Attachment 8). This is done to allow for the management of excavated soils within the AOC. Excavated soils will be managed according to the requirements specified in Removal Action No. 17.

It is estimated that 35 cubic yards of mixed waste soil with concurrent petroleum contamination will be excavated and will require treatment and disposal. An estimated 200 cubic yards of radiologically contaminated surface soils have also been identified as potential mixed wastes based on the presence of trace levels of listed VOCs within soil vapor that may also be present within the soil. The final identification of mixed waste soils will be based on laboratory analyses as discussed in Section 3.3 of this plan. An estimated 1.6 cubic yards of PCB contaminated soil will be removed and containerized. Approximately 3 cubic yards of hazardous waste soil will be excavated from the magnesium burn area.

3.4.5.4 Demolition Waste

Demolition waste will include debris generated from raising the block building and associated asphalt pad, the horizontal pressure vessel, the skid tank, skid tank drain line, skid tank sump, and the open top tank. All demolition waste is expected to be free of measurable radiological surface contamination with the exception of the open top tank, skid tank, skid tank pedestals, two spots on the horizontal pressure vessel, and sections of the FTF block building floor. It is not known at this time whether the drain line from the skid tank to the skid tank sump is radiologically contaminated.

Radiological surveys of the open top tank were performed during 1989. These surveys indicate surface contamination on the internal sides ranging from 10,000 to 20,000 dpm. Radiological contamination detected on the edge of the tank ranged from 3,000 to 132,000 dpm.

Radiological surveys of the skid tank and pedestals were performed during 1989. These surveys detected surface contamination on the skid tank ranging from 12,000 to 16,000

dpm. Radiological contamination detected on the skid tank pedestals ranged from 10,000 to 32,000 dpm.

Radiological surveys of the FTF concrete block building were performed on 10/9/92. Surveys detected several spots of fixed contamination in the first and second floor concrete. There are two spots on the first floor that each read 1,000 dpm and several spots, within close proximity of each other, on the second floor that read between 1,000 dpm to 40,000 dpm. No loose contamination was detected during the survey.

Radiological surveys of the horizontal pressure vessel were performed on 01/26/93. Surveys detected four spots of fixed contamination on the exterior surface approximately one foot up from the bottom of the vessel and one spot on the exterior surface of the lid. Fixed contamination levels on the vessel ranged from 1,000 dpm to 2,000 dpm and the one spot on the lid read 1,500 dpm. No loose contamination was detected on either the vessel or the lid during the survey.

Following scabbling to remove the 0.6 cm surface layer containing potentially hazardous constituents (approximately 1 cubic yard) the remaining nonhazardous concrete rubble (estimated at 30 cubic yards) which cannot be free released, will be stockpiled onsite in a demolition dumpster and undergo sampling and analysis in accordance with guidance provided in the Removal Action No. 17 and No. 9 Work Plans.

The open top tank, skid tank, and horizontal pressure vessel will be decontaminated in the field and/or transported to the decontamination building for final disposition based on FEMP procedures.

3.4.5.5 Other Solid Wastes

Other solid wastes produced from this removal action include soiled protective clothing and decontamination waste. The disposal of contaminated protective clothing is a routine function of FEMP addressed in the existing SOPs (FMPC-0515, FMPC-2128, RM-00091, 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 cotton overalls, splash aprons, respirators and butyl nitrate gloves. For the purposes of

this plan, all protective clothing used in the identified radiologically controlled area are considered radioactivity contaminated until cleaned and surveyed for re-use.

3.5 HEALTH AND SAFETY

The health and safety program for the activities described in this plan shall be based upon the FEMP Safe Shutdown Health and Safety Plan. All operations conducted during the removal action shall be in compliance with FEMP procedures and state and Federal occupational safety and health regulations.

The FTF HASP will include the Hazard Analysis derived from the Safe Shutdown HASP. The Hazard Analysis will incorporate information obtained from the Risk Assessment Report and specific FEMP procedures. The completed FTF Hazard Analysis Form is included as Attachment 3.

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 removal action and closure will be conducted according to the overall QA program at the FEMP as described in the FEMP SCQ (FD-1000, September 22, 1992). The Quality Assurance Project Plan is based on the criteria specified in American Society of Mechanical Engineers NQA-1, USEPA 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 surveillance to verify compliance with the Quality Assurance Project Plan (Attachment 4).

3.7 ARARs ANALYSIS

The FTF action 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 CFR § 300.400[g]). The following ARARs matrix (Table 3-11) identifies the laws and regulations which should be considered during the FTF 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 materials, wastes, and debris at the FTF.

Table 3-11. Regulatory requirements for the removal and closure of the Fire Training Facility.

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. Specifies annual concentration and method for determining if effluent can be discharged to surface water.	NRC public dose rates are relevant to the operation of activities during the removal action. Effluent may be discharged to Great Miami River.
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.	Debris, salvage materials, and wastes 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.

Table 3-11. Regulatory requirements for the removal and closure of the Fire Training Facility.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
10 C.F.R. § 20.1904 to .1905	Relevant and Appropriate	Action	NRC	Labeling	Requires labeling of containers storing radioactive waste.	Open top tank, block building debris, horizontal pressure vessel, skid tank and soils may be radioactive.
10 C.F.R. § 20.2001	Relevant and Appropriate	Chemical	NRC	Release of Effluent	Allows effluent to be released if meets levels specified in § 20.1301.	Liquid from pond and open top tank may be discharged to Great Miami River.
10 C.F.R. Part 61	Relevant and Appropriate	Action	NRC	Low-Level Radioactive Waste Disposal Facilities	Establishes criteria for the design of a radioactive waste disposal facility.	Radioactive waste (i.e., soils from FTF) will be permanently disposed of in LLW disposal facility.
10 C.F.R. § 830.340	To Be Considered[a]	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.
10 C.F.R. § 835.101	To Be Considered[a]	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.

Table 3-11. Regulatory requirements for the removal and closure of the Fire Training Facility.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
10 C.F.R. § 835.202	To Be Considered[a]	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[a]	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[a]	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[a]	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 3-11. Regulatory requirements for the removal and closure of the Fire Training Facility.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
10 C.F.R. § 835.209	To Be Considered[a]	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[a]	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[a]	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[a]	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.

Table 3-11. Regulatory requirements for the removal and closure of the Fire Training Facility.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
10 C.F.R. § 835.404	To Be Considered[a]	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 (i.e., block building debris, horizontal pressure vessel and skid tanks, and open top tank), may consider these regulations in determining transportation of materials within the facility.
10 C.F.R. § 835.501	To Be Considered[a]	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.	FTF is located in a radiological area.
10 C.F.R. § 835.601	To Be Considered[a]	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.	FTF is located in a radiological area.

4779
109

Table 3-11. Regulatory requirements for the removal and closure of the Fire Training Facility.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
10 C.F.R. § 835.602	To Be Considered[a]	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.	FTF is located in a radiological area.
10 C.F.R. § 835.603	To Be Considered[a]	Location	DOE	Radiological Area	Requires posting of each access point to a radiological area. Specific postings are mandated to reflect different dose ranges.	FTF is located in a radiological area.
10 C.F.R. § 835.901	To Be Considered[a]	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.

Table 3-11. Regulatory requirements for the removal and closure of the Fire Training Facility.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
10 C.F.R. § 835.902	To Be Considered[a]	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[a]	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.
10 C.F.R. § 835.1003	To Be Considered[a]	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[a]	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.

111
4779

Table 3-11. Regulatory requirements for the removal and closure of the Fire Training Facility.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
10 C.F.R. § 835.1202	To Be Considered[a]	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 CFR § 1910.120	Applicable	Action	OSHA	Hazardous Waste Operations and Emergency Response	Provides detailed definitions pertaining to hazardous waste operations.	Removal action at the FTF will meet OSHA requirements.
29 CFR Part 1910, Subpart D	Applicable	Action	OSHA	Walking-Working Surfaces	Provides safety requirement for walking-working surfaces.	Removal action at the FTF will meet OSHA requirements.
29 CFR Part 1910, Subpart G	Applicable	Action	OSHA	Occupational Health and Environmental Control	Provides safety requirements for ventilation, noise exposure and ionizing radiation.	Removal action at the FTF will meet OSHA requirements.
29 CFR Part 1910, Subpart H	Applicable	Action	OSHA	Hazardous Material	Provides safety requirements for the handling of hazardous materials.	Removal action at the FTF will meet OSHA requirements.
29 CFR 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 at the FTF will meet OSHA requirements.

Table 3-11. Regulatory requirements for the removal and closure of the Fire Training Facility.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
29 CFR Part 1910, Subpart L	Applicable	Action	OSHA	Fire Protection	Provides requirements for fire protection in workplace.	Removal action at the FTF will meet OSHA requirements.
29 CFR 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 at the FTF will meet OSHA requirements.
29 CFR 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 at the FTF will meet OSHA requirements.
29 CFR Part 1910, Subpart Z	Applicable	Chemical	OSHA	Toxic and Hazardous Substances	Provides exposure limits for employee exposure to toxic or hazardous substances.	Removal action at the FTF will meet OSHA requirements.
29 CFR Part 1926	Applicable	Action	OSHA	Safety and Health Regulations for Construction	Provides worker protection requirements for construction-related activities.	Construction-related activities subject to OSHA will be performed during the removal.
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. Parts 141 and 142 (O.A.C. 3745-81)	Relevant and Appropriate	Chemical	EPA	MCL Standards	Specifies MCL standards for organics, inorganics, and radionuclides.	MCL standards are relevant and appropriate to determining decontamination levels and for groundwater remediation at the FTF.

Table 3-11. Regulatory requirements for the removal and closure of the Fire Training Facility.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
40 C.F.R. Part 192	Relevant and Appropriate	Action	EPA	Health and Environmental Protection Standards for Uranium and Thorium Mild Tailings	Specifies standards for management of uranium byproduct materials and thorium byproduct materials.	Relevant and appropriate standards for management of uranium and thorium contaminated materials at FTF.
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.	FTF is a hazardous waste management unit.
40 C.F.R. § 260.10 (O.A.C. 3745-50)	Applicable	Action	EPA	Definition of Wastewater Treatment Unit	Defines wastewater treatment unit.	Liquid from open top tank and pond will be treated in wastewater treatment unit.
40 C.F.R. § 261.2 (O.A.C. 3745-51-02)	Applicable	Chemical	EPA	Definition of Waste	Defines solid waste under subtitle C of RCRA.	FTF contains wastes.
40 C.F.R. § 261.3 (O.A.C. 3745-51-03)	Applicable	Chemical	EPA	Definition of Hazardous Waste	Defines hazardous waste.	FTF 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.	Under this regulation source, special nuclear, and byproduct materials are exempt from RCRA regulation. The radioactive contaminated wastes and radioactive portion of the mixed waste at the FTF are exempt from RCRA regulation.

Table 3-11. Regulatory requirements for the removal and closure of the Fire Training Facility.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
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 FTF.
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 FTF.
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 FTF may be characteristic wastes.
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 the open top tank and surface pond or soils may meet TCLP designations.
40 C.F.R. § 261.31 (O.A.C. 3745-51-31)	Relevant and Appropriate	Chemical	EPA	Hazardous Waste from Nonspecific Sources	Enumerates solid wastes which are listed hazardous wastes from nonspecific sources.	Liquid contained in open top tank and pond and soils may be listed waste.
40 C.F.R. § 265.1 (O.A.C. 3745-55-01)	Applicable	Action	EPA	Applicability of Interim Status Rules	Exempts wastewater treatment units from the interim status regulations.	Liquid from the open top tank and pond will be treated in wastewater treatment unit.
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 wastes from the FTF and soils will need to be sampled and analyzed.

Table 3-11. Regulatory requirements for the removal and closure of the Fire Training Facility.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
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.	Because hazardous waste from the FTF will be stored at an on-site TSDF, these inspection requirements will need to be complied with.
40 C.F.R. § 262.10 (O.A.C. 3745-52-10)	Applicable	Action	EPA	Purpose, Scope, and Applicability	Specifies that regulations apply to generators of who treat stove or dispose of hazardous waste off-site.	Regulation will be applicable if FTF hazardous wastes are treated or disposed of off-site.
40 C.F.R. § 262.11 (O.A.C. 3745-52-11)	Applicable	Action	EPA	Hazardous Waste Determination	Requires that generators of hazardous waste determine if waste is hazardous through specified methods.	Prior to determining applicability of regulations, FEMP will be to make hazardous waste determination.
40 C.F.R. § 262.12 (O.A.C. 3745-52-12)	Applicable	Action	EPA	EPA Identification Number	Requires that generators must obtain an EPA identification number prior to treating, ___, disposing, offering for transport, or transporting hazardous waste. Specifies that generator must not offer hazardous waste for transport to TSDF unless TSDF has hazardous waste identification number.	The FEMP has a hazardous waste identification number. Prior to transport of FTF hazardous waste, FEMP must ensure offsite TSDF has hazardous waste identification numbers.

4279

Table 3-11. Regulatory requirements for the removal and closure of the Fire Training Facility.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
40 C.F.R. §§ 262.20 through 262.23 (O.A.C. 3745-52-20 through 3745-52-23)	Applicable	Action	EPA	Manifest Requirements	Requires that generators who offer for transport or transport hazardous waste to off-site TSDF must prepare a manifest; specifies number of copies and use requirements for the manifest.	If FTF hazardous waste is transported off-site, FEMP must comply with these requirements.
40 C.F.R. §§ 262.30 through 262.33 (O.A.C. 3745-52-30 through 3745-52-33)	Applicable	Action	EPA	Pre-Transportation Requirements	Specifies packaging, labeling, marking, and placarding standards for hazardous waste being transported off-site.	If FTF hazardous waste is transported off-site, FEMP must comply with these requirements.
40 C.F.R. §§ 262.40 through 262.44 (O.A.C. 3745-52-40 through 3745-52-44)	Applicable	Action	EPA	Recordkeeping and Recording Requirements	Specifies requirements for submittal of exception and biennial/annual report and keeping records of manifests, biennial/annual reports, exception reports, and test analysis.	If FTF hazardous waste is transported off-site, FEMP must comply with these requirements.
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.	Personnel will be trained as described in the RCRA Part B Permit Application.
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.	Precautions must be taken in storing the liquids from the open top tank and pond and soils to ensure the containers and tanks hold compatible wastes.

Table 3-11. Regulatory requirements for the removal and closure of the Fire Training Facility.

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.	The FEMP 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.	Because hazardous waste from FTF will be stored at FEMP TSDF, contingency plan requirements will need to be met.
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. Records are kept in the RCRA Operating Record and Administrative Record.	Because hazardous waste from FTF will be stored at FEMP TSDF, recordkeeping and recording requirements for the FEMP TSDF will need to be met.
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.	If hazardous waste is released from the FEMP, when FTF wastes will be stored, then release monitoring and response requirements will need to be met.

Table 3-11. Regulatory requirements for the removal and closure of the Fire Training Facility.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
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.	Closure of the FTF will comply with these standards to the extent possible. However, since remediation goals have not been established yet under the ROD, some specific cleanup/closure performance standards may not be met. These standards will be met after completion of the ROD.
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.	Closure plan requirements will be incorporated into this CPID.
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 FTF, contaminated debris and tanks, and soils 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.	The FEMP will provide certification that closure of the FTF was accomplished in accordance with this CPID.
40 C.F.R. § 265.171 (O.A.C. 3745-66-71)	Applicable	Action	EPA	Condition of Containers	Established standards for containers storing hazardous wastes.	Containers storing the soils from FTF will need to meet these requirements.

Table 3-11. Regulatory requirements for the removal and closure of the Fire Training Facility.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
40 C.F.R. § 265.172 (O.A.C. 3745-66-72)	Applicable	Action	EPA	Compatibility of Waste with Container	Requires that waste not react with or be otherwise incompatible with the container.	Containers storing the soils from the FTF will need to meet these requirements.
40 C.F.R. § 265.173 (O.A.C. 3745-66-73)	Applicable	Action	EPA	Management of Containers	Requires that container holding waste remain closed, and be handled in a manner to prevent rupture or leaking.	Containers storing the soils from the FTF will need to meet these requirements.
40 C.F.R. § 265.174 (O.A.C. 3745-66-74)	Applicable	Action	EPA	Inspections	Requires weekly inspection of containers for leaks. Requires maintaining a record of the inspections.	Containers storing the soils from the FTF will need to meet these requirements.
40 C.F.R. § 265.177 (O.A.C. 3745-66-77)	Applicable	Action	EPA	Special Requirements for Incompatible Wastes	Requires that incompatible wastes be stored separately.	Storage of soils must meet this requirement.
40 C.F.R. § 265.228	Applicable	Action	EPA	Closure and Post-closure Care	Specifies the requirements for closure for surface impoundments.	Because FTF is a surface impoundment, it will need to meet closure requirements.
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.	FTF removal action is subject to this regulation and plan should comply with the requirements.

Table 3-11. Regulatory requirements for the removal and closure of the Fire Training Facility.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
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 FTF 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 and for debris which must be met prior to land disposal.	Treatment technology standards will need to be met. For any non-soil hazardous wastes at the FTF (i.e., liquids contained in the above ground bank and pond). Mixed waste soils are currently exempt from LDR standards under a nationwide variance. Excavated soils will be stockpiled within the AOC pending characterization. Radiologically contaminated soils will then be managed per the requirements of R.A. #17. Specific treatment standards for hazardous debris are outlined under § 268.45.

Table 3-11. Regulatory requirements for the removal and closure of the Fire Training Facility.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
49 C.F.R. Parts 172 and 173	Applicable	Action	DOT	Transportation of Radioactive Materials	Specifies manifesting, placarding, storing, and transporting requirements for low-level radioactive waste.	Radioactively contaminated debris, soils, and hazardous wastes may be transported off-site.
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.
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. Specifies effluent limitations for radioactive materials discharged to surface water. Specifies limits on release of residual radioactive materials (based on NRC standards in Section 4 of Regulatory Guide 1.86).	Removal action will require compliance with radiation protection standards. Liquid from open top tank and pond will be discharged to Great Miami River. Debris and scrap metal will require decontamination.

Table 3-11. Regulatory requirements for the removal and closure of the Fire Training Facility.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
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	Block building debris, horizontal pressure vessel, skid tank, open top tank, and soils may be subject to DOE requirements.
DOE Order 6430.1A	To Be Considered	Action	EPA	General Design Criteria	Eliminates design criteria for storage facilities at DOE facilities.	Radioactive waste from FTF will need to be stored at an approved DOE storage facility.

123
4779

Table 3-11. Regulatory requirements for the removal and closure of the Fire Training Facility.

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.	FTF removal action should consider radiation standards.
O.A.C. 3745-33	Applicable	Action	OEPA	NPDES Permits	Specifies requirements for NPDES permits.	Prior to discharge of liquids from FTF through FEMP wastewater treatment system, discharge will need to meet NPDES permit requirements.
O.A.C. 3745-1-21	Applicable	Action	OEPA	Surface Water Standards for Great Miami River	Specifies surface water quality standards for the Great Miami River.	Discharge of effluent through FEMP wastewater treatment system may need to comply with these standards.
O.A.C. 3745-81-25A	Applicable	Chemical	OEPA	Analytical Methods for Radioactivity	Specifies analytical methods, references for other radionuclides not listed, detection limits, and data handling for radioactivity.	In testing radionuclides in groundwater, testing methods may be employed.
PP0303.200	To Be Considered	Action	OEPA	Review of Groundwater Sampling and Analysis Plans	Policy for review procedures conducted by the DGW of sampling and analysis plans.	Guidance may want to be considered in drafting sampling and analysis plan for groundwater.

Table 3-11. Regulatory requirements for the removal and closure of the Fire Training Facility.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
Guidance (May 28, 1991)	Applicable	Action	OEPA	Closure Plan Review Guidance	Provides description of process OEPA employs to determine closure.	The CPID will comply with the intent and substantive requirements for closure plans as specified in this document.
42 USC § 2011 et seq.	Applicable	Action	DOE	Atomic Energy Act	Provides the framework for managing radioactive waste.	FTF will 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.
EPA 600/4-89/034	TBC	Action	EPA	Handbook of Suggested Practices for the Design and Installation of Groundwater Monitoring Wells	Describes how to design and install groundwater monitoring wells.	Monitoring wells will be installed at the FTF.

a This statute is proposed and therefore is To Be Considered.

125
4779

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 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 closure of the FTF was accomplished 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 SACD, RCRA regulations, and all other ARARs and guidance discussed in this document.

4.1 RCRA CLOSURE STANDARDS

4.1.1 Standard of Clean for Soil Samples

Soil samples will be collected and analyzed for the FTF contaminants of concern (Section 3.3). The soil will be considered clean if none of the samples exceeds applicable standards. For metals and organic compounds identified in the RSE, the standard of clean will be based on comparison to FEMP background concentrations as determined by the FEMP soil background study (FERMCO 1993). The soil will be considered clean if none of the samples exceeds the upper tolerance level (UTL) for metals, while background concentrations for organic compounds are assumed to be zero.

For the purpose of this action, radiologically contaminated soil will be left in place if none of the samples exceeds 100 pCi/g uranium, 50 pCi/g thorium, or 5 pCi/g radium, the levels established by Removal Action No. 17 (FEMP 1993) as the point at which radiologically contaminated soils require controlled storage.

4.1.2 Decontamination Verification of the FTF Components

Decontamination that may be performed in the field or at the FEMP decontamination building in accordance with Removal Action No. 9 (WEMCO 1992) will be verified based on samples from final rinsate. Decontamination will be complete when the final rinsate 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 (Attachment 5, Table 5-2).

The Decontamination Action Levels enumerated in Table 4-1 have been established for this action based upon OEPA guidance (OEPA 1991) and the nature of FTF components to be decontaminated. Unlike tanks systems that are decontaminated to TCLP levels in final rinsate samples, the FTF components are more appropriately decontaminated to the levels in Table 4-1. 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 milligrams per liter (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 by a qualified, independent registered professional engineer licensed in Ohio or his/her designated representatives to ensure that the FTF is closed in accordance with this plan. Representatives of the DOE and FERMCO shall also conduct inspections during the performance of response actions. The major emphasis of the closure inspection will be:

Table 4-1. Decontamination action levels. Page 1 of 2

Analyte	MCL/MCLG (mg/l)[a/]	Decontamination Action Levels (mg/l)[b/]
Inorganics		
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
Organics		
Acetone	-	1.0
Bis(2-ethylhexel)-phthalate	-	1.0
Chloroform	0.1	1.0
Dioxin	.00000003	.00000045
1,2-dichloroethane	0.005	0.075
1,1-dichloroethene	0.007	0.105
1,2-dichloroethylene	0.07	1.0
2,4-Dimethylphenol	-	1.0
Ethylbenzene	0.7	1.0
Methylene chloride	0.005	0.075
n-nitrosodiphenylamine	-	1.0
PCBs	0.0005	0.0075
pentachlorophenol	0.001	0.015
tetrachloroethene	0.005	0.075
Trichloroethylene	0.005	0.075

4779

Table 4-1. Decontamination action levels.

Analyte	MCL/MCLG (mg/l)[a/]	Decontamination Action Levels (mg/l)[b/]
toluene	1.0	1.0
1,1,1-trichloroethane	0.2	1.0
Xylene	10	1.0

a/ Maximum Contaminant Levels or Maximum Contaminant Level Goals as listed in 40 C.F.R. Parts 141 and 142, O.A.C. 3745-81-11, and O.A.C 3745-81-12.
b/ pH range is not characteristic of corrosivity.

129

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

- To ensure that the structures from the FTF, including the open top tank, skid tank, sump piping, and horizontal pressure vessel are properly dispositioned

- To ensure that the block building debris is disposed of in accordance with Removal Action No. 17

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

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

4.3 CERTIFICATION DOCUMENTS

All closures of HWMU must be certified by both the owner or operator and a qualified, independent registered professional engineer 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)

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 FTF 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 Fire Training Facility has been closed in accordance with the closure plan information and data for the Fire Training Facility as approved by the Ohio EPA on....(date)."

4.5 POST-CLOSURE PLAN

As all hazardous waste and hazardous waste residues from the FTF will be removed at closure, no post-closure plan will be required.

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. As all hazardous waste and hazardous waste residues from the FTF will be removed at closure, no notice in deed will be required.

5.0 SCHEDULE

4779

Ohio environmental regulations include schedule requirements for completing closure of RCRA waste facilities. OAC 3745-66-13 (A) and (B) require that the DOE remove any hazardous waste inventories within 90 days and that the DOE complete all closure actions within 180 days after the OEPA approves a closure plan.

The CERCLA programs and activities that will achieve closure of the FTF are discussed in Section 3.0 of this CPID. As indicated in Table 5-1, completing these actions will require more than 180 days. In accordance with OAC 3745-66-13(A)(1) and (2), the DOE requests that the Director of OEPA approve the extended schedule to allow completion of closure through the CERCLA process as described in Section 3.0.

During the extended closure performance schedule, the FEMP staff will continue to inspect the FTF and conduct all activities prescribed by the existing FEMP Spill Prevention, Control, and Countermeasures Plan. As documentation for the CERCLA programs is developed (e.g., work plans, evaluations of sampling and analytical data, etc.), the DOE will provide the OEPA with copies of the documents for review and comment. In addition, the standard procedures for RCRA closures will require that the FEMP field supervisors contact both the independent, registered, professional engineer(s) and OEPA's facility inspector(s) at least 5 business days prior to any significant activity. Significant activities in closing the FTF will include: sampling, removing, and containerizing any surface water from the open top tank, skid tank pond and sump, and the horizontal pressure vessel end piece; removing, sampling, and dispositioning debris and scrap materials; excavating, sampling and containerizing contaminated soils; and sampling residual soils and perched water.

Section 3.0 of this plan specified the ongoing and planned CERCLA programs for removing and remediating contamination at the FEMP that will accomplish the objectives of the FTF closure. The July 1986 USEPA/DOE Federal Facilities Compliance Agreement, as amended by the September 1991 Consent Agreement,

establishes schedules for these CERCLA programs. Table 5-1 lists the milestone schedule for the interim FTF source area removal actions. Factors considered in the development of this schedule include the following:

Table 5-1. Milestones for the removal action schedule.

Milestone	Activity Duration (months)	Cumulative Duration (months)[a/]
Work Plan Approval	Start	0
Schedule Hold Interval[b/]	-	-
Identify Removal Organization and Perform Final Design	2	2
Perform Removal Preparations and Training	1	3
Conduct Excavation and Removal Activities, Sampling and Analysis (including procurement activities)	11	14
Final Report	6	20

[a/] Number of months from approval of the work plan.
[b/] A discretionary hold interval is included in the schedule to allow flexibility in timing the start of field activities to coincide with the summer construction season. While the duration of subsequent milestone activities will not be altered, their cumulative durations will increase by the length of the schedule hold, if exercised.

1) Removal of surface liquids and soils will be ineffective if conducted during or immediately following period of sustained rainfall. Therefore, a schedule hold interval has been incorporated into the schedule that will allow field activities to start during a dry season of the year (e.g., in the event of plan approval in the winter, field start-up could be delayed until the following summer).

2) Nationwide, the available capacity of facilities that manage mixed radioactive and hazardous wastes is extremely limited and subject to allocation by a strict system of priorities. Therefore, there is currently no offsite capacity for treating, storing,

or disposing mixed wastes from the FEMP such as probable mixed waste soils from the skid tank pond.

3) It is anticipated that some portion of the wastes resulting from the FTF closure will be characterized as mixed radioactive waste. Limited capacity exists at the TSCA incinerator at Oak Ridge and at Enviro Care in Utah.

4779

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135

4769

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136

ATTACHMENT 1
REMOVAL SITE EVALUATION

CONTAMINATION AT THE
FIRE TRAINING FACILITY
Removal Action Work Plan and
Closure Plan Information and Data Package

Fernald Environmental Management Project

September 1993

4779

REMOVAL SITE EVALUATION

Contamination at the Fire Training Facility

Fernald Environmental Management Project
U. S. Department of Energy

June 1992

138

TABLE OF CONTENTS

		Page
1.0	INTRODUCTION	1
2.0	SOURCE TERM	2
2.1	Hazardous Substance List Sampling Data	2
2.2	Radiological Sampling Data	2
2.3	Radiological Pathway Assessment	3
3.0	EVALUATION OF POTENTIAL THREAT	4
3.1	Hazardous Substance Parameters	4
3.2	Radionuclides	5
4.0	ASSESSMENT OF THE NEED FOR REMOVAL ACTION	9
5.0	APPROPRIATENESS OF A RESPONSE	9
APPENDIX A		10
APPENDIX B		11
APPENDIX C		12
REFERENCES		13
FIGURE 1		
FIGURE 2		

4769

LIST OF TABLES

		Page
Table 1 -	Source Characterization of Radionuclides in soil	6
Table 2 -	Source Characterization for HSLs in soil	6
Table 3 -	Source Characterization for Uranium in Groundwater	7
Table 4 -	Source Characterization of Radionuclides by depth	7
Table 5 -	Potential Drinking Water Dose Equivalents	8

140

4779

REMOVAL SITE EVALUATION

Contamination at the Fire Safety Training Area

Feed Materials Production Center
U. S. Department of Energy

July 1991

1.0 INTRODUCTION

The Fire Safety Training Area is located north of the FMPC Production Area (just outside the fenced perimeter) on the North Access Road. This area has historically been used to simulate fire and emergency response conditions for training purposes. The Fire Safety Training Area presently consists of the following components (See Figure 1):

1. An abandoned two story concrete block structure (bunker) surrounded by an asphalt pad.
2. An eight foot diameter stainless steel pressure vessel with elliptical ends. One end of the vessel has been removed and forms a "bowl" on the east end of the vessel.
3. An unbermed 500 gallon skid mounted steel tank (above ground).
4. An open top partially submerged rectangular tank constructed of steel on all five sides. This tank is believed to be a reclaimed salt bath tank from Plant 6.
5. An underground sump with valve to gravity drain water and oil from the pond around the above ground skid tank.

The windows and door of the concrete block structure (bunker) are boarded up to prevent entry into the structure. There are visible cracks in the asphalt pad around the block structure. The pad and the pressure vessel are located on the west side of the North Access Road and access is uncontrolled. The 500 gallon skid tank contains visible holes and is severely corroded. The tank is located in the center of a very shallow circular pond containing brownish liquid. Black stains are evident around the perimeter of the pond. The open top rectangular tank contains approximately 8 inches of brownish liquid. The skid tank and the rectangular tank are enclosed by a 4 foot livestock fence on the east side of the North Access Road to control access to this area.

From the best available information it was determined that the following list of materials were burned or stored in the Fire Safety Training Area:

Material	Source of Material	Comments
Waste Oil	FMPC	Primarily from Garage (Bldg. 31)
Kerosene	FMPC	
Gasoline	FMPC	
Waste Wood Pallets	FMPC	Possibly contaminated
Straw	Non - FMPC	Primarily from Ross, Ohio
Vehicle	FMPC	
Office Furniture	FMPC	
Household Furniture	Unknown	
Rubber Tires	FMPC	
Small Wood Structure	FMPC	
Metallic Sodium	FMPC	
Magnesium	FMPC	Usually floor sweeping or broken bags (possibly contaminated)
Waste Solvents	Non - FMPC	Brought in by another fire department for training (possibly containing paint thinners)

The Fire Safety Training Area has been identified as a "suspect area" to be remediated under the RI/FS Operable Unit 3. The RI/FS for Operable Unit 3 aimed at investigating the remedial alternatives in the Production Area and other identified suspect areas outside the Production Area is presently underway. The Fire Safety Training area has been determined to be a Hazardous Waste Management Unit (HWMU) under the requirements of the Resource Conservation Recovery Act (RCRA).

This Removal Site Evaluation (RSE) has been completed by the DOE under authorities delegated by Executive Order 12580 under Section 104 of CERCLA and is consistent with Section 300.410 of the National Oil and Hazardous Substance Pollution Contingency Plan (NCP). This RSE addresses contaminated soils in the Fire Safety Training Area and has been completed to support the decision as to whether the present conditions warrant a removal action.

2.0 SOURCE TERM

2.1 Hazardous Substance List Sample Data

Eight piezometers were installed in the Fire Safety Training Area as part of the Remedial Investigation/ Feasibility Study (RI/FS) Facility Testing Program (See Figure 1 for locations). These borings were sampled for full hazardous substance list (HSL) parameters in the soil and groundwater. Appendix A contains the results of this soil and groundwater sampling. Appendix A only includes analyses that were detected. Undetected analytes are not included in Appendix A.

2.2 Radiological Sample Data

Based upon historical data, it is believed that radionuclide contaminated oils and wastes were burned in the fire safety training area. Also, the open top tank which may have been reclaimed from the Plant 6 process area is suspected of being contaminated with radionuclides. A radiological contamination survey was performed at the Fire Safety Training Area by the Industrial Radiation Safety and Training (IRS&T) Department in May 1989. The results of this survey are presented in Figure 2. In May 1990, groundwater sampled from the eight wells mentioned previously was submitted to the International Technology Corporation Radiological Sciences Laboratory for full radiological analysis. The results of this testing is included in Appendix B. Soil samples were submitted for radiological analysis when the eight wells were originally installed in February 1990. The results of this soil sampling is included in Appendix B also.

2.3 Radiological Pathway Assessment

2.3.1 INTRODUCTION:

In order to support the decision as to whether the present conditions warrant a removal action, a risk analysis was conducted (Attachment C) to characterize the risks to a potential Reasonable Maximum Exposure (RME) individual. The RME individual is identified under the exposure scenario. The exposure scenario evaluated the dose and risk associated with a worker installing a security fence and excavating contaminated soil around the salt bath tank and the pond. The exposure to this individual occurs from two exposure pathways: 1) external radiation pathway from working the contaminated region and 2) inhalation radiation pathway resulting from breathing resuspended dust containing with radionuclides.

2.3.2 SOURCE TERM:

Total uranium and thorium, assumed to be represented by a natural isotopic activity distribution, are the only radionuclides of concern. In order to simplify the calculation, as well as provide conservative dose and risk estimates, the maximum total uranium and thorium values were used.

67.8 parts per million = Concentration for Uranium.

138 parts per million = Concentration for Thorium.

Assuming a natural activity distribution would correspond to the following activities:

Total Uranium = 45.2 pCi/g

U-238 = 22.1 Pci/g

U-235 = 1.0 pCi/g

U-234 = 22.1 pCi/g

Although a natural isotopic distribution is assumed for the uranium isotopes, the uranium contamination is assumed to be NORMAL in content, meaning that the uranium has decayed and the only daughters which are included in the dose and risk calculation are the immediate, short-lived daughters, which are thorium-234 and protactinium-234.

Total Thorium represents all thorium-232

Th-232 = 14.96 pCi/g

Th-228 = 14.96 pCi/g (Secular Equilibrium with Thorium-232)

2.3.3 EVALUATION OF MAGNITUDE OF THE POTENTIAL THREAT:

Dose and risk were estimated for the exposure scenario for the maximum identified source locations. The exposure scenario was identified as the worker who performs the excavation activities along with the installation of the security fencing.

The total risk for the exposure scenario is shown below:

Total Risk = 9.70 $x10^{-7}$ (see appendix C)

This risk is based on several assumptions, outlined below, which provide very conservative doses and associated risk.

1) A constant homogeneous source distribution.

2) Conservative, hypothetical exposure scenario.

3) A uniform source distribution.

4) A conservative dust resuspension factor.

Even considering the above assumptions, the doses estimated in this assessment can be considered insignificant. The EPA and NRC have proposed BRC (Below Regulatory Concern) dose levels of between 5 and 10 mrem per year, committed effective dose equivalent. As a result, the risk estimated is in the range of proposed "diminis levels" (Travis, 1989).

3.0 Evaluation of the Magnitude of the Potential Threat

3.1 Hazardous Substance List Parameters

The HSL sampling results included in Appendix A identify the hazardous substances that were detected in the Fire Safety Training Area. The results indicate that boring # 1509 located to the southwest of the 500 gallon skid tank is the only location where appreciable concentrations of organics were detected in the groundwater. Methylene chloride was also detected in the groundwater from borings 1508, 1511, 1513, and 1514 but at concentrations which were inconclusive when considering that methylene chloride was found in the associated blank for these samples. The HSL substances which were detected in the groundwater at levels above MCL standards for drinking water are listed in Table 2.

Elevated levels of calcium, magnesium, and potassium were also reported in the groundwater from these borings but below harmful concentrations when compared to the recommended daily allowances for these minerals. The groundwater in the Fire Training Area is not presently utilized as a drinking water supply but the analytical results from this groundwater are compared to proposed or existing drinking water standards for the purposes of this RSE.

The HSL soil sampling results are listed in Appendix A. It is important to note however, that a larger number of HSL organic parameters were observed in the soil than the groundwater from these borings. It is probable that these organic compounds are held in retention in the soils and have not migrated to the groundwater. Sample results were not received for boring numbers 1510 and 1511 (excluding arsenic, lead, and potassium results for boring 1511). The soil sampling results also show elevated levels of HSL metals including aluminum, calcium, iron, magnesium, manganese, sodium, and potassium. One HSL parameter (Aroclor-1260) from the pesticides/PCB analysis was detected in the soil sampling results from boring numbers 1508 (240 ug/kg) and 1512 (2700 ug/kg).

3.2 Radionuclides

Eight groundwater samples were characterized for a variety of radionuclides, including total uranium and thorium (see Table 3). Four of the samples (50%) for total uranium had concentration levels below the proposed 20 picocuries per liter MCL. The groundwater sampling results are compared to the proposed MCL concentrations for uranium in drinking water assuming natural isotopic proportions of 20 Pci/L and corresponding to a mass concentration of 30 ug/L of total uranium (assuming natural equilibrium). This proposed level must be used since promulgation of a MCL for uranium in community water systems is not expected until 1992. Other specific radionuclides, including thorium, were identified in only a few of the groundwater samples which further emphasizes the conservative nature of the assessment.

The sampling results for radiological parameters in the groundwater demonstrate that the higher activity levels were detected in the piezometers near the above ground skid tank even though the rectangular open topped tank has much higher activity levels on the surface. This could be attributed to the presumption that radionuclide contaminated oils collected in the circular pond around the skid tank and were able to migrate more easily to the groundwater than the surface contamination on the rectangular tank. Two values for total uranium are listed for each well. The wells appear to have been resampled for total uranium only approximately one month after the initial sampling.

Boring 1509 also has the highest radionuclide concentrations. The complete sampling results for radionuclide parameters (Total Uranium and Total Thorium) are included in Appendix B. The acceptable residual concentrations in surface soil is assumed to be 35 Pci/g (approximately 50 ug/g) total uranium and 10 Pci/g (approximately 46 ug/g) total thorium for this removal action. These concentrations were developed from the Nuclear Regulatory Commission (NRC) Branch Technical Position, "Disposal or On-Site Storage of Residual Thorium or Uranium (Either as Natural Ores or Without Daughters Present) From Past Operations" (1981) and has been adapted for numerous sites throughout the United States. The soil sampling results exceeded the guidances as listed in Table 4:

Table 5 lists the average, maximum, and minimum dose equivalents (mrem/yr.) as derived from the Dose conversion factor for each specific radioisotope. Also, the total dose equivalent, found by summing the individual dose equivalents, is shown at the bottom of Table 5.

Table 1: Source Characterization of Radionuclides in Soil Samples

Radionuclide	Average (ug/g)	Maximum (ug/g)	Minimum (ug/g)
Total Thorium	35.75	136	7
Total Uranium	32.05	67.8	16.4

Table 2: Source Characterization for HSLs in Groundwater Samples.

HSL Parameter	Boring #	Results (ug/L)	MCL Standard (ug/L)
2,4-Dimethylphenol	1509	40	5
Bis (2-Ethylhexel)-phthalate	1509	4	3
Methylene chloride	1509	26	5
1,1 Dichloroethene	1509	490	7
1,2 Dichloroethane	1509	19	5
1,1,1 Trichloroethane	1509	2900	200
Trichloroethene	1509	98	5
Tetrachloroethene	1509	280	0.7

Table 3: Source Characterization for Uranium in Groundwater at each Boring.

Boring #	Isotope	Concentration (Pci/L)	Collection Date (MM/DD/YY)
1508	U-Total	53.9	5/2/90
	U-Total	48.7	6/4/90
1509	U-234	47.1	5/2/90
	U-238	45.3	5/2/90
	U-Total	183	5/2/90
	U-Total	41.3	6/4/90
1510	U-234	44.2	5/3/90
	U-238	38.5	5/3/90
	U-Total	97.2	5/3/90
	U-Total	138	6/4/90
1511	U-234	23.6	5/3/90
	U-238	20.2	5/3/90
	U-Total	31.4	5/3/90
	U-Total	57.4	6/4/90
1513	U-Total	11.5	5/2/90
	U-Total	103	6/16/90

Table 4: Source Characterization of Borings by Depth.

Boring #	Isotope	Reading (ug/g)	Depth (ft)
1509	U-Total	67.8	0 - 0.5
1511	Th-Total	82	0 - 0.5
	Th-Total	48	2.5 - 3.0
	Th-Total	78	6.0 - 6.5
1512	U-Total	38.4	0 - 0.5
	U-Total	136	2.5 - 3.0
1515	U-Total	42.3	0 - 0.5

Table 5: Potential Drinking Water Dose Equivalents

Radionuclide	Average Dose (mrem/yr)	Maximum Dose (mrem/yr)	Minimum Dose (mrem/yr)
Radium-226	3.7	4.7	2.7
Thorium-228	1.3	1.9	0.7
Thorium-230	0.8	1.3	0.5
Thorium-232	4.2	5.7	2.7
Uranium-234	3.5	8.9	0.6
Uranium-235/236	0.3	0.7	0.2
Uranium-238	3.1	8.3	0.5
Total Dose	17	32	8

4.0 Assessment of the Need for Removal Action

Consistent with Section 40 CFR 300.410 of the National Contingency Plan, the Department of Energy (DOE) shall determine the appropriateness of a removal action. Eight factors to be considered in this determination are listed in 40 CFR 300.415 (b)(2). The following apply specifically to the above background concentrations of contaminants occurring at the Fire Safety Training Area.

40 CFR 300.415 (b)(2)(i)

Actual or potential exposure to nearby human populations, animals, or food chain from hazardous substances or pollutants or contaminants.

This factor is considered appropriate as a result of the concentrations of contamination at the soils in the Fire Safety Training Facility.

5.0 Appropriateness of a Response

If it is determined that a response action is appropriate due to both the level of contamination found in the soils in the Fire Safety Training Area and the potential of contaminant migration, a removal action may be required to address the existing situation. If a planning period of less than six months exists prior to initiation of a response action, DOE will issue an Action Memorandum. The Action Memorandum will describe the selected response and provide supporting documentation for the decision.

If it is determined that there is a planning period greater than six months before a response is initiated, DOE will issue an Engineering Evaluation/Cost Analysis (EE/CA) Approval Memorandum. This memorandum is to be used to document the threat of public health and the environment. It will also serve as a decision document to be included in the Administrative Record.

In conclusion, this RSE assumes that only the east side of the fire training area needs to be controlled. This assumption is made based upon information in this RSE. A removal action is necessary and should be integrated with the RCRA Hazardous Waste Management Unit (HWMU) closure for the Fire Training Area.

APPENDIX A

HAZARDOUS SUBSTANCE LIST SAMPLING RESULTS

TABLE A.1

Hazardous Substance List Soil Sampling Results

Organics - Current EPA CLP Protocol - MV702 (ug/kg)

Parameter		Boring Number 1508	1509	1510	1511	1512	1513	1514	1515
Methylene Chloride	V	4JB	5JB	D	5JB	5JB			4JB
2-Butanone	V	76B	54B	D	59B	86B			50B
Acetone	V		10JB	D	16B				13B
1,2-Dichlorothane	V		6	D					
1,1,1-Trichloroethane	V		1J	D					
Tetrachloroethene	V		2J	D					
Toluene	V		2J	D					
Hexanedioic Acid, Dioctyl ES	SV			D			240J		
1,2-Dichloroethylene	V		2J	D					
unknown (hydroxypentanone?)	SV			D		1100ABJ	1100ABJ	1300ABJ	1700ABJ
2-Pentanone, 4-Hydroxy 4-Met	SV			D		34000ABJ	17000ABJ	19000ABJ	18000ABJ
Unknown (sat'd HC)	SV			D		840J			
Pentahloraphenol	SV			D			98J		530J
Unknown	SV			D		970	250J	340J	
Benzoic Acid	SV			D			49JB		
2-Hexanal	SV			D			180JB	200BJ	250JB
2-Hexanone, 6-(Acetyloxy)	SV			D			670ABJ	720ABJ	1000ABJ
4-Heptanol, 2-methyl	SV			D			180JB	230JB	
Hexadecanoic acid	SV			D			350JB	200J	
N-Nitrosodi-phenylamine(1)	SV			D				46	
9-Octadecenamide, (2)	SV			D					620J
Chloroform	V			D					2J

TABLE A.1 (Continued)

TAL ICP Metals - EPA CLP Protocol - AP703 (mg/kg)

Parameter		Boring Number 1508	1509	1510	1511	1512	1513	1514	1515
Aluminum		10600	8470	D	14300	13300	14400	16800	12400
Barium		95	69.2	D	119	135	128	156	134
Cadmium		2.6	4.2	D	3.9	3.3	3.4	3.4	2.9
Calcium		44900I	97700I	D	28600I	20600I	10100I	4910I	4850I
Chromium		20.7	24.3	D	23.6	20.8	19.5	19.8	14.3
Iron		19900	16200	D	26500	24200	29900	30200	26900
Magnesium		6190	24600	D	12100	7660	4900	3890	2830
Manganese		436	495	D	833	678	285	1080	765
Silver		2.8		D	2.9	5.6			
Sodium		102	154I	D	87.6I	139I	363I	85.3I	91.2I
Vanadium		24.6	25.8E	D	24.9E	22.9E	20.4D	21.9E	25.7E
Zinc		52.2	47.3E	D	64.8E	75.3E	74.8E	74.7E	54.8E
Beryllium		1.4	1.6	D	1.5	1.8	1.8	1.9	1.7
Cobalt		12.3	10.2I	D	18.6	14.7	13.4	20.3	16.9
Copper		15.3	11.4	D	18.1	19.2	19.8	21.5	13.8
Nickel		34.1	67.1	D	43.2	36.8	50.5	50	28.7
Arsenic	W	4.8	5.1	D	7.6	5.1		10	5.7
Lead	W	14.8	21.1	D	2.1	25.4	20.9	15.4	18.5
Sellenium	W			D					
Thallium	W			D					
Potassium	X	1020	935I	D	827I	977I	783I	775	590I
Mercury	Y		0.18	D	0.11				
Cynide	Z		0.5I	D					

TABLE A.1 (Continued)

EPA CLP TCL Pesticides & PCBs - Current EPA Protocol - (ug/kg)

Parameter	Boring Number 1508	1509	1510	1511	1512	1513	1514	1515
Aroclor-1260	240		D		2700LJ			

TABLE A.2

Hazardous Substance List Groundwater Sampling Results

TAL ICP Metals - EPA CLP Protocol - (ug/l)

Parameter	Boring Number 1508	1509	1510	1511	1512	1513	1514	1515
Aluminum	91.7I	121I	93I	842	89.3I	110I	137I	162I
Barium	77.1I	94.6I	64.9I	78.4I	116I	62.4I	83.4I	115I
Cadmium	3.3I	6.2	5.4	3.7I	6.5	4.6I	4.6I	5.5I
Calcium	105000	155000	126000	116000	136000	106000	98800	111000
Chromium	25.2	35.9	32.2	28	31.1	26.8	24.6	29.6
Iron	59.2I	296	38.5I	555	41.7I	62.2I	108	152
Magnesium	30500	45300	30700	32000	52200	33400	33100	41800
Manganese	1470	2540	344	1220	794	67.3	74.3	206
Silver	17.9	24.3	21.6	19.3	21.5	18.5	17.9	19
Sodium	19500	33600	18500	12200	20000	21300	11800	26000
Vanadium	14.3I	19.3I	16.1I	14I	16.1I	14I	12.9I	14.4I
Zinc	17.9I	11.4I	10.3I	9.2I	17.7I	12I	10.5I	
Arsenic	2.2I	2.8I				7.1F		
Lead	5.3NI	2.6INI				5INI		3.5INI
Potassium	1030I	695I	1060I	2380I	2330I	597I	1340I	514I
Copper		11.7I	12.1I					
Nickel		25.6I		20I	20.8I	20.2I		21.6I
Mercury				.73N				

TABLE A.2 (Continued)

Organics - Current EPA CLP Protocol - (ug/l)

Parameter	Boring Number 1508	1509	1510	1511	1512	1513	1514	1515
Benzyl alcohol		5J						
4-Methylphenel		15						
2,4-Dimenthylphenol		40						
Benzoid Acid		25J						
bis (2-Ethylhexl) phthalate		4J						
Methylene Chloride V	1BJ	26B		1BJ		1BJ	1BJ	
1,1-Dichloroethane V	3J	2500E						
Chloroethane V		110						
1,1-Dichloroethene V		490E						
1,2-Dichloroethane V		19						
1,1,1-Trichloroethane V		2900E						
Trichloroethene V		98						
Tetrachloroethene V		280E						
Toluene V		260E						
Ethylbenzene V		13						
Total Xylenes V		55						
Acetone V		59						

TABLE A.3

Qualifiers and Symbols

B	Analyte found in associated blank
J	Estimated value (1:1 response assumed or less than quantitations limit but greater than zero)
A	A TIC is a suspected aldol-condensation product
I	Reported value is less than Contract-Required Detection Limit (CRDL), but greater than the Instrument Detection Limit (IDL)
E	Estimated value due to interference
N	Spiked sample recovery not within control limits
T	Duplicate analysis not within control limits
W	TAL Metal Analysis by Furnace - Current EPA CLP Protocol
X	Potassium by Flame - Current EPA CLP Protocol
Y	Mercury by Cold Vapor - Current EPA CLP Protocol
Z	Total Cyanide - Current EPA CLP Protocol
D	Sample results have not been returned from laboratory to date.
L	Compound analyzed at a secondary dilution factor
V	Volatile Organic by GCMS - Current EPA CLP Protocol - (ug/L)
SV	Semi-volatile organic
F	Post digestion spike for furnace AA analysis is out of control limits

Blank fields indicate that analyte was not detected.

APPENDIX B

RADIOLOGICAL SAMPLING RESULTS

TABLE B.1

Radiological Groundwater Sampling Results from Boring 1508

Parameter	Result	2-Sigma Error	Units	Date Collected
NP-237	< 1.0		pCi/L	5/2/90
PU-238	< 1.0		pCi/L	5/2/90
PU-239/240	< 1.0		pCi/L	5/2/90
RA-226	3.37	0.57	pCi/L	5/2/90
RA-228	< 3.0		pCi/L	5/2/90
SR-90	< 5.0		pCi/L	5/2/90
TC-99	< 30		pCi/L	5/2/90
TH-228	3.40	0.95	pCi/L	5/2/90
TH-230	3.44	0.96	pCi/L	5/2/90
TH-232	2.84	0.85	pCi/L	5/2/90
TH-Total	25.6	7.7	ug/L	5/2/90
U-234	15.7	2.2	pCi/L	5/2/90
U-235/236	1.20	0.39	pCi/L	5/2/90
U-238	15.2	2.2	pCi/L	5/2/90
U-Total	53.9	8.4	ug/L	5/2/90
CS-137	< 20		pCi/L	5/2/90
RU-106	< 150		pCi/L	5/2/90
U-Total	48.7	6.8	ug/L	6/4/90

TABLE B.1 (Continued)

Radiological Groundwater Sampling Results From Boring 1509

Parameter	Result	2-Sigma Error	Units	Date Collected
NP-237	< 1.0		pCi/L	5/2/90
PU-238	< 1.0		pCi/L	5/2/90
PU-239/240	< 1.0		pCi/L	5/2/90
RA-226	< 1.0		pCi/L	5/2/90
RA-228	< 3.0		pCi/L	5/2/90
SR-90	< 5.0		pCi/L	5/2/90
TC-99	< 30		pCi/L	5/2/90
TH-228	< 1.0		pCi/L	5/2/90
TH-230	2.67	0.89	pCi/L	5/2/90
TH-232	< 1.0		pCi/L	5/2/90
TH-Total	5.91	4.25	ug/L	5/2/90
U-234	47.1	17.9	pCi/L	5/2/90
U-235/236	2.4	0.6	pCi/L	5/2/90
U-238	45.3	5.9	pCi/L	5/2/90
U-Total	183	30	ug/L	5/2/90
CS-137	< 20		pCi/L	5/2/90
RU-106	< 150		pCi/L	5/2/90
U-Total	41.3	9.9	ug/L	6/4/90

TABLE B.1 (Continued)

Radiological Groundwater Sampling Results From Boring 1510

Parameter	Result	2-Sigma Error	Units	Date Collected
NP-237	< 1.0		pCi/L	5/3/90
PU-238	< 1.0		pCi/L	5/3/90
PU-239/240	< 1.0		pCi/L	5/3/90
RA-226	5.93	0.91	pCi/L	5/3/90
RA-228	< 3.0		pCi/L	5/3/90
SR-90	< 5.0		pCi/L	5/3/90
TC-99	*		pCi/L	5/3/90
TH-228	< 1.0		pCi/L	5/3/90
TH-230	1.21	0.64	pCi/L	5/3/90
TH-232	1.31	0.66	pCi/L	5/3/90
TH-Total	11.8	6.0	ug/L	5/3/90
U-234	44.2	5.7	pCi/L	5/3/90
U-235/236	3.74	0.77	pCi/L	5/3/90
U-238	38.5	5.0	pCi/L	5/3/90
U-Total	96.2	12.9	ug/L	5/3/90
CS-137	< 20		pCi/L	5/3/90
RU-106	< 150		pCi/L	5/3/90
U-Total	138	18	ug/L	6/4/90

* Data will be reported by the laboratory at a later date.

TABLE B.1 (Continued)

Radiological Groundwater Sampling Results From Boring 1511

Parameter	Result	2-Sigma Error	Units	Date Collected
NP-237	< 1.0		pCi/L	5/3/90
PU-238	< 1.0		pCi/L	5/3/90
PU-239/240	< 1.0		pCi/L	5/3/90
RA-226	< 1.0		pCi/L	5/3/90
RA-228	< 3.0		pCi/L	5/3/90
SR-90	< 5.0		pCi/L	5/3/90
TC-99	•		pCi/L	5/3/90
TH-228	< 1.0		pCi/L	5/3/90
TH-230	< 1.0		pCi/L	5/3/90
TH-232	< 1.0		pCi/L	5/3/90
TH-Total	< 3.7		ug/L	5/3/90
U-234	23.6	3.0	pCi/L	5/3/90
U-235/236	2.48	0.52	pCi/L	5/3/90
U-238	20.2	2.6	pCi/L	5/3/90
U-Total	31.4	5.1	ug/L	5/3/90
CS-137	< 20		pCi/L	5/3/90
RU-106	< 150		pCi/L	5/3/90
U-Total	57.4	11.8	ug/L	6/4/90

• Data will be reported by the laboratory at a later date.

TABLE B.1 (Continued)

Radiological Groundwater Sampling Results From Boring 1512

Parameter	Result	2-Sigma Error	Units	Date Collected
NP-237	< 1.0		pCi/L	5/3/90
PU-238	< 1.0		pCi/L	5/3/90
PU-239/240	< 1.0		pCi/L	5/3/90
RA-226	< 1.0		pCi/L	5/3/90
RA-228	< 3.0		pCi/L	5/3/90
SR-90	*		pCi/L	5/3/90
TC-99	*		pCi/L	5/3/90
TH-228	< 1.0		pCi/L	5/3/90
TH-230	< 1.0		pCi/L	5/3/90
TH-232	< 1.0		pCi/L	5/3/90
TH-Total	< 7.0		ug/L	5/3/90
U-234	4.44	0.83	pCi/L	5/3/90
U-235/236	< 1.0		pCi/L	5/3/90
U-238	3.20	0.66	pCi/L	5/3/90
U-Total	12.9	1.4	ug/L	5/3/90
CS-137	< 20		pCi/L	5/3/90
RU-106	< 150		pCi/L	5/3/90
U-Total	23.4	3.6	ug/L	6/16/90

* Data will be reported by the laboratory at a later date.

TABLE B.1 (Continued)

Radiological Groundwater Sampling Results From Boring 1513

Parameter	Result	2-Sigma Error	Units	Date Collected
NP-237	< 1.0		pCi/L	5/2/90
PU-238	< 1.0		pCi/L	5/2/90
PU-239/240	< 1.0		pCi/L	5/2/90
RA-226	< 1.0		pCi/L	5/2/90
RA-228	< 3.0		pCi/L	5/2/90
SR-90	< 5.0		pCi/L	5/2/90
TC-99	< 30.		pCi/L	5/2/90
TH-228	1.29	0.55	pCi/L	5/2/90
TH-230	< 1.0		pCi/L	5/2/90
TH-232	< 1.0		pCi/L	5/2/90
TH-Total	7.78	4.19	ug/L	5/2/90
U-234	2.94	0.60	pCi/L	5/2/90
U-235/236	< 1.0		pCi/L	5/2/90
U-238	2.71	0.57	pCi/L	5/2/90
U-Total	11.5	1.2	ug/L	5/2/90
CS-137	< 20		pCi/L	5/2/90
RU-106	< 150		pCi/L	5/2/90
U-Total	103	14	ug/L	6/16/90

- Data will be reported by the laboratory at a later date.

TABLE B.1 (Continued)

Radiological Groundwater Sampling Results From Boring 1514

Parameter	Result	2-Sigma Error	Units	Date Collected
NP-237	< 1.0		pCi/L	5/3/90
PU-238	< 1.0		pCi/L	5/3/90
PU-239/240	< 1.0		pCi/L	5/3/90
RA-226	< 1.0		pCi/L	5/3/90
RA-228	< 3.0		pCi/L	5/3/90
SR-90	< 5.0		pCi/L	5/3/90
TC-99	*		pCi/L	5/3/90
TH-228	< 1.0		pCi/L	5/3/90
TH-230	1.28	0.55	pCi/L	5/3/90
TH-232	< 1.0		pCi/L	5/3/90
TH-Total	< 4.7		ug/L	5/3/90
U-234	6.22	0.99	pCi/L	5/3/90
U-235/236	< 1.0		pCi/L	5/3/90
U-238	5.31	0.88	pCi/L	5/3/90
U-Total	18.1	2.7	ug/L	5/3/90
CS-137	< 20		pCi/L	5/3/90
RU-106	< 150		pCi/L	5/3/90
U-Total	10.6	1.1	ug/L	6/16/90

* Data will be reported by the laboratory at a later date.

TABLE B.1 (Continued)

Radiological Groundwater Sampling Results From Boring 1515

Parameter	Result	2-Sigma Error	Units	Date Collected
NP-237	< 1.0		pCi/L	5/2/90
PU-238	< 1.0		pCi/L	5/2/90
PU-239/240	< 1.0		pCi/L	5/2/90
RA-226	< 1.0		pCi/L	5/2/90
RA-228	< 3.0		pCi/L	5/2/90
SR-90	< 5.0		pCi/L	5/2/90
TC-99	< 30.		pCi/L	5/2/90
TH-228	< 1.0		pCi/L	5/2/90
TH-230	< 1.0		pCi/L	5/2/90
TH-232	< 1.0		pCi/L	5/2/90
TH-Total	2.75	2.49	ug/L	5/2/90
U-234	4.79	0.80	pCi/L	5/2/90
U-235/236	< 1.0		pCi/L	5/2/90
U-238	4.20	0.72	pCi/L	5/2/90
U-Total	11.0	1.9	ug/L	5/2/90
CS-137	< 20		pCi/L	5/2/90
RU-106	< 150		pCi/L	5/2/90
U-Total	15.8	2.6	ug/L	6/16/90

- Data will be reported by the laboratory at a later date.

TABLE B.2

Radiological Soil Sampling Results from Boring 1508

Parameter	Depth (ft.)	Result	2-Sigma Error	Units
U - Total	0.0 - 0.5	16.4	2.6	ug/g
U - Total	3.0 - 3.5	8.26	2.54	ug/g
U - Total	6.0 - 6.5	10.6	3.0	ug/g
U - Total	10.0 - 10.5	<3.45		ug/g
Th - Total	0.0 - 0.5	5	2	ug/g
Th - Total	3.0 - 3.5	14	4	ug/g
Th - Total	6.0 - 6.5	10	3	ug/g
Th - Total	10.0 - 10.5	6	2	ug/g

Radiological Soil Sampling Results from Boring 1509

Parameter	Depth (ft.)	Result	2-Sigma Error	Units
U - Total	0.0 - 0.5	67.8	8.1	ug/g
U - Total	3.0 - 3.5	14.3	3.8	ug/g
U - Total	5.0 - 5.5	13.6	3.8	ug/g
U - Total	10.0 - 10.5	<4.62		ug/g
U - Total	15.0 - 15.5	8.25	2.82	ug/g
Th - Total	0.0 - 0.5	4	2	ug/g
Th - Total	3.0 - 3.5	10	3	ug/g
Th - Total	5.0 - 5.5	10	3	ug/g
Th - Total	10.0 - 10.5	16	4	ug/g
Th - Total	15.0 - 15.5	10	4	ug/g

TABLE B.2 (Continued)

Radiological Soil Sampling Results from Boring 1510

Parameter	Depth (ft.)	Result	2-Sigma Error	Units
U - Total	0.0 - 0.5	17.2	4.8	ug/g
U - Total	2.5 - 3.0	6.44	3.84	ug/g
U - Total	5.0 - 5.5	8.52	3.21	ug/g
Th - Total	0.0 - 0.5	6	2	ug/g
Th - Total	2.5 - 3.0	10	4	ug/g
Th - Total	5.0 - 5.5	7	2	ug/g

Radiological Soil Sampling Results from Boring 1511

Parameter	Depth (ft.)	Result	2-Sigma Error	Units
U - Total	0.0 - 0.5	23.2	4.7	ug/g
U - Total	2.5 - 3.0	10.1	3.3	ug/g
U - Total	6.0 - 6.5	6.53	3.33	ug/g
U - Total	10.0 - 10.5	6.41	3.17	ug/g
Th - Total	0.0 - 0.5	82	17	ug/g
Th - Total	2.5 - 3.0	48	10	ug/g
Th - Total	6.0 - 6.5	78	17	ug/g
Th - Total	10.0 - 10.5	17	4	ug/g

TABLE B.2 (Continued)

Radiological Soil Sampling Results from Boring 1512

Parameter	Depth (ft.)	Result	2-Sigma Error	Units
U - Total	0.0 - 0.5	38.4	5.3	ug/g
U - Total	2.5 - 3.0	8.47	3.3	ug/g
U - Total	5.0 - 5.5	<5.07		ug/g
U - Total	10.0 - 10.5	3.4	2.94	ug/g
Th - Total	0.0 - 0.5	3	1	ug/g
Th - Total	2.5 - 3.0	136	26	ug/g
Th - Total	5.0 - 5.5	7	2	ug/g
Th - Total	10.0 - 10.5	<4		ug/g

Radiological Soil Sampling Results from Boring 1513

Parameter	Depth (ft.)	Result	2-Sigma Error	Units
U - Total	0.0 - 0.5	22.8	4.6	ug/g
U - Total	2.5 - 3.0	7.07	2.25	ug/g
U - Total	5.0 - 5.5	<4.48		ug/g
U - Total	10.0 - 10.5	20.7	4.5	ug/g
U - Total	15.0 - 15.5	13.8	4.0	ug/g
Th - Total	0.0 - 0.5	6	2	ug/g
Th - Total	3.0 - 3.5	8	3	ug/g
Th - Total	5.0 - 5.5	5	3	ug/g
Th - Total	10.0 - 10.5	3	2	ug/g
Th - Total	15.0 - 15.5	11	3	ug/g

TABLE B.2 (Continued)

Radiological Soil Sampling Results from Boring 1514

Parameter	Depth (ft.)	Result	2-Sigma Error	Units
U - Total	0.0 - 0.5	28.3	5.5	ug/g
U - Total	2.0 - 2.5	10.2	3.5	ug/g
U - Total	5.0 - 5.5	2.93	2.31	ug/g
U - Total	10.0 - 10.5	3.55	2.40	ug/g
Th - Total	0.0 - 0.5	6	2	ug/g
Th - Total	2.0 - 2.5	7	2	ug/g
Th - Total	5.0 - 5.5	7	2	ug/g
Th - Total	10.0 - 10.5	7	3	ug/g

Radiological Soil Sampling Results from Boring 1515

Parameter	Depth (ft.)	Result	2-Sigma Error	Units
U - Total	0.0 - 0.5	42.3	6.0	ug/g
U - Total	2.5 - 3.0	3.56	3.36	ug/g
U - Total	5.0 - 5.5	6.68	3.24	ug/g
U - Total	10.0 - 10.5	<5.58		ug/g
Th - Total	0.0 - 0.5	5	2	ug/g
Th - Total	2.5 - 3.0	10	2	ug/g
Th - Total	5.0 - 5.5	6	2	ug/g
Th - Total	10.0 - 10.5	9	2	ug/g

APPENDIX C

ESTIMATION OF POTENTIAL DOSE AND RISK ASSOCIATED WITH THE INSTALLATION OF A SECURITY FENCE AND THE EXCAVATION OF CONTAMINATED SOIL IN THE FIRE TRAINING AREA

INTRODUCTION

This assessment will characterize the doses and risks to a Reasonable Maximum Exposure (RME) individual as identified under Exposure Scenario below:

- A exposed worker who both install a security fence and excavate the material around the salt tank as well as the pond is assumed to work in eastern portion of the fire training area on a daily basis, five days per week, for a total of one month. The fence will enclose an area of 2090.3 m^2 and will be constructed with fence post that are driven into the ground without removing any soil. The soil excavation would consist of removing soil from two areas. The area of the pond, which is approximately 116.75 m^2 and the area of the salt bath tank, which is approximately 23.24 m^2. The total excavation area is about 140 m^2.

The format for this investigation will consist of the following components: 1) source characterization, 2) exposure scenario and their associated parameters, 3) exposure pathways and their methodology, and 4) dose and risk results for the exposure scenario.

SOURCE CHARACTERIZATION

The radioactivity sources for this investigation are assumed to be uniformly and homogeneously distributed throughout the contaminated zone, as represented by the maximum observed concentrations of total uranium and thorium in Attachment B. In addition, a uniform distribution of radionuclides are assumed. The fire training facility can be considered an infinite or semi-infinite region. The volume of contamination is assumed to be uniformly distributed to an infinite depth as well. As a result of these assumptions, the resulting dose distribution can be assumed to be uniform within the body (Gilbert, 1989). Finally by utilizing these idealized assumptions, dose conversion factors (DCFs) relating an effective dose equivalent rate to a radionuclide concentration can be established.

The external radiation pathway is primarily controlled by gamma-ray radiation. Gamma radiation is the primary radiation of concern for the external radiation pathway because it is sufficiently penetrating to represent a dose at considerable distances. The DCFs for ground contamination were developed based on exposure at a distance of one meter above the ground. These DCFs represent the annual effective dose equivalent from exposure to external radiation.

The radiation dose from inhalation has been extensively evaluated by the International Radiation Protection association in its Publication 30 (ICRP, 1979-1982). Dose equivalents in organs and tissues of the body are calculated with models that describe first the entrance of materials into the body and then the deposition and later retention of the radionuclides in the bodily organs. Dose equivalents estimate the energy deposition of the radionuclides in the tissues of the body (ICRP, 1979-1982). Dose conversion factors for inhalation represent committed effective dose equivalents per unit intake of a radionuclide.

Figures 1 & 2 identify the proposed security fence and soil excavation activities in the fire training area. The tables of Attachment B identify both soil and groundwater results for total uranium and thorium for the fire

training area. Total uranium and thorium, assumed to be represented by a natural isotopic activity distribution, are the only radionuclides of concern. In order to simplify the calculations, as well as provide conservative dose and risk estimates, the maximum total uranium and thorium values were used.

67.8 parts per million = Average Concentration for Uranium.

136 parts per million = Average Concentration for Thorium.

Assuming a natural activity distribution would correspond to the following activities:

Total Uranium = 45.2 pCi/g

U-238 = 22.1 pCi/g

U-235 = 1.0 pCi/g

U-234 = 22.1 pCi/g

Although a natural isotopic distribution is assumed for the uranium isotopes, the uranium contamination is assumed to be NORMAL in content, meaning that the uranium has been processed and the only daughters which are included in the dose and risk calculations are the immediate, short-lived daughters, which are thorium-234 and Protactinium-234.

Mass of Total Thorium Represents All Thorium-232

Th-232 = 14.96 pCi/g

Th-228 = 14.96 pCi/g (Secular Equilibrium with Thorium-232)

EXPOSURE SCENARIO AND PARAMETERS

The exposure scenario evaluated in this assessment is identified in the introduction. The exposure scenario evaluates the exposure to the worker who installs the fence and excavates soil. In addition to an external radiation dose, the installation of the fence and soil excavation is assumed to result in the resuspension of dust during excavation activities which can also result in a potential dose to the RME individual.

The exposure scenario, characterizing the RME individual who will be performing the installation of the fence and excavating the soil, is composed of two pathways: external radiation and inhalation of resuspended dust. The inhalation of resuspended dust becomes potentially significant where excavation of contaminated soil occurs.

The exposure and source term parameters for the external radiation and inhalation pathways are as follows:

EF = 0.0197 Exposure Factor for both external radiation and inhalation (See Reference 5, based on a limited exposure duration of 8 hours, five days each week for a total of 4.3 weeks.)

Bulk Density = Soil default value of 1.8 g/cm^3.

FA_1 = 1, External radiation area factor.
$FA_2 = A^{1/2}/(A^{1/2}+DL)$. Inhalation area factor, see calculations in the Exposure Pathways and Methodology Section.

A = Area of Contamination. DL = Dilution length, default value of 3 meters is typically used. The subscript (2) represents the inhalation pathway.

FCD_{i1} = 1, External radiation depth factor.(USDOE 1989)

FCD_{i2} = 1, Inhalation depth factor, For Cd(t) = 0, T(t) $\geq$ dm.

Where Cd(t) = Uncontaminated cover depth at time t is equal to zero, due to start of excavation.

T(t) = Contaminated zone thickness at time t is approximately 1 meter, dm = Mixing depth default of 0.15 meters, based on the air resuspension model. (USDOE 1989)

FI = Inhalation Rate, 8400 m^3/yr.

EXPOSURE PATHWAYS AND METHODOLOGY

The direct radiation pathway is shown in Equation (1) below:

DOSE (mrem/yr) = DCF_{i1} x Bulk Density x Source Conc. x EF x FA_1 x FS (1)

DCF_{i1} = (mrem/yr)/(pCi/cm^3) representing the annual effective dose equivalent from exposure to external radiation. See Table 3-1 of this appendix for the specific values.

Bulk Density of soil with a default value of 1.8 g/cm^3.

Source Term = Picocuries/Gram of Soil for the ith radionuclide. Use the radionuclide specific values on page 3.

FS = Shape Factor, 1. The shape factor corrects for a noncircular shape area factor.

FA_1 = Area Factor, 1. The area factor represents a circular-area-equivalent contaminated zone. A more detailed analysis can be found in DOE, 1989.

EF = Exposure Factor, see previous description.
= 0.0197

The inhalation of resuspended dust pathway is shown in Equation (2) below:

DOSE (mrem/yr) = ASR x FA_2 x $FCD_{i2}(t)$ x EF x FI_2 x Source Term x DCF_{i2} (2)

ASR = Air-to-Soil resuspension factor, 2 $x10^{-4}$ g/m^3 typically used value (USDOE, 1989).

FA_2 = Area Factor for the inhalation pathway which is identified by the subscript number 2.

$^*FA_2 = A^{1/2}/(A^{1/2} + DL) = 140^{1/2}/(140^{1/2} + 3) = 0.789$
Where DL = Dilution length, default value of 3 meters. (USDOE, 1989)

Contaminated zone area based on excavation of 140 m^2.

$FCD_{i2}(t)$ = Cover and Depth factor, 1. The cover and depth factor represents the fraction of resuspended soil particles at the ground surface that are contaminated. It is calculated by assuming that the mixing of the soil will occur within a layer of thickness d_m at the surface (USDOE, 1989). The subscript (2) represents the inhalation pathway.

The term $C_d(t)$ represents the uncontaminated cover depth (meters) at time "t". The T(t) term represents the contaminated thickness depth (meters) at time "t".

EF = Exposure Factor, (0.0197 for the exposure Scenario).

FI = Average adult breathing rate, 8400 m^3/yr.

Source Term = Picocuries per Gram of soil for the ith radionuclide.
See page 3 for radionuclide specific concentrations.

DCF_{i2} = Annual committed Effective Dose Equivalent from a one time exposure one intake of the ith radionuclide (USDOE, 1989). See Table 3-2 for specific DCFs.

DOSE AND RISK RESULTS

The purpose of this section is to bring together the source term characterization, the exposure scenario description, and the pathway analysis methodology and then estimate the resulting dose and risk. There was exposure scenario identified in the introduction. Over this exposure scenario dose and risk will be estimated for the fence instillation and soil excavation in the region of contamination. The results will appear as below:

Table 3-1: Doses and Risks for the External Radiation Pathway for Exposure Scenario

$$\text{Dose} = DCF_{i1} \times \text{Bulk Density} \times \text{Source Term} \times EF \times FA_1 \times FS$$

Radionuclide	DCF_{i1} (mrem/yr)/(pCi/cm^3)	Dose (mrem/yr)	Risk/yr
U-238+D	6.97×10^{-2}	5.46×10^{-2}	1.09×10^{-8}
U-235+D	4.9×10^{-1}	1.73×10^{-2}	3.00×10^{-9}
U-234	6.97×10^{-4}	5.46×10^{-4}	1.09×10^{-10}
Total U	-	7.24×10^{-2}	1.40×10^{-8}
Th-232+D	6.04×10^{-4}	3.20×10^{-4}	6.4×10^{-11}
Th-228+D	7.36	3.90	7.80×10^{-7}
Total Th	-	3.90	7.80×10^{-7}

Sum of External Risk = $1.40 \times 10^{-8} + 7.8 \times 10^{-7} = 7.94 \times 10^{-7}$

* Based on BEIR III Risk Coefficient of 2×10^{-7} risk/mrem

+D = Aggregated Dose Conversion Factors for Intake of Principal Radionuclide Plus Radionuclides of Associated decay chain in secular equilibrium.

General Equation for the Inhalation of Resuspended Dust Pathway

$$\text{Dose} = DCF_{i2} \times ASR \times FA_2 \times \text{Source Term} \times FCD_{i2} \times EF \times FI_2$$

Table 3-2: Doses and Risks from the Inhalation of Dust Pathway for Exposure Scenario

Radionuclide	DCF_{i2} (mrem/pCi)	Dose (mrem/yr)	Risk/yr
U-238+D	1.20×10^{-1}	8.78×10^{-2}	1.70×10^{-8}
U-235+D	1.20×10^{-1}	3.97×10^{-3}	7.94×10^{-10}
U-234	1.30×10^{-1}	9.51×10^{-2}	1.90×10^{-8}
Total U	-	1.87×10^{-1}	3.70×10^{-8}
Th-232+D	1.1	5.42×10^{-1}	1.08×10^{-7}
Th-228+D	3.10×10^{-1}	1.53×10^{-1}	3.06×10^{-8}
Total Th	-	6.95×10^{-1}	1.39×10^{-7}

Sum of Inhalation Risk = $3.70 \times 10^{-8} + 1.39 \times 10^{-7} = 1.76 \times 10^{-7}$

TOTAL RISK (External and Inhalation) = $7.94 \times 10^{-7} + 1.76 \times 10^{-7} = 9.7 \times 10^{-7}$

* Based on using BEIR III Risk Coefficient of 2×10^{-7} risk/mrem.

+D = Aggregated Dose Conversion Factors for Intake of Principal Radionuclide Plus Radionuclides of Associated decay chain in secular equilibrium.

SUMMARY/DISCUSSION OF RESULTS

Dose and risk were estimated for the exposure scenario for the maximum identified source locations. This scenario was identified by the worker who performs the excavation activities along with the installation of the security fence.

The total risk for This exposure scenario is shown below. This value represents the potential risk to the individual in the above working situation.

Total Risk = 9.70×10^{-7}

This risk is based on several assumptions, outlined below, which greatly exaggerate the doses and associated risks.

1) A constant homogeneous source distribution.

2) Conservative, hypothetical exposure scenario.

3) A uniform source distribution.

4) A conservative dust resuspension factor.

Even considering the above assumptions, the doses estimated in this assessment can be considered insignificant. The EPA and NRC have proposed BRC (Below Regulatory Concern) dose levels of between 5 to 10 mrem per year, committed effective dose equivalent. As a result, the risks estimated are in the range of proposed "diminis levels" (Travis, 1989).

APPENDIX C REFERENCES

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4. Travis, C.C. et. al. 1989. "Is Ionizing Radiation Regulated More Stringently than Chemical Carcinogens," Health Physics, Volume 56, No. 4, pages 527-531.

5. U.S. Department of Energy, 1989. A Manual for Implementing Residual Radioactive Material Guidelines, Argonne National Laboratory, ANL/ES-160, DOE/CH/8901.

References

1. U.S. Department of Energy, 1988. Internal Dose Conversion Factors for Calculation of Dose to the Public, National Technical Information Service, Contract Number: DE88-014297.

2. U.S. Nuclear Regulatory Commission, 1981. "Disposal or Onsite Storage of Thorium and Uranium Wastes from Past Operations," Federal Register, Volume 46, Number 205, page 52061 f.

3. National Research Council, 1989. Health Effects of Exposure to Low Levels of Ionizing Radiation, BEIR V, National Academy Press.

4. U.S. Environmental Protection Agency, 1989. Risk Assessment Guidance for Superfund: Human Health Evaluation Manual Part A, Interim Final, Office of Emergency and Remedial Response, Washington, D.C. OSWER Directive 9285.7-01a.

FIGURE 1

FIRE SAFETY TRAINING AREA
FMPC

VEV DATE: 9/26/90

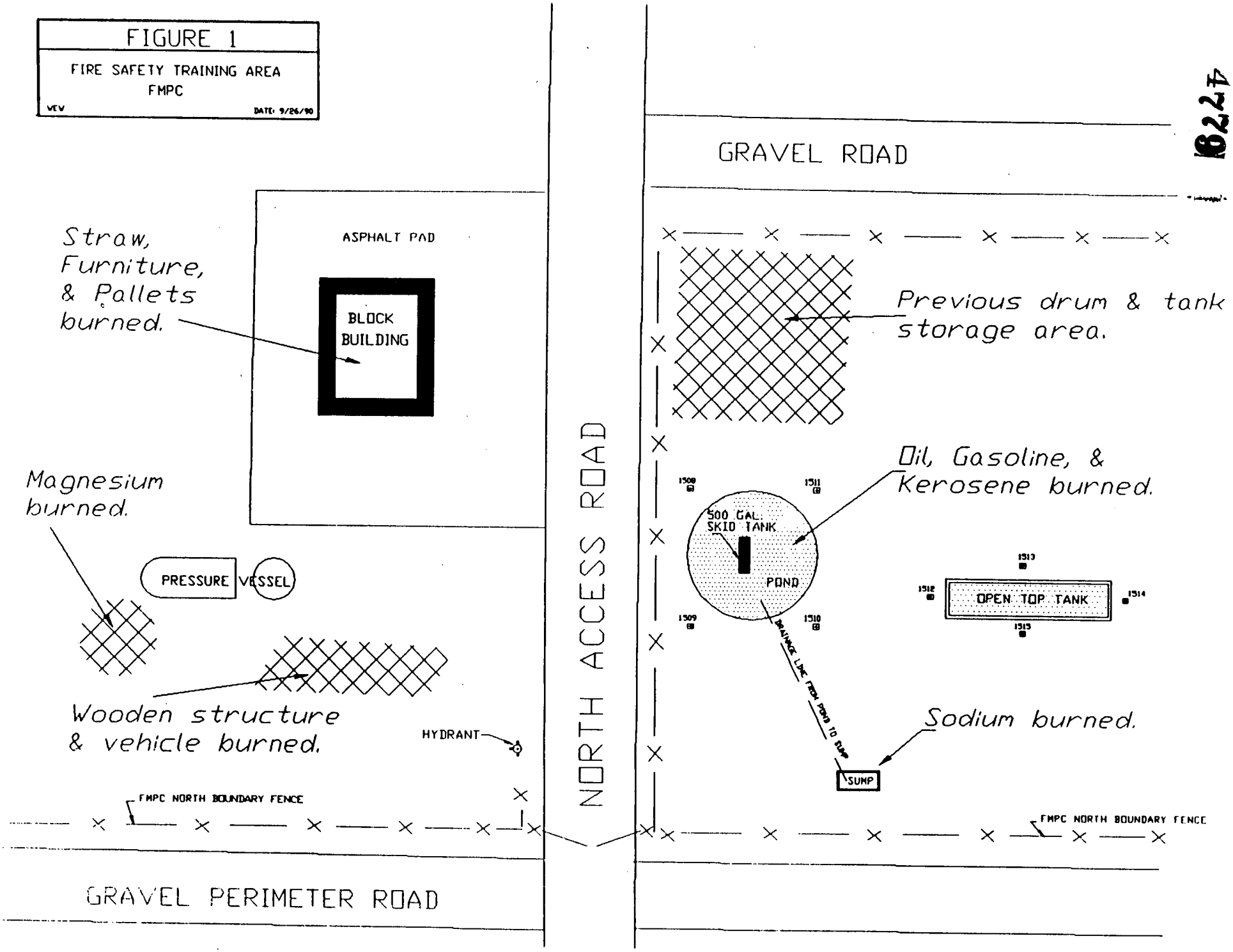
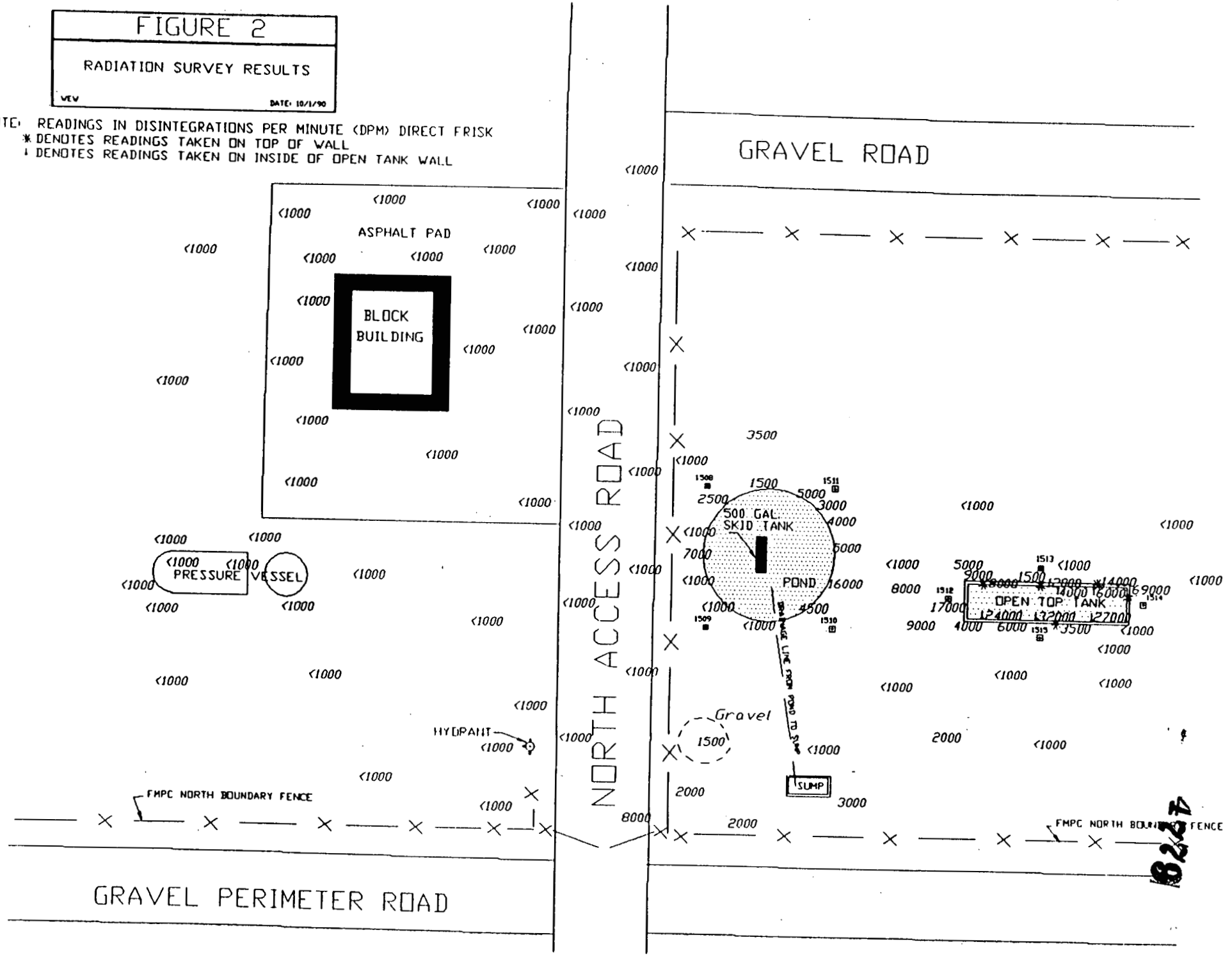


FIGURE 2

RADIATION SURVEY RESULTS

VEV DATE: 10/1/90

NOTE: READINGS IN DISINTEGRATIONS PER MINUTE (DPM) DIRECT FRISK
* DENOTES READINGS TAKEN ON TOP OF WALL
↓ DENOTES READINGS TAKEN ON INSIDE OF OPEN TANK WALL



ATTACHMENT 2
ANALYTICAL SUPPORT LEVELS

CONTAMINATION AT THE
FIRE TRAINING FACILITY
Removal Action Work Plan and
Closure Plan Information and Data Package

Fernald Environmental Management Project

September 1993

The intended use of acquired data is to assess 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 U.S. Environmental Protection Agency (USEPA)-defined DQO levels 1 through 5 (USEPA 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 U.S. Department of Energy (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 USEPA and DOE/USEPA 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 photoionization or flame ionization detectors (PID or FID), pH, conductivity, alpha and beta-gamma friskers, or radiological wipe samples. ASL A is analogous to USEPA 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 PIDs 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., USEPA 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 National Pollutant Discharge Elimination System (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 (VOCs) 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.

4779

ATTACHMENT 3
HEALTH AND SAFETY PLAN
(Safe Shutdown Hazard Analysis Form)

CONTAMINATION AT THE
FIRE TRAINING FACILITY
Removal Action Work Plan and
Closure Plan Information and Data Package

Fernald Environmental Management Project

September 1993

188

9770

CONTENTS

1.0 TASK NAME 1

2.0 APPROVALS 1

3.0 TASK INFORMATION 2

4.0 REQUIRED PERMITS 5

5.0 HAZARD IDENTIFICATION 5
5.1 CHEMICAL/RADIOLOGICAL HAZARDS 6

6.0 PROPOSED HEALTH AND SAFETY TEAM 7

7.0 MONITORING 8
7.1 CHEMICAL 8
7.2 PHYSICAL 8
7.3 RADIOLOGICAL 9
7.4 PERSONAL MONITORING 9
7.4.1 Chemical 9
7.4.2 Radiation 9
7.5 BIOLOGICAL MONITORING/MEDICAL SURVEILLANCE 9

8.0 ACTION LEVELS 10

9.0 PERSONAL PROTECTIVE EQUIPMENT 11
9.1 PRELIMINARY LEVELS OF PROTECTION/PROTECTIVE CLOTHING 11
9.2 RESPIRATORY PROTECTION (to be used or available at work area) . . 14

10.0 DECONTAMINATION 15
10.1 PERSONNEL 15

CONTENTS (continued)

10.2 EQUIPMENT 17

11.0 EMERGENCY/SAFETY EQUIPMENT 18

12.0 EMERGENCY/CONTINGENCY PLANS 19
12.1 FERMCO MEDICAL FACILITY 19
12.2 EMERGENCY PHONE NUMBERS 19

FIGURES

3-1 Map of the Fire Training Facility 3

FINAL

SAFE SHUTDOWN HEALTH AND SAFETY HAZARD ANALYSIS FORM

1.0 TASK NAME: FIRE TRAINING FACILITY REMOVAL ACTION

Proposed Start Date: TBD

Estimated Completion Time: TBD

Hazard Analysis Form Prepared By: Ebasco Environmental for D. Beheler, FERMCO

Date: June 1993

2.0 APPROVALS:

(For completed Hazard Analysis Form)

Printed Name:	Signature:	Date:
Safe Shutdown Project Coordinator		
Safe Shutdown Manager		
Safety Engineering and Fire Services		
Industrial Hygiene		
Radiological Safety Engineer		
Fire Protection Engineer		
Medical Director		

3.0 TASK INFORMATION

Task Name: FIRE TRAINING FACILITY REMOVAL ACTION

Task Scope of Work:

The scope of the removal action involves multiple tasks and activities. These tasks include: surface water removal, removal of structures, soil excavation and removal, source area borings, monitoring well installation, groundwater sampling, and survey and installation of monument HWMU boundaries. A full description of the tasks can be found in Section 3.0 of the Removal Action Work Plan.

Task Location:

The location for most field activities is the Fire Training Facility. The site layout is identified in Figure 3-1. Decontamination of tanks and sumps will be conducted at Building 69, Decontamination Facility.

Task Activities:

The following is a brief breakdown of the Tasks and Activities:

Surface Water Removal

1. Pump-up of free surface water by diaphragm pump.
2. Transport, treatment and disposal of liquids.

Removal of Structures

1. Building decontamination and demolition.
2. Former horizontal pressure vessel removal.
3. Skid pad to be unbolted and cut up.
4. Pedestals to be broken up and placed into containers.
5. Open top tank and sump to be lifted up by backhoe and decontaminated at Building 69. Piping associated with the sump shall be trenched and removed.

Soil Excavation and Removal

1. Soil removal of contaminated areas by backhoe.
2. Soil sampling to verify cleanliness of removed areas.
3. Real time monitoring of soil excavations.

Source Area Borings and Monitoring Well Installation

1. Hollow stem auger sampling with sample collection.
2. Well installation with soil sample collection.

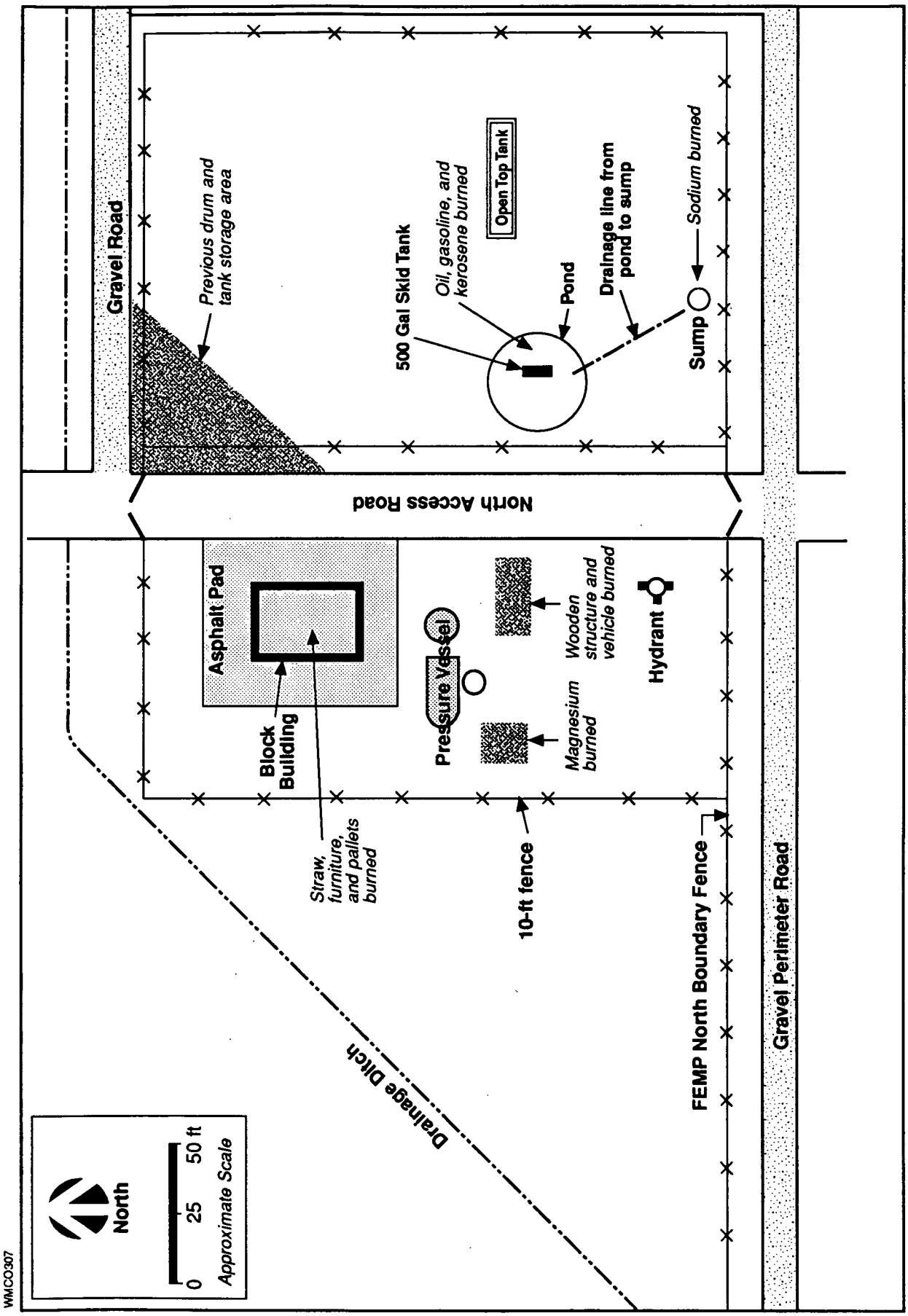


Figure 3-1. Map of the Fire Training Facility.

Groundwater Sampling

1. Groundwater sampling of wells.
2. Slug tests on installed wells.

Survey and Monument HWMU Boundaries

1. Placement of permanent monuments.
2. Survey of monuments and wells.

4.0 REQUIRED PERMITS

	N/A	YES	OPERATIONS/LOCATIONS WHERE REQUIRED
Confined Space	✓		
Open Flame and Welding		✓	Fire Training Facility
Chemical Hazardous Materials		✓	Fire Training Facility
Asbestos	✓		Fire Training Facility
Construction Excavation/Penetration		✓	Fire Training Facility
Hazardous Work		✓	Fire Training Facility
Radiation		✓	Fire Training Facility

5.0 HAZARD IDENTIFICATION:

- ✓ Chemical
- ✓ Radiological
- ✓ Fire/Explosion
- ✓ Heat/Cold Stress
- ___ Electrical
- ✓ Machinery/Mechanical Equipment
- ___ Confined Space
- ✓ Cutting and Welding
- ✓ Noise
- ___ Other - Describe below:
- ✓ Trips, Slips, Falls
- ✓ Trenching/Shoring
- ✓ Heavy Equipment/Vehicular Traffic
- ✓ Overhead Hazards
- ___ Unstable/Uneven Terrain
- ✓ Underground Hazards
- ___ Lockouts
- ___ Elevated Work Platforms
- ___ Asbestos

5.1 CHEMICAL/RADIOLOGICAL HAZARDS

Chemical/Radiological Hazards (list all chemicals, radionuclides, materials and compounds - present, generated or necessary for task completion). For each chemical or substance listed below, additional information is to be compiled on the Chemical Inventory Worksheet and the Chemical Hazard Worksheet, attached to this form.

Chemical Substance	Concentrations	Manufacturer	MSDS On File
1,2-Dichloroethane	1.89 ppm (soil/gas-26)*	N/A	Yes
1,2-Dichloroethane	6 ppb (soil-1509)	N/A	Yes
N-Nitrossodiphenylamine	46 ppb (soil-1514)	N/A	Yes
Aroclor-1260	240 ppb (soil-1508)	N/A	Yes
4-Methylphenel	15 ppb (groundwater-1509)	N/A	Yes
2,4-Dimethylphenol	40 ppb (groundwater-1509)	N/A	Yes
Chloroethane	110 ppb (groundwater-1509)	N/A	Yes
1,2-Dichloroethane	19 ppb (groundwater-1509)	N/A	Yes
Trichloroethane	98 ppb (groundwater-1509)	N/A	Yes
Ethylbenzene	13 ppb (groundwater-1509)	N/A	Yes
Total Xylenes	55 ppb (groundwater-1509)	N/A	Yes
Acetone	59 ppb (groundwater-1509)	N/A	Yes

Radionuclide	Concentration	Radiation Type
U-Total	67.8 μg/kg (soil-1509)	Alpha and Beta\Gamma
Th-Total	82.0 μg/kg (soil-1511)	Alpha and Beta\Gamma

* These numbers indicate the sample locations.

6.0 PROPOSED HEALTH AND SAFETY TEAM

Position	Person	Telephone Number	Radio	Pager
Industrial Hygienist	TBD			
Safety Engineer	TBD			
Radiation Safety Engineer	TBD			
Industrial Hygienist Technician	TBD			
Radiation Technician	TBD			
Fire Protection Engineer	TBD			

4779

7.0 MONITORING

Instrument	Monitoring Frequency
7.1 CHEMICAL	
PID (HNu or OVM) w/11.7ev Lamp or FID (Foxboro OVA)	Continuous in areas where personnel are potentially exposed to chemicals. Monitoring shall be conducted in the breathing zone of workers. As monitoring information becomes available the frequency may be adjusted, based on discussions with the Project Industrial Hygienist. The indicator compound of interest will be 1,2-Dichloroethane. This compound was the only compound of concern detected during a recent soil gas survey.
Combustible Gas (CGI)	Performed prior to beginning hot work in accordance with Open Flame and Welding Permit (SPR 2-57)
Oxygen	Performed prior to beginning hot work in accordance with Open Flame and Welding Permit (SPR 2-57)
H_2S	None
Dust	See Alpha and Beta/Gamma CAMs
Colorimetric Detector Tubes	None
Other:	NA
7.2 PHYSICAL	
Noise	Performed at the direction of the Project Industrial Hygienist in accordance with SPR 5-7 "Hearing Conservation Program"
Heat Stress	Performed at the direction of the Project Industrial Hygienist in accordance with SPR 5-5, "Working in Extreme Temperatures"
Cold Stress	Performed at the direction of the Project Industrial Hygienist in accordance with SPR 5-5, "Working in Extreme Temperatures"

198

7.3 RADIOLOGICAL	
Alpha and Beta/Gamma CAMs	Alpha and Beta/Gamma CAMs shall be run continuously during activities which have the potential to generate airborne particulates.
Alpha and Beta/Gamma probe	Exit surveys of personnel and equipment will be conducted with an alpha and beta/gamma pancake probe. Exit surveys of personnel and equipment shall be conducted with an alpha probe.
External Radiation	TLDs and SRDs
Radon & Working Level Monitor	None

7.4 PERSONAL MONITORING

7.4.1 Chemical

_N/A_ Passive Dosimeter _✓_ Personal Air Sampling _N/A_ Other _____
Description/Other: When personnel are working in areas where Level C respiratory protection is warranted due to chemical exposure, personnel monitoring for indicator chemicals shall be performed. Personnel monitoring shall be in the form of charcoal filters for the collection of 1,2-Dichloroethane in accordance with NIOSH Method 1003. The Project Industrial Hygienist shall select personnel with the greatest potential for exposure for monitoring when the Level D action level is exceeded.

7.4.2 Radiation

_✓_ TLD _✓_ Pocket Dosimeter _✓_ Other: Air Filters

Description/Other: Air filters will be collected on an individual identified by the HP/IH tech who has the greatest potential to exposure to airborne particulates. The air filter will be analyzed for gross alpha and beta/gamma on a field proportional counter.

7.5 BIOLOGICAL MONITORING/MEDICAL SURVEILLANCE

_✓_ This project requires medical surveillance or biological monitoring procedures beyond the provisions of the routine medical surveillance program (see description below).

Description: Bioassays will be conducted for workers entering into radiation control zones as prescribed by FERMCO Dosimetry.

8.0 ACTION LEVELS

The following action levels are for the materials classified as characterized materials. Where materials are classified as uncharacterized, use the action levels listed in the HSP.

Instrument	Contaminant	Action Level	Specific Action
PID	1,2-Dichloroethane[1/]	0.6 ppm	Upgrade to Level C
PID	1,2-Dichloroethane	64 ppm[2/]	Stop work Consult Project Industrial Hygienist
FID	1,2-Dichloroethane[3/]	0.2 ppm	Upgrade to Level C
FID	1,2-Dichloroethane	30 ppm[4/]	Stop work Consult Project Industrial Hygienist
Beta/Gamma CAMs	Sr-90[(5)]	2.0E-09 μCi/ml	Stop work Consult Health Physicist
Alpha CAMs	Pu-239[(5)]	2.0E-12 μCi/ml	Consult Health Physicist
Alpha Probe	Gross alpha	>100 dpm above background	Consult Health Physicist
Beta/Gamma Probe	Gross beta/gamma	1000 dpm above background	Consult Health Physicist
CGI	Combustible gases	>10% LEL	Stop work Consult Industrial Hygienist
Oxygen	Low oxygen	<20.5% Oxygen	Stop work Consult Industrial Hygienist

1/ 1,2-Dichloroethane's (DCA) relative response on the PID is 129 percent. Based on DCA's PEL of 1 ppm (15 minute duration) and a safety factor of 50% an action level of 0.6 ppm (rounded down to 0.6 ppm) on the HNu 101 is established.
2/ The action level is calculated by the following equation: 1 ppm DCA · 100 (protection factor of full face respirator) · 0.50 (safety factor) · 1.29 (relative response factor of DCA on a PID).
3/ 1,2-Dichloroethane's relative response on the FID is 60 percent. Based on DCA's PEL of 1 ppm and a safety factor of 50% an action level of 0.2 ppm (rounded down to 0.2 ppm) on the Foxboro OVA is established.
4/ The action level is calculated by the following equation: 1 ppm DCA · 100 (protection factor of full face respirator) · 0.50 (safety factor) · 0.6 (relative response factor of DCA on an FID).
5/ Both Sr-90 and Pu-239 were chosen as the most restrictive DACs.

200
4279

9.0 PERSONAL PROTECTIVE EQUIPMENT

9.1 PRELIMINARY LEVELS OF PROTECTION/PROTECTIVE CLOTHING

The levels of protection identified in this section are tentative and may change depending on site conditions and real time monitoring. Changes to the levels of protection will be recommended by the site health and safety officer and approved by FERMCO Industrial Hygiene and Radiological Safety Engineers.

Activity	Level	Suit	Outer Gloves	Inner Gloves	Boot Covers	Safety Shoes	Hard Hat	Safety Glasses	Hearing Protection	Other
Pump-up of free surface water by diaphragm pump	B									
	C[1/]									
	D	Polycoated Tyvek	Nitrile	Vinyl	Latex	PVC	Yes	Yes	NA	NA
Building demolition (uncontaminated building)	B									
	C									
	D	Uncoated Tyvek	Leather Gloves	Vinyl	Latex	PVC steel-toed	Yes	Yes	NA	NA
Horizontal pressure vessel removal	B									
	C									
	D	Polycoated Tyvek	Nitrile	Vinyl	Latex	PVC steel-toed	Yes	Yes	NA	NA
Open top tank removal	B									
	C									
	D	Polycoated Tyvek	Nitrile	Vinyl	Latex	PVC steel-toed	Yes	Yes	NA	NA

Activity	Level	Suit	Outer Gloves	Inner Gloves	Boot Covers	Safety Shoes	Hard Hat	Safety Glasses	Hearing Protection	Other
Pedestal removal	B									
	C[1/]									
	D	Polycoated tyvek	Nitrile	Vinyl	Latex	PVC steel-toed	Yes	Yes	NA	NA
Skid tank and sump removal	B									
	C									
	D	Polycoated tyvek	Nitrile	Vinyl	Latex	PVC steel-toed	Yes	Yes	NA	NA
Contaminated soil excavation	B									
	C									
	D	Polycoated tyvek	Nitrile	Vinyl	Latex	PVC steel-toed	Yes	Yes	NA	NA
Soil sampling	B									
	C									
	D	Polycoated tyvek	Nitrile	Vinyl	Latex	PVC steel-toed	Yes	Yes	NA	NA
Source area borings	B									
	C									
	D	Polycoated tyvek	Nitrile	Vinyl	Latex	PVC steel-toed	Yes	Yes	Yes	NA

Activity	Level	Suit	Outer Gloves	Inner Gloves	Boot Covers	Safety Shoes	Hard Hat	Safety Glasses	Hearing Protection	Other
Monitoring well installation	B									
	C[1/]									
	D	Polycoated tyvek	Nitrile	Vinyl	Latex	PVC steel-toed	Yes	Yes	Yes	NA
Groundwater sampling	B									
	C									
	D	Polycoated tyvek	Nitrile	Vinyl	Latex	PVC steel-toed	Yes	Yes	NA	NA
Slug tests	B									
	C									
	D	Polycoated tyvek	Nitrile	Vinyl	Latex	PVC steel-toed	Yes	Yes	NA	NA
Placement of permanent monuments	B									
	C									
	D	Polycoated tyvek	Nitrile	Vinyl	NA	PVC steel-toed	Yes	Yes	NA	NA
Survey of monuments and wells	B									
	C									
	D	Polycoated tyvek	Nitrile	Vinyl	NA	PVC steel-toed	Yes	Yes	NA	NA

1/ Level C protection shall be characterized by full face respirators with OV/HEPA cartridges, with polycoated tyvek, nitrile (outer) gloves, latex (inner) gloves, latex boot covers, PVC boots, etc.

4779

9.2 RESPIRATORY PROTECTION (to be used or available at work area):

Level B

N/A Pressure demand airline with escape provisions
N/A Pressure demand SCBA

Level C

✓ Full face air purifying respirator

Respirator Cartridge Type: Organic vapor with HEPA filter

10.0 DECONTAMINATION

10.1 PERSONNEL

Personnel and equipment leaving the Exclusion Zone shall proceed through the following decontamination stations and procedures:

Station	Procedure
LEVEL B	
1. Level B decontamination is not applicable to the characterization activities.	1. N/A
LEVEL C	
1. Boot Cover Removal	1. The tape and cover boots shall be removed and disposed of in a designated contaminated waste receptacle.
2. Outer Glove Removal	2. The tape and outer gloves shall be removed and disposed of in a designated contaminated waste receptacle. A water/detergent wash/ rinse may be necessary based on visual contamination and at the direction of the Project Industrial Hygienist.
3. Chemical Protective Clothing Removal	3. The outer protective clothing shall be removed and disposed of in a designated contaminated waste receptacle.
4. Respirator Removal and Decontamination	4. The respirator shall be removed and placed in a special container for decontamination. The cartridges shall be removed and disposed of in a designated contaminated waste receptacle.
5. Exit Survey	5. Personnel shall be frisked by a health physics technician with an alpha and beta/gamma probe prior to leaving the area.

Station	Procedure
6. Inner Glove Removal	6. Inner gloves shall be removed and disposed of in a designated contaminated waste receptacle. A hand wash shall be conducted after removal of the inner gloves.

Station	Procedure
LEVEL D	
1. Boot Cover Removal	1. The tape and cover boots shall be removed and disposed of in a designated contaminated waste receptacle.
2. Outer Glove Removal	2. The tape and outer gloves shall be removed and disposed of in a designated contaminated waste receptacle. A water/detergent rinse may be necessary when visual contamination is present.
3. Coverall Removal	3. Coveralls shall be removed and placed in a receptacle for laundering on-site.
4. Exit Survey	4. Personnel shall be frisked by a health physics technician with an alpha and beta/gamma probe prior to leaving the area. A GM detector shall be used when background counts are less than 300 cpm. A Zinc Sulfide Scintillation detector shall be used when background counts are greater than 300 cpm.
5. Inner Glove Removal	5. Inner gloves shall be removed and disposed of in a designated contaminated waste receptacle. A hand wash shall be conducted after removal of the inner gloves.

10.2 EQUIPMENT

EQUIPMENT DECONTAMINATION

Station	Procedure
1. Equipment drop off	1. Equipment will be inspected by the industrial hygienist/health physicist.
2. Equipment wipedown	2. All equipment, including heavy equipment with rad contamination, will be wiped down with a moist disposable cloth.
3. Equipment survey	3. All equipment will be frisked with an alpha probe/pancake probe.

11.0 EMERGENCY/SAFETY EQUIPMENT

Equipment	Quantity	Existing in Work Area	Need to be Provided
Eye Wash	1	Located in CRZ	
Shower (Emergency)	None		
Fire Extinguisher	Variable	Each piece of heavy equipment shall have at least one 10-pound ABC fire extinguisher.	
2-Way Radios	2	Site Supervisor and TBD	
Telephone	1		Mobile phone on site during field activities.
First Aid Kit	1	Located in CRZ.	
Spill Control Kit	1	For fuel and oil spills located in CRZ.	
Flammable Storage Area	None		
Other: (Specify)	None		

12.0 EMERGENCY/CONTINGENCY PLANS

WORK AREA	RALLY POINT	TORNADO SHELTER
Fire Training Facility	TBD[1/]	TBD[1/]

1/ The rally point and tornado shelters will be determined by Fermco Safety prior to the commencement of field activities.

12.1 FERMCO MEDICAL FACILITY

The FERMCO Medical Facility (Building 53) is the primary choice for on-site injuries. The FERMCO ambulance will transport the injured to the nearest hospital if necessary. FERMCO maintains an emergency response capability which includes an ambulance and Emergency Medical Technicians.

Emergency Telephone Numbers

Ambulance: ext. **6511**
Fire: ext. **6511**

12.2 EMERGENCY PHONE NUMBERS

Name	Work Number	Radio Number
EMERGENCY RESPONSE	**6511** or 6295	**CONTROL**
Industrial Hygiene	6207	357
Radiation Control	6889	355
Fire Services	6235	303
Industrial Safety	8604	
Assistant Emergency Duty Officer (AEDO)	6431 or 6295	202
CRU 3 Safety Manager	9216	762
Security	6295	Control

DIRECTORY OF RELEVANT CONTACT ORGANIZATIONS		
Title	Location	Telephone
Construction Safety and Health	Bldg. 53	8692
CRU 3 Safety Manager	Trailer 81	9216
CRU 3 Control Account Manager	Trailer 81	6375
Industrial Hygiene	Bldg. 53	6211
Industrial Safety	Bldg. 53	8604
Fire Protection/Emergency Response	Bldg. 53	6802
Radiological Control	Bldg. 13B	6257
Medical Services	Bldg. 53	6217
Emergency		6511
Assistant Emergency Duty Officer (AEDO)		6431

SAFE SHUTDOWN PROGRAM
CHEMICAL INVENTORY WORKSHEET

TASK: FIRE TRAINING FACILITY REMOVAL ACTION

CHEMICAL INFORMATION					MSDS	
CHEMICAL NAME	TRADE NAME	HAZARDOUS INGREDIENTS	PERCENT	SUPPLIER/ MANUFACTURER	ON FILE (Y/N)	MSDS DATE
1,2-Dichloroethane	Ethylene Dichloride	N/A	100%	N/A	Yes	

SAFE SHUTDOWN PROGRAM
CHEMICAL HAZARD WORKSHEET

TASK: FIRE TRAINING FACILITY REMOVAL ACTION

HAZARDOUS INGREDIENT	EXPOSURE LIMITS				HAZARD IDENTIFICATION				
	OSHA PEL	OSHA STEL	ACGIH TLV	ACGIH STEL	IDLH	LEL	UEL	FLASH POINT	OTHER HAZARDS
1,2-Dichloroethane	1 ppm	2 ppm	10 ppm	40 ppm	CA	6.2%	16%	56°F	N/A

ATTACHMENT 4
QUALITY ASSURANCE PROJECT PLAN

CONTAMINATION AT THE
FIRE TRAINING FACILITY
Removal Action Work Plan and
Closure Plan Information and Data Package

Fernald Environmental Management Project

September 1993

CONTENTS

Page

1.0 INTRODUCTION 1-1

2.0 FIRE TRAINING FACILITY HISTORY 2-1

3.0 APPLICABLE SCQ REQUIREMENTS FOR THE FIRE TRAINING FACILITY REMOVAL ACTION 3-1
- 3.1 PROJECT DESCRIPTION 3-1
- 3.2 PROJECT ORGANIZATION AND RESPONSIBILITY 3-2
- 3.3 QUALITY ASSURANCE OBJECTIVES 3-2
- 3.4 FIELD ACTIVITIES 3-2
- 3.5 SAMPLING REQUIREMENTS 3-3
- 3.6 SAMPLE CUSTODY 3-3
- 3.7 CALIBRATION PROCEDURES AND FREQUENCY 3-4
- 3.8 ANALYTICAL PROCEDURES 3-4
- 3.9 INTERNAL QUALITY CONTROL CHECKS AND FREQUENCY . . . 3-4
- 3.10 DATA REDUCTION, VALIDATION, AND REPORTING 3-4
- 3.11 PERFORMANCE AND SYSTEM AUDITS 3-5
- 3.12 PREVENTIVE MAINTENANCE 3-5
- 3.13 CORRECTIVE ACTIONS 3-5
- 3.14 QUALITY ASSURANCE REPORTS TO MANAGEMENT 3-5

4.0 REFERENCES 4-1

ACRONYMS AND ABBREVIATIONS

ASL	analytical support level
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DOE	U.S. Department of Energy
DQO	Data Quality Objective
FEMP	Fernald Environmental Management Project
FTF	Fire Training Facility
HWMU	hazardous waste management unit
OEPA	Ohio Environmental Protection Agency
QA	Quality Assurance
QC	Quality Control
RAWP	Removal Action Work Plan
RCRA	Resource Conservation and Recovery Act
SAP	Sampling and Analysis Plan
SCQ	Site-Wide CERCLA Quality Assurance Project Plan
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound

1.0 INTRODUCTION

The Fernald Environmental Management Project (FEMP), owned by the U.S. Department of Energy (DOE), 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 (USEPA) requires that environmental monitoring and measurement programs mandated or supported by USEPA 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 USEPA 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 USEPA recommendations, to consolidate QA requirements and documents whenever possible (USEPA 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, USEPA, 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 FIRE TRAINING FACILITY HISTORY

The FEMP operated a fire training area immediately north of the former production area for several years. The FEMP Fire Training Facility (FTF) was operated in a manner similar to the many other fire training areas in use across the nation, with the notable exception that some of the material used to start and maintain simulated fires in the structure, primarily waste oils and solvents, were also contaminated with radionuclide. Gasoline and kerosene were also used in a 500-gallon skid tank and open top tank. Other than the radionuclide contamination, the area resembles a standard area used by fire departments in the past to train fire fighters. Contamination consists of low levels of volatile organic compounds (VOCs) in the soils and groundwater mostly, methylene chloride, areas of obvious surface contamination, and low concentrations of radiation. Eight piezometers are in place, four around the skid tank and pond and four around the open top tank.

The FTF currently consists of the following components:

a. An abandoned two-story concrete block structure (bunker) surrounded by an asphalt pad.
b. An 8-foot diameter stainless steel tank with elliptical ends. One end of the vessel has been removed and forms a "bowl" on the east end of the vessel.
c. An unbermed 500-gallon skid mounted steel tank (above ground).
d. An open top partially submerged rectangular tank constructed of salt bath tank from Plant 6.
e. An underground sump with valve to gravity drain water and oil from the pond around the above ground skid tank.

The windows and door of the concrete block structure (bunker) are boarded up to prevent entry into the structure. There are visible cracks in the asphalt pad around the block structure. The pad and the stainless steel tank are located on the west side of the old North Access Road and access is uncontrolled. The 500-gallon skid tank contains visible holes and is severely corroded. The tank is located in the center of a very shallow circular pond containing brownish liquid. Black stains are evident around the

perimeter of the pond. The open top rectangular tank contains approximately 8 inches of brownish liquid. The skid tank and the rectangular tank are enclosed by a 4-foot livestock fence on the east side of the old North Access Road to control access to this area, and the area is marked off with plastic chain and signs restricting access.

The FTF equipment, tanks, buildings, and structures are in Operable Unit 3; residual soils and groundwater are in Operable Unit 5. The FTF has been determined to be a Hazardous Waste Management Unit (HWMU) under the requirements of the Resource Conservation and Recovery Act (RCRA). Boundaries for the HWMU are the old North Access Road, North Construction Gravel Road, and the North Boundary fence.

3.0 APPLICABLE SCQ REQUIREMENTS FOR THE FIRE TRAINING FACILITY REMOVAL ACTION

The FTF 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 the various activities associated with the removal action. Pertinent sections which shall govern activities 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 14- Corrective Actions
Section 15- Quality Assurance Reports to Management

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

3.1 PROJECT DESCRIPTION

The FEMP project description is defined in Section 2 of this Quality Assurance Project Plan. The project objectives and schedule are stated in Sections 2.5, 3.0, and 5.0 of the Removal Action Work Plan (RAWP).

3.2 PROJECT ORGANIZATION AND RESPONSIBILITY

The FEMP organization is defined in the SCQ. The FTF removal action organization and responsibilities are included in Section 3.2 of the RAWP.

3.3 QUALITY ASSURANCE OBJECTIVES

The removal action QA objectives are found in 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, representative and comparability, and surveillance/audits. The data generated during the removal action will be of known quality and in compliance with the selected DQOs. Specific sampling and analysis objectives are defined in Section 3.3 of the RAWP. All personnel working on this removal action will be trained in accordance with the SCQ and as defined in Section 3.2 of the RAWP. Records administration and Document Control will also be in accordance with the SCQ.

3.4 FIELD ACTIVITIES

Field activities will consist mainly of removal activities, but will also include sample collection and analysis. The goal of the removal action is to remove all contaminated structures, surface water, and surface soils to mitigate immediate hazards and potential sources of contaminant migration. The sampling and analysis will provide information on chemical and radiological contamination levels for health and safety monitoring, and compliance with removal criteria.

The general policies for conducting the field activities will be in accordance with the FEMP SCQ. All field activities will be documented in a daily log as stated in the SCQ. General procedures for conducting field activities are contained in 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 sampling and analysis plan (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.

Field radiological contamination surveys will be in accordance with the SCQ.

3.5 SAMPLING REQUIREMENTS

Sampling requirements on the removal action will be performed in accordance with the SCQ. These requirements will be referenced in the Fire Training Facility Removal Action Sampling and Analysis Plan along with task-specific sampling procedures required to meet the removal action data needs. Section 3.3 of the removal action work plan describes specific sampling requirements for this removal action. Included are:

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

3.6 SAMPLE CUSTODY

Sample custody will be in accordance with the SCQ.

4769

3.7 CALIBRATION PROCEDURES AND FREQUENCY

Calibration of test and measurement equipment and special process equipment as specified in the work plan, will be in accordance with the SCQ and equipment manufacturer's recommendations. All equipment to be used in the removal action shall be compiled in a list and attached to the removal action work plan. This list will contain applicable calibration requirements. SCQ Appendix requirements shall also be referenced in the calibration list. Calibration procedures will be generated if appropriate calibration procedures do not 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 calibrated. 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 the SCQ and referenced in the removal action SAP. SCQ Appendcies shall be used as a resource to select the appropriate method. If the required analytical method is not located, the new analytical requirements shall be identified and added to Attachment I (FEMP Laboratory Analytical Methods Manual) of the SCQ.

3.9 INTERNAL QUALITY CONTROL CHECKS AND FREQUENCY

Internal quality control checks and frequency will be in accordance with the requirements of the SCQ and defined in the work plan SAP. Required frequencies for the QC checks shall be in accordance with the requirements listed in the SCQ.

3.10 DATA REDUCTION, VALIDATION, AND REPORTING

Data reduction, validation, and reporting shall be in accordance with the requirements specified in the SCQ section pertaining to the Data Validation Plan.

3.11 PERFORMANCE AND SYSTEM AUDITS

Self-assessments and independent assessments of the removal action will be in accordance with the FEMP SCQ. Self-assessment will be performed at least 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 for the removal action in accordance with the FEMP SCQ. All preventive maintenance activities shall be documented on maintenance logs.

3.13 CORRECTIVE ACTIONS

Corrective actions will be in accordance with the SCQ.

3.14 QUALITY ASSURANCE REPORTS TO MANAGEMENT

Project reports will be in accordance with the SCQ.

4.0 REFERENCES

U.S. Department of Energy (DOE) and U.S. Environmental Protection Agency (USEPA). 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.

U.S. Environmental Protection Agency (USEPA). 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

CONTAMINATION AT THE
FIRE TRAINING FACILITY
Removal Action Work Plan and
Closure Plan Information and Data Package

Fernald Environmental Management Project

September 1993

CONTENTS

Page

1.0 INTRODUCTION 1-1

2.0 CONTAMINANT-SPECIFIC REQUIREMENTS 2-1
2.1 FEDERAL REQUIREMENTS 2-1
2.1.1 Resource Conservation and Recovery Act 2-1
2.1.2 Clean Air Act 2-5
2.1.3 Nuclear Regulatory Commission Regulations 2-5
2.1.4 Occupational Safety and Health Administration Standards 2-6
2.1.5 Safe Drinking Water Act 2-7
2.2 STATE OF OHIO REQUIREMENTS 2-7
2.2.1 State Hazardous Waste Management Regulations 2-7
2.2.2 Air Quality 2-8
2.2.3 Water Quality 2-9

3.0 LOCATION-SPECIFIC REQUIREMENTS 3-1

4.0 ACTION-SPECIFIC REQUIREMENTS 4-1
4.1 FEDERAL REQUIREMENTS 4-1
4.1.1 Comprehensive Environmental Response, Compensation, and Liability Act 4-1
4.1.2 Atomic Energy Act 4-3
4.1.3 Resource Conservation and Recovery Act 4-3
4.1.4 Land Disposal Restrictions, 40 C.F.R. Part 268 4-7
4.1.5 Nuclear Regulatory Commission 4-8
4.1.6 Department of Transportation 4-9
4.1.7 Occupational Safety and Health Administration Standards 4-10
4.2 STATE OF OHIO REQUIREMENTS 4-11
4.2.1 Ohio Hazardous Waste Management Regulations 4-12
4.2.2 Radiation Protection 4-15
4.2.3 Water Quality 4-16

CONTENTS (continued)

5.0 TO-BE-CONSIDERED CRITERIA 5-1
5.1 DOE ORDER 5000.3A—OCCURRENCE REPORTING AND UTILIZATION OF OPERATIONS INFORMATION (DRAFT) 5-1
5.2 DOE ORDER 5400.1—GENERAL ENVIRONMENTAL PROTECTION PROGRAM 5-1
5.3 DOE ORDER 5400.3—HAZARDOUS AND RADIOACTIVE MIXED WASTE PROGRAM 5-2
5.4 DOE ORDER 5400.5—RADIATION PROTECTION OF THE PUBLIC AND ENVIRONMENT 5-2
5.5 DOE ORDER 5480.11—RADIATION PROTECTION FOR OCCUPATIONAL WORKERS 5-5
5.6 DOE ORDER 5480.23—NUCLEAR SAFETY ANALYSIS REPORTS . 5-6
5.7 DOE ORDER 5483.1A—OSHA PROGRAMS FOR DOE CONTRACTORS AT GOVERNMENT OWNED CONTRACTOR FACILITIES 5-7
5.8 DOE ORDER 5820.2A—RADIOACTIVE WASTE MANAGEMENT OF LOW-LEVEL WASTE 5-7
5.9 DOE ORDER 6430.1A—GENERAL DESIGN CRITERIA 5-8
5.10 10 C.F.R. § 830.340—MAINTENANCE MANAGEMENT (PROPOSED RULE) 5-8
5.11 10 C.F.R PART 835—RADIATION PROTECTION FOR OCCUPATIONAL WORKERS (PROPOSED RULE) 5-9
5.12 OEPA GUIDANCE—"CLOSURE PLAN REVIEW GUIDANCE" . . . 5-12
5.13 OEPA GUIDANCE—"REVIEW OF GROUNDWATER SAMPLING AND ANALYSIS PLANS" 5-13
5.14 USEPA GUIDANCE—"HANDBOOK OF SUGGESTED PRACTICES FOR THE DESIGN AND INSTALLATION OF GROUNDWATER MONITORING WELLS" 5-13

6.0 CONCLUSION 6-1

TABLES

Page

2-1 Contaminant-specific ARARs for inorganic and organic contaminants of concern 2-4
2-1 Maximum contaminant levels potentially applicable to FTF removal action . . . 2-8
5-1 Surface contamination guidelines 5-4
5-2 Surface radioactivity values 5-10

ACRONYMS AND ABBREVIATIONS

AEA	Atomic Energy Act
ALARA	as low as reasonably achievable
ANSI	American National Standards Institute
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
DOT	Department of Transportation
DPM	disintegrations per minute
EDE	effective dose equivalent
Fed. Reg.	Federal Register
FEMP	Fernald Environmental Management Project
FMPC	Feed Materials Production Center
FTF	Fire Training Facility
HWMU	hazardous waste management unit
LDR	land disposal restriction
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
NAAQS	National Ambient Air Quality Standards
NCP	National Oil and Hazardous Substance Pollution Contingency Plan
NESHAP	National Emission Standards for Hazardous Air Pollutants
NPDES	National Pollutant Discharge Elimination System

ACRONYMS AND ABBREVIATIONS (continued)

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
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
RSE	Removal Site Evaluation
SARA	Superfund Amendments and Reauthorization Act
TBC	To-Be-Considered
TCLP	Toxicity Characteristic Leaching Procedure
TSD	treatment, storage, or disposal facility
USEPA	U.S. Environmental Protection Agency
U.S.C.	U.S. Code
VOC	volatile organic compound

1.0 INTRODUCTION

The Fire Training Facility (FTF) removal action is required under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 106 (42 U.S. Code [U.S.C.] § 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 Site Evaluation (RSE) (Attachment 1) documents the hazards posed by the FTF and the need for the removal action. The removal action is also the subject of a Consent Agreement (the Agreement) between the U.S. Environmental Protection Agency (USEPA) 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 IX requires the DOE to identify removal actions and to submit Removal Action Work Plans (RAWP) to these removal actions. The FTF was identified as a Phase IV removal action in DOE letter DOE-0854-93 "Proposed Phase IV Removal Actions" (dated January 14, 1993). The information contained in this plan fulfills the requirements of an RAWP.

The closure of the FTF 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 Stipulated Amendment to the Consent Decree was signed on January 22, 1993.

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 FTF has been identified as an HWMU based on records of releases of hazardous materials to the environment. The FTF was included in the list of HWMUs in the Resource Conservation and Recovery Act (RCRA) Part A Permit Application submitted to OEPA in June 1991 and the RCRA Part B

Permit Application submitted in October 1991. Pursuant to RCRA, HWMUs must be closed in a manner that minimizes the need for further maintenance and controls, and minimizes or eliminates the threat to human health and the environment (40 Code of Federal Regulations [C.F.R.] § 265.11, Ohio Administrative Code [O.A.C.] 3745-65-11). This plan is submitted to fulfill the written closure plan requirements under RCRA.

The purpose of the FTF removal action is to reduce an immediate threat to human health and the environment. Cleanup levels are identified in the applicable or relevant and appropriate requirements (ARARs) for the decontamination of the block building, skid tank, inground sump and associated piping, and the open top tank. Excavation of hazardous, mixed hazardous and radioactively contaminated, and only radioactively contaminated soils will be performed. Cleanup levels for soil will be based upon the following guidance: for radiologically contaminated soils, the levels established in Work Plan 17 will guide the removal action; for soils contaminated with mixed waste, the clean up levels specified in OEPA closure guidance will be used.

The USEPA 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. Part 300, Subpart E [1990]). Under the NCP, USEPA requires that removal actions under Comprehensive Environmental Response, Compensation, and Liability Act (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 USEPA will examine the urgency of the situation and the scope of the removal action.

The USEPA 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, they may be "relevant and appropriate," 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, address 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 FTF removal action and closure. Specific requirements pertaining to removal of the block building, skid tank, inground sump, and open top tank and their 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]). A state standard is considered more stringent if it is part of an EPA-approved and delegated program [40 C.F.R. § 300.400(g)(4)].

4779

The specific types of ARARs evaluated for the FTF 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 FTF removal action and closure, contaminant-specific ARARs address chemical and/or radionuclide contamination of the structures and their 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.

236

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 FTF removal action are summarized below.

2.1 FEDERAL REQUIREMENTS

The federal contaminant-specific requirements are enumerated in federal statutes and regulations, the U.S.C. and the 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 identification, 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 USEPA (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 the basic RCRA program and parts of clusters 1 and 2 of the Hazardous and Solid Waste Amendments of 1984 (HSWA) in the state of Ohio (RCRA § 3006, 42 U.S.C. § 1693, 54 Fed. Reg. 27170, June 28, 1989). This authorization enables the OEPA and USEPA to jointly regulate hazardous waste in the state of Ohio.

The RCRA is applicable to the FTF closure and removal action. Pursuant to the RCRA requirements, the USEPA 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 (40 C.F.R. § 261.24). The liquids contained in the surface pond, inground sump and associated piping, and open top tank will need to be sampled and analyzed to determine if they are characteristically hazardous wastes for toxicity due to the presence of TCLP metals. If the liquids contained in these structures exceed the TCLP levels for metals under the USEPA regulations, these wastes will be characteristically toxic.

In addition to possibly being a characteristic waste, the contents of the surface pond, inground sump, and open top tank are listed "F" wastes, Nos. F002 and F003, because spent solvents are known to have been burned in these structures. Under the "mixture" rule, the mixture of a spent solvent with a solid waste remains a listed hazardous waste [40 C.F.R. § 261.3(b)(2)]. A waste that is listed must be managed as a hazardous waste unless the waste is formally "delisted" pursuant to the requirements of 40 C.F.R. § 260.20.

During a previous soil/gas survey, the soils adjacent to the open top tank and surface pond were found to contain constituents from "F" listed solvent wastes. The most recent soil/gas survey, conducted in February 1993, found no volatile organic compounds (VOCs) in the soils at the FTF. VOCs, however, may be contained in subsurface soils. When the soils are excavated, the RAWP proposes to test the soils for VOCs, TCLP metals, and radioactivity. If "F" listed constituents are found in these soils, the soils will be hazardous waste. Under the USEPA "contained-in" rule, soils must be managed as hazardous wastes when hazardous materials are contained in the soils. The soils are no longer hazardous when the hazardous waste in the soils is not detectable using USEPA-approved analytical methods.

The USEPA has also promulgated land disposal restriction regulations (LDRs) that establish concentration limits for the hazardous constituents of wastes and technology-

based standards (40 C.F.R. Part 268). The EPA has promulgated two sets of concentration 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. If a concentration limit is set for a waste constituent, the waste must meet or fall below the standard prior to disposal. Any technology may be used in complying with this standard. For technology-based standards, the specified technology must be used to treat the waste prior to disposal. The waste contained in structures at the FTF must comply with the numerical values specified in Table 2-1. No LDR standards have been specified for mixed hazardous and radioactively contaminated soils.

The inground tank and skid tank are materials that will be salvaged and may contain concentrations of VOCs in detectable amounts. Table 2-1 shows the concentrations levels for the constituents of concern at the FTF. If the inground tank and skid tank contain VOCs that exceed the concentration values in Table 2-1, these units will need to be decontaminated according to the hazardous debris standards in 40 C.F.R. Part 268. This regulation specifies that metal objects may be treated to remove foreign matter adhering to the metal to produce a "clean debris surface." This treatment may consist of abrasive blasting, scarification, grinding, and planing, spalling, vibratory finishing and high pressure steam and water sprays. The debris will be "clean" when:

> the surface when viewed without magnification, must be free of all visible contaminated soil and hazardous waste, except that residual staining caused by soil and waste consisting of light shadows, slight streaks, or minor discolorations, and soil and waste in cracks, crevices and pits may be present provided that such staining and soil and waste in cracks, crevices, and pits shall be limited to no more than 5% of each square inch of surface area" (40 C.F.R. § 268.45).

Therefore, if the inground tank and skid tank are found to contain concentrations of VOCs that exceed the values in Table 2-1, these materials will need to be cleaned to a "clean debris surface" using the specified physical treatment technology discussed in 40 C.F.R. Part 268.

Table 2-1. Contaminant-specific ARARs for inorganic and organic contaminants of concern.

	RCRA TCLP Designation Limits[1/] (mg/l)	RCRA Land Ban Limits			
		CCW[2/]		CCWE[3/]	
		Nonwastewater	Wastewater[4/]	Nonwastewater	Wastewater
Metals					
Arsenic	5.0	-	5.0	5.0	-
Barium	100	-	100	100	-
Cadmium	1.0	-	1.0	1.0	-
Chromium (total)	5.0	-	5.0	5.0	-
Lead	5.0	-	5.0	5.0	-
Mercury	0.2	-	0.2	0.2	-
Selenium	1.0	-	1.0	5.7	-
Silver	5.0	-	5.0	5.0	-
Organics					
Acetone	-	160	0.28	-	-
Ethylbenzene	-	6.0	0.057	-	-
Methylene chloride	-	33	0.089	-	-
1,1,1-trichloroethane	-	5.6	0.89	-	-
Xylenes (total)	-	28	0.32	-	-

CCW = Constituent Concentrations in Wastes
CCWE = Constituent Concentrations in Waste Extracts
TCLP = Toxicity Concentration Leaching Procedure
1/ 40 C.F.R. § 261.24
2/ 40 C.F.R. § 268.41
3/ 40 C.F.R. § 268.43
4/ "wastewater" is an aqueous waste containing 1% total organic compounds (TOC) or 1% total F001 - F005 spent solvents.

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 USEPA has been delegated the authority to establish 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 are applicable to the FTF removal action because the removal action will not require air emissions from major stationary sources.

Under NESHAP, the USEPA 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 USEPA 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 FTF 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 Federal Register [Fed. Reg.] 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 FEMP is not an NRC-licensed facility and therefore 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 FTF is identified 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).

Subpart K allows licensees to dispose of licensed material by release of effluent within the limits specified in 10 C.F.R. § 20.1301. A licensee demonstrates compliance with these standards by showing that the annual average concentrations of radioactive material released in liquid effluent at the boundary of the unrestricted area do not exceed the values specified in Table 2 of Appendix B, and demonstrating that if an individual were continually located in an unrestricted area, the dose from external sources would not exceed 0.002 rem/hr and 0.05 rem/yr (10 C.F.R. § 20.1302). The RAWP proposes to dispose of the contents of the open top tank and surface pond through the FEMP waste water treatment system. If this discharge occurs, it will need to comply with the FEMP National Pollutant Discharge Elimination System (NPDES) permit and should comply with these NRC standards for radionuclide concentration levels in liquid effluent.

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.

2.1.5 Safe Drinking Water Act

Table 2-2 shows the maximum contaminant level (MCL) standards for contaminants detected in the FTF groundwater. If the FTF is to be "clean" closed, these MCL standards may need to be met. Groundwater remediation has not been proposed as part of this removal action unless perched groundwater is encountered during soil excavation. If perched groundwater is remediated, cleanup should strive to meet the standards specified in Table 2-2.

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 O.A.C., respectively.

2.2.1 State Hazardous Waste Management Regulations

The USEPA has authorized the OEPA to implement the basic RCRA program and parts of clusters 1 and 2 of HSWA 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 FTF removal action. Generally, the state hazardous waste regulations parallel the federal regulations. The state definition of "hazardous waste" incorporates the USEPA definition (O.A.C. 3745-51-10). Under the Ohio regulations, a waste is hazardous if it is specifically listed or if it exhibits characteristic properties of reactivity, ignitability, corrosivity, or toxicity (O.A.C. 3745-51-20).

The liquids contained in the structures at the FTF need to be sampled and analyzed for toxicity characteristics. If these liquids exceed the TCLP levels for metals, they will be characteristically toxic wastes (O.A.C. 3745-51-24). The liquids contained in the structures at the FTF are "F003 and F002" waste because spent solvents were burned in these structures (O.A.C. 3745-51-31). Under the "mixture rule," the mixture of spent solvents and nonhazardous liquids remains a listed hazardous waste. A listed waste must be managed as a hazardous waste until "delisted" under 40 C.F.R. § 260.20. The soils adjacent to the open top tank and surface pond have been found to contain constituents from "F" listed wastes. USEPA has determined that soils are hazardous

Table 2-2. Maximum contaminant levels potentially applicable to FTF removal action.

Contaminant	OEPA MCL Standard[1/] (milligram/l)	EPA MCL Standard[2/] (milligram/l)
1,2-dichloroethane	.005	.005
Ethylbenzene	--	0.7
1,1,1-trichloroethane	0.2	0.2
Xylene	--	10
Beta particle and photon activity (formerly man-made radionuclides)	4 mrem/yr	4 mrem/yr
Gross alpha particle activity, <u>except</u> radon and uranium	15 pCi/l	15 pCi/l
Uranium	--	20 μg/l[3/]

1/ O.A.C. 3745-81-12 through 3745-81-15.
2/ 40 C.F.R. Parts 141 and 142.
3/ Proposed standard

wastes because they are considered materials that contain hazardous wastes (i.e., "F"-listed spent solvents).

2.2.2 Air Quality

The Ohio Department of Health has 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 FTF 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 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).

2.2.3 Water Quality

Table 2-2 shows the OEPA MCL levels for contaminants detected in the FTF groundwater samples. If the FTF were to be "clean" closed, these MCL standards would most likely need to be met. Groundwater remediation has not been proposed as part of this removal action. If perched groundwater is remediated, cleanup should strive to meet the standards specified in Table 2-2.

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 FTF, 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 USEPA 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 FTF 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.

- Evacuation or removal of highly contaminated soils—necessary to reduce the spread of contamination.

- 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 FTF 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. The DOE is in the process of determining whether the structures at the FTF 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.

Based upon the most recent soil/gas survey results, no hazardous substances have been released in reportable quantities. Nevertheless, during the removal action, as subsoils are excavated, the DOE will need to confirm that no reportable quantities have been released.

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 surface pond area and open top tank have residual radioactive surface contamination. This surface contamination may be source material under the AEA because these structures contain a liquid with concentrations of uranium and thorium. Management of the surface pond, its contents, and the open top tank before decontamination will need to comply with the AEA.

4.1.3 Resource Conservation and Recovery Act

The RCRA and USEPA regulations implementing RCRA enumerate numerous action-specific requirements that may be ARARs for the FTF removal action and closure. Under RCRA, the USEPA and its authorized states have the authority to regulate hazardous wastes.

Although RCRA § 1004(27) excludes "source, special nuclear and by-product material" from RCRA management, the USEPA has concluded that RCRA § 1004(2) excludes only the radioactive portion of the mixed waste from RCRA management. Therefore, the hazardous components of the contents of the open top tank, sump and surface pond and soils are subject to the RCRA hazardous waste management regulations.

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 FTF only if the wastes are stored at a FEMP TSD facility. The FTF removal action will be consistent with the requirements specified for an interim status facility. Subpart B requires that a TSD facility analyze the waste before treatment, storage or disposal. In addition, a TSD facility must provide adequate security, inspections, and personnel training and take special precautions for ignitable wastes and incompatible wastes.

4779

Subpart E enumerates record keeping requirements for all hazardous wastes stored, treated or disposed of at the TSD facility. 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 HWMUs. The FTF was identified as an HWMU in the FEMP Part A Permit Application and Part B Permit Application. The RCRA closure requirements are applicable to the closure of the FTF. 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, identifying the following steps to achieve partial or final closure:

- Describe how the HWMU 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 HWMU (40 C.F.R. § 265.112).

250

The information contained in this plan is being submitted to OEPA and USEPA 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).

The FTF has been designated in the RCRA Part A permit application as a landfill. Under USEPA's guidance, however, the FTF is more likely a surface impoundment because it is an area where hazardous wastes have been routinely disposed of. USEPA has indicated that the burning of hazardous wastes in pits and the seepage of the waste into surrounding soils may contaminate the surrounding soils. When listed wastes are burned, the soil then contains a listed hazardous waste and must be managed as hazardous waste until it is delisted or the listed waste is no longer contained in the soil. When characteristic wastes are burned, the soil is hazardous waste only if the soil is characteristically hazardous. The release of hazardous waste into soil constitutes disposal, and the unit must be regulated as a surface impoundment (memorandum from Kenneth D. Feigner, Chief Waste Management Branch, USEPA Region X, to Marcia E. Williams, Director, Office of Solid Waste, USEPA Headquarters, dated June 24, 1987). Because spent solvents were routinely disposed of at the FTF, it is a surface impoundment and the closure of the FTF must comply with the closure requirements specified for surface impoundments (40 C.F.R. § 265.228).

At closure of a surface impoundment, the owner or operator must perform the following activities:

- remove or decontaminate all waste residues, contaminated subsoils, and structures and equipment contaminated with waste; <u>or</u>
- eliminate free liquids by removing liquid wastes or solidifying the remaining wastes and waste residues;
- stabilize the remaining wastes; and
- cover the surface impoundment with a final cover (40 C.F.R. § 265.228[a]).

Subpart J enumerates standards for storing hazardous waste in tanks at TSD facilities (40 C.F.R. § 265.191 to 265.199). These standards, however, are not applicable to the tanks at the FTF because the open top tank and skid tank are not active hazardous waste management tank units. Both units are part of the FTF HWMU that is a regulated surface impoundment. In addition, the Subpart J standards are not applicable to the Plant 8 storage tank that will manage the liquid wastes extracted from the open top tank, sump, and surface pond, because the Plant 8 storage tank is part of the FEMP Wastewater Treatment System. Such units are exempt from RCRA Subtitle C regulations under the "wastewater treatment unit" exemption (40 C.F.R. § 260.10, 40 C.F.R. § 265.1(g)).

Because the mixed hazardous and radioactive soils will be stored in containers to await treatment and permanent disposal, the USEPA regulations in 40 C.F.R. Part 265, Subpart I, are applicable to the removal action. The USEPA regulations define storage as "the holding of hazardous waste for a temporary period, at the end of which the hazardous waste is treated, disposed of, or stored elsewhere" (40 C.F.R. § 260.10). The interim status TSD regulations require that containers holding hazardous waste be maintained in good condition and have no severe rusting or structural defects. In addition, if the container begins to leak, the contents must be transferred to an adequate container. The hazardous waste stored in containers must be compatible with the wastes and the containers must remain closed at all times, and the containers be inspected weekly. Finally, the regulations require that ignitable waste be located at least 50 feet from the property line. The management of soils from the FTF will be conducted in accordance with the Removal Action No. 17 Work Plan which specifies that these RCRA storage requirements must be met.

In addition to TSD facility requirements, the RCRA regulations 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.

The USEPA RCRA regulations also specify standards for generators of hazardous waste who transport hazardous waste off-site. The 40 C.F.R. Part 262 standards require that the generator make a hazardous waste determination, obtain an USEPA identification

number, comply with accumulation times for waste not stored in RCRA permitted areas, and comply with recordkeeping and recording requirements. Prior to shipment, the waste must be properly manifested according to the standards enumerated in 40 C.F.R. §§ 262.20 through 262.22, and properly packaged, labeled, marked, and placarded according to the requirements in 40 C.F.R. §§ 262.30 through 262.33.

4.1.4 Land Disposal Restrictions, 40 C.F.R. Part 268

The USEPA has established LDRs for certain listed and characteristic wastes. The liquid contents of the open top tank and sump and surface pond may be prohibited from land disposal if they are determined to be mixed waste. These wastes will need to be sampled to determine if the specific waste code is prohibited from land disposal under 40 C.F.R. Part 268. If the wastes exceed the LDR concentration values or they have technology-based standards, they will be prohibited from land disposal unless they are treated to the specified technology standard or fall below the concentration level. Subpart E allows a TSD facility to store a hazardous or mixed 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 liquid contents from the tank and surface ponds is subject to this one-year requirement.

The one-year storage requirement may be avoided based upon USEPA's recent policy statement (May 7, 1992). Because of a lack of treatment capacity for mixed waste streams, DOE has requested a case-by-case extension of the LDR requirements for mixed waste. The USEPA published a proposed notice in the Federal Register on May 26, 1992, approving DOE's request for an extension of the LDR effective date requirements for 352 mixed wastes generated at 31 DOE facilities. The FEMP is included as one of the 31 DOE facilities. If USEPA grants this extension, the DOE will want to ensure that the LDR variance covers mixed waste stored on site at the FEMP TSD facilities.

In addition, the USEPA granted a variance from LDR standards for soils contaminated with mixed hazardous and radioactive wastes (57 Fed. Reg. 47772, October 20, 1992). The variance was granted because there is a nationwide lack of capacity for treatment of

4779

mixed waste soils to meet current treatment standards. USEPA indicated that affected generators must maintain proper records on site which include:

- The name, address, location, and USEPA identification number of the facility;
- A description of the soil waste stream, including the RCRA waste code;
- Waste generation rates and estimated inventories;
- Method of storage of contaminated soil, the storage capacity, and RCRA permit status of the storage unit during the extension period; and
- Certification that any surface impoundment or landfill used for disposal of soil meets RCRA hazardous waste permitting or interim status requirements.

This variance will expire May 8, 1993; however, USEPA is authorized to extend the variance until May 1994, if necessary. Storage of any mixed waste soils from the FTF will need to comply with the recording requirements specified in this variance and those requirements specified in Removal Action 17.

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 FTF removal action because the FTF is designated 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 radioactively-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). If the radioactive concentration of the 1) mixed and low-level waste soils; 2) liquids from the pond; 3) liquids from the open top tank; and 4) the open top tank do not exceed the levels specified in 10 C.F.R.

§ 20.1605, the NRC labeling requirements will not need to be met. Even if these materials 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.

The NRC regulations also specify requirements for transportation and disposal of low-level waste. The transportation of this low-level waste will comply with NRC's manifesting, placarding, and storing regulations (10 C.F.R. Parts 61 and 71).

In addition, the disposal site should comply with low-level waste disposal site requirements. The NRC specifies standards for the design of low-level radioactive waste disposal facilities under 10 C.F.R. Part 61. The regulations require that radioactive wastes be characterized as A, B, or C wastes, depending upon the concentration of short- and long-lived radionuclides. In addition, the regulations establish stability and site design criteria that includes proper segregation of the waste, proper packaging, and monitoring to ensure compliance with radiation protection standards. These regulations will be relevant and appropriate to the permanent storage of any mixed or radioactive soils or debris from the FTF.

4.1.6 Department of Transportation

After material is removed from the FTF area, attempts will be made to decontaminate it. If the decontamination efforts are unsuccessful, the material will be properly dispositioned. Transportation of any low-level waste will comply with the Department of Transportation's (DOT) regulations concerning manifesting, placarding, storing, and transporting low-level waste specified in 49 C.F.R. Parts 172 and 173.

The DOT regulations concerning transportation of low-level radioactive wastes are applicable to the FTF removal action. The packaging requirements for radioactive materials are specified in 49 C.F.R. Part 173, and labeling requirements for radioactive materials are specified in 49 C.F.R. Part 172. The DOT regulations also enumerate

requirements for generators to properly test, placard, and manifest the materials being shipped under 49 C.F.R. Parts 172 and 173.

4.1.7 Occupational Safety and Health Administration Standards

The OSHA standards were established to protect individuals in the workplace (29 C.F.R. Parts 1910 and 1926). The OSHA requirements are promulgated in 29 C.F.R. Part 1910. The requirements of 29 C.F.R. Part 1910 applicable to the removal 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.
- 29 C.F.R § 1910.120 - In addition to the general safety requirements listed above, OSHA has set safety standards for hazardous waste operations pursuant to CERCLA and RCRA.

The requirements of 29 C.F.R. Part 1926 applicable to the removal action are as follows:

- Subpart C enumerates the general safety and health requirements, including recordkeeping, training, medical, fire protective, and protective clothing requirements.
- Subpart D specifies the occupational health and environmental controls, including noise exposure, ionizing radiation, nonionizing radiation, and ventilation.
- Subpart E specifies the personal protective clothing requirements.
- Subpart F outlines the fire protection and prevention requirements.
- Subpart G enumerates the requirements for signs, signals, and barricades.
- Subpart H outlines the materials handling, storage, use, and disposal requirements.
- Subpart I enumerates the hand-held and power tool standards.
- Subpart J specifies marker protection standards for welding and cutting.
- Subpart N specifies the standards for cranes, derricks, and hoists.
- Subpart P enumerates the requirements for excavation.

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 FTF 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 TSD facility regulations are applicable to the FTF removal action. As previously discussed, the liquids contained in the open top tank and surface pond contain hazardous "F" listed solvent wastes and the soils contain "F" listed hazardous waste.

Since these materials are hazardous waste and will be stored at the FEMP, the waste must be managed in accordance with the Ohio TSD facility requirements. The FTF removal action will be consistent with requirements specified for an interim status facility. The interim status TSD facility standards are specified in O.A.C. 3745-65. Before treatment or storage, the liquids contained in the open top tank and surface pond, and the mixed waste soils will need to be analyzed to determine that they are hazardous waste (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. The FEMP TSD facility must comply with security, inspection, and personnel training requirements (O.A.C. 3745-65-14, -15, and -16).

The FEMP TSD facility must also meet 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 state of Ohio regulations also enumerate standards for the use and management of containers that store hazardous wastes (O.A.C. 3745-66-70 to 3745-66-78). These requirements are applicable to the storage of the mixed radioactive and hazardous soils.

The containers holding the mixed radioactive and hazardous soils must be in good condition and have no severe rust or structural defects (O.A.C. 3745-66-71). The type of hazardous wastes must be compatible with the container to ensure that the ability of the container to store the waste is not compromised (O.A.C. 3745-66-72). The containers must remain closed, except in adding or removing waste; weekly inspections must be performed; and the containers must provide for secondary containment (O.A.C. 3745-66-74 to O.A.C. 3745-66-75). These management standards are included in Removal Action No. 17, and management of mixed waste soils or debris from the FTF will be conducted in accordance with the Removal Action No. 17 Work Plan.

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. These standards are not applicable to the open top tank and tank skid at the FTF because these units are not active hazardous waste management tank units. Both of these units are part of the FTF HWMU that is a regulated surface impoundment. In addition, the Subpart J standards are not applicable to the Plant 8 storage tank that will manage the liquid wastes extracted from the open top tank, sump, and surface pond because the Plant 8 storage tank is part of the FEMP wastewater treatment system. Such units are exempt from RCRA Subtitle C regulation under the "wastewater treatment unit" exemption (O.A.C. 3745-51-10, O.A.C. 3745-55-01).

Finally, the Ohio Hazardous Waste Management Regulations enumerate requirements for the closure of HWMUs. The FTF area is a "hazardous waste management unit" because it is "a contiguous area of land on or in which hazardous waste is placed" (O.A.C. 3745-50-10[46]). The FTF was identified as an HWMU in the RCRA Part A and Part B Permit Applications and as such must comply with the requirements of "Closure Requirements for Interim Status Facilities," O.A.C. 3745-66. The FTF 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, identifying the following steps to achieve partial or final closure:

- Describe how the HWMU 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 HWMU (O.A.C. 3745-66-12).

The information contained in this plan is being submitted to OEPA and USEPA 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).

Under USEPA's guidance, the FTF is identified as a surface impoundment because it is an area where hazardous wastes have been routinely disposed of. USEPA has indicated that the burning of hazardous wastes in pits and the seepage of the waste into surrounding soils may contaminate the surrounding soils. When listed wastes are burned, the soil then contains a listed hazardous waste and must be managed as hazardous waste until it is delisted or the listed waste is no longer contained in the soil. When characteristic wastes are burned, the soil is hazardous waste only if it is characteristically hazardous. The release of hazardous waste into soil constitutes disposal, and the unit must be regulated as a surface impoundment (memorandum from Kenneth D. Feigner, Chief Waste Management Branch, USEPA Region X, to Marcia E. Williams, Director, Office of Solid Waste, USEPA Headquarters, dated June 24, 1987).

Because spent solvents were routinely disposed of at the FTF, it is a surface impoundment, and the closure of the FTF must comply with the closure requirements specified for surface impoundments (O.A.C. 3745-67-28).

At closure of a surface impoundment, the owner or operator must perform the following activities:

- remove or decontaminate all waste residues, contaminated subsoils, and structures and equipment contaminated with waste; or
- eliminate free liquids by removing liquid wastes or solidifying the remaining wastes and waste residues;
- stabilize the remaining wastes; and
- cover the surface impoundment with a final cover (O.A.C. 3745-67-28[A]).

The FTF removal action and closure is an "interim action"; therefore, no post-closure plan will be submitted. Because final closure will occur during closure of the entire FEMP facility, the post-closure plan and monitoring requirements will be submitted and compiled with at that time.

The OEPA RCRA regulations also specify standards for generators of hazardous waste who transport hazardous waste off-site. The O.A.C. 3745-52 standards require that the generator make a hazardous waste determination, obtain an USEPA identification number, comply with accumulation times for waste not stored in RCRA permitted areas, and comply with recordkeeping and recording requirements. Prior to shipment, the waste must be properly manifested according to the standards enumerated in O.A.C. 3745-52.20 through 3745-52-23, and properly packaged, labeled, marked, and placarded according to the requirements in O.A.C. 3745-52-30 through 3745-52-33.

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 open top tank, liquids from this tank, and surface impoundment and soils are radiologically contaminated before decontamination, these wastes should be properly labeled.

4.2.3 Water Quality

4.2.3.1 Surface Water Quality

If the liquid wastes extracted from the open top tank and surface pond are discharged through the FEMP wastewater treatment system, the discharge will need to comply with the FEMP NPDES permit issued by OEPA under O.A.C. 3745-33. In addition, the discharge must meet surface water standards for the Great Miami River. These standards are specified in O.A.C. 3745-1-21.

4.2.3.2 Groundwater Quality

The Department of Health has established monitoring requirements for organic and inorganic chemicals and radionuclides (O.A.C. 3745-81-23 to 3745-81-26). In addition, the Ohio regulations specify the analytic methods for testing the radioactivity and organic and inorganic concentrations in groundwater (O.A.C. 3745-81-25 and 3745-81-27).

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 FTF 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 FTF 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 contamination, water, and groundwater.

5.3 DOE ORDER 5400.3—HAZARDOUS AND RADIOACTIVE MIXED WASTE PROGRAM

The DOE Order 5400.3 establishes a program to manage hazardous and radioactive mixed waste. The Order requires that all mixed waste be managed according to the criteria established in RCRA, Subtitle C, and in the AEA. The RCRA requirements will apply to the extent such criteria are not inconsistent with the AEA. The goals of the mixed waste program are to protect the safety and health of the DOE, its contractor employees, the public, and the environment, and to safely and properly handle, treat, store, and dispose of mixed wastes. The mixed waste located at the FTF should comply with this Order.

5.4 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, 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 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.

4779

The DOE Order 5400.5 also 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 not to the demolition of a building. Surface contamination of the block building debris, horizontal pressure vessel, skid tank, and open top tank 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. It is anticipated that only the open top tank will need to be managed as low-level waste. The Order also establishes interim storage, interim management, and long-term management for uranium and 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 FTF is tested, these concentration values should be considered in characterizing the soil. Because these values are guidelines only, the RAWP proposes to use the concentration levels developed under Removal Action 17 for the cleanup of soil and debris. Since the levels specified in Removal Action 17 are based upon background levels, these levels should comply with this DOE Order requirement.

The RAWP indicates that the liquids contained in the open top tank and surface pond will be discharged through the FEMP waste water treatment system to the Great Miami River. The DOE Order 5400.5, Chapter II, Section 3 specifies standards for the management and control of radioactive materials in liquid discharges. These standards are pertinent to the discharge of the liquid contained in the surface pond and open top tank. Under DOE Order 5400.5, discharge to surface water may occur, without the use of best available technology (BAT), as long as the radionuclide concentration of the

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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.

4779

Table 5-1. Surface contamination guidelines.

Radionuclides[2/]	Allowable Total Residual Surface Contamination (dpm/100cm^2)[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.

266

effluent at the point of discharge does not exceed the derived concentration guide (DCG) values in Chapter III of this Order. If the DCG is exceeded, then the system must employ BAT. Therefore, the liquid effluent from the FEMP system, which will include the liquid wastes from the FTF, must either comply with the DCGs or employ BAT. Discharge of the effluent from the FEMP system must also comply with the FEMP NPDES permit limitations.

5.5 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 specified 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 block building debris, horizontal pressure vessel, skid tank, sump and open top tank 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 American National Standards Institute (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 visible 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.

5.6 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.

5.7 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 FTF removal action are specified in Attachment 3.

5.8 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 FTF 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 block building debris,

horizontal pressure vessel, skid tank, and possibly the open top tank 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.

5.9 DOE ORDER 6430.1A—GENERAL DESIGN CRITERIA

The DOE Order 6430.1A provides the minimum requirements for DOE facility designs. Generally, the Order requires that DOE facilities be designed to protect the public from hazardous radioactive and other materials, and to minimize occupational and public exposure to hazardous materials. This DOE Order should be considered in determining the storage and containment requirements for storage of any radioactive or mixed waste from the FTF. Section 1300-7 enumerates the general containment system requirements which are necessary to minimize the spread of radioactive and hazardous materials. Section 1300-8.3 requires that mixed waste be identified and segregated. The design criteria for radioactive solid waste storage facilities (Section 1324) should also be considered to ensure that the storage area in which the mixed or radioactive wastes from the FTF will be contained meets the specified standards.

5.10 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 FTF 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 FTF comply with the facility maintenance plan.

5.11 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

4779

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.

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 building debris, horizontal pressure vessel, skid tank, and open top tank, these units will need to 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 devices at the entrance, conspicuous visible or audible alarms and any other administrative procedures should be established to ensure that entry into the area is controlled.

Subpart G requires that 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 open top tank, skid tank, horizontal pressure vessel and building

4779

debris, 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.

5.12 OEPA 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 FTF. This OEPA guidance enumerates the items that should be included in a hazardous waste facility closure plan. This document specifies procedures for the decontamination of hazardous waste and its residues from tanks and containers. In the plan, the owner or operator must specify that reasonable means to clean or decontaminate tanks or containers 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/l or, if neither an MCL nor an MCLG is available for a particular contaminant, 1 mg/l shall be used as the clean standard.

5.13 OEPA GUIDANCE—"REVIEW OF GROUNDWATER SAMPLING AND ANALYSIS PLANS"

The OEPA guidance enumerates the agency's policy in reviewing procedures for conducting groundwater sampling and analysis (PP0303.200). This guidance should be considered in drafting the sampling and analysis plan for review of groundwater contamination at the FTF.

5.14 USEPA GUIDANCE—"HANDBOOK OF SUGGESTED PRACTICES FOR THE DESIGN AND INSTALLATION OF GROUNDWATER MONITORING WELLS"

This USEPA guidance describes how groundwater monitoring wells should be designed and installed. OEPA is currently following this guidance while it drafts its own guidance regarding installation and design of groundwater monitoring wells. This guidance should be considered in designing and installing monitoring wells for the FTF.

6.0 CONCLUSION

Under the NCP, the USEPA 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 USEPA pursuant to the Consent Agreement and Consent Decree signed by the parties.

ATTACHMENT 6
SOP 20-C-916 CLEANING SUMP SYSTEMS

CONTAMINATION AT THE
FIRE TRAINING FACILITY
Removal Action Work Plan and
Closure Plan Information and Data Package

Fernald Environmental Management Project

September 1993

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.

4779 **RESPONSIBILITIES** (cont.)

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.

4779

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.)

4779 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.

4779

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.

4779

7.0 **PROCEDURE** (cont.)

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.

7.0 **PROCEDURE** (cont.)

4779

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.

7.0 **PROCEDURE** (cont.)

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"

4779

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

4779

SUMP SYSTEM CONTENT REMOVAL - EQUIPMENT CHECKLIST

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

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

4779

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

4779

CARD XX ITEM PRODUCTION/CERTIFICATION/IDENTIFICATION

P. O. NO.	SOURCE	CLASS	MATERIAL TYPE	LOT SEQUENCE NO	DATE MO	DAY	YEAR	SHIFT	BADGE NO	PACKAGE NO

SEAL NUMBER	SEAL DATE MONTH	DAY	YEAR	PACKAGE PHYSICAL CERTIFICATION	YES	NO	PLANT	PROD MBA
				EMPTY CONTAINER AT START				
				RUST HOLES OR DENTS				
				MATERIAL IS AS CODED			PLANT TO	MBA TO
WASTE DESCRIPTION AND COMMENTS				PROHIBITED MATERIALS				
				LIQUIDS IN CONTAINER				
PACKAGE TYPE				MINIMUM OF VOID SPACE				
PACKAGE SIZE				PACKAGE SECURED				
				DRAIN PLUG SECURED				

GROSS WEIGHT

TARE WEIGHT

NET WEIGHT

GENERATOR SIGNATURE SUPERVISOR SIGNATURE DATE

FS-F-1945-XX (REV 3/19/92)

CARD 65 ITEM PRODUCTION/CERTIFICATION/IDENTIFICATION

P. O. NO.	SOURCE	CLASS	MATERIAL TYPE	LOT SEQUENCE NO.	DATE MO	DAY	YEAR	SHIFT	BADGE NO.	PACKAGE NO

SEAL NUMBER	SEAL DATE MONTH	DAY	YEAR	PACKAGE PHYSICAL CERTIFICATION	YES	NO	PLANT	PROD MBA
				EMPTY CONTAINER AT START				
				RUST HOLES OR DENTS				
				MATERIAL IS AS CODED			PLANT TO	MBA TO
WASTE DESCRIPTION AND COMMENTS				PROHIBITED MATERIALS				
				LIQUIDS IN CONTAINER				
PACKAGE TYPE				MINIMUM OF VOID SPACE				
PACKAGE SIZE				PACKAGE SECURED				
				DRAIN PLUG SECURED				

GROSS WEIGHT

TARE WEIGHT

NET WEIGHT

GENERATOR SIGNATURE SUPERVISOR SIGNATURE DATE

FS-F-1945-65 (REV 3/19/92)

CARD 66 ITEM PRODUCTION/CERTIFICATION/IDENTIFICATION

P. O. NO.	SOURCE	CLASS	MATERIAL TYPE	LOT SEQUENCE NO.	DATE MO	DAY	YEAR	SHIFT	BADGE NO.	PACKAGE NO.

SEAL NUMBER	SEAL DATE MONTH	DAY	YEAR	PACKAGE PHYSICAL CERTIFICATION	YES	NO	PLANT	PROD MBA
				EMPTY CONTAINER AT START				
				RUST HOLES OR DENTS				
				MATERIAL IS AS CODED			PLANT TO	MBA TO
WASTE DESCRIPTION AND COMMENTS				PROHIBITED MATERIALS				
				LIQUIDS IN CONTAINER				
PACKAGE TYPE				MINIMUM OF VOID SPACE				
PACKAGE SIZE				PACKAGE SECURED				
				DRAIN PLUG SECURED				

GROSS WEIGHT

TARE WEIGHT

NET WEIGHT

GENERATOR SIGNATURE SUPERVISOR SIGNATURE DATE

FS-F-1945-66 (REV 3/19/92)

ITEM PRODUCTION/CERTIFICATION/IDENTIFICATION
FS-F-1945-XX
FIGURE 5

4779

RECORD OF ISSUE/REVISIONS

DATE	REV. NO.	DESCRIPTION AND AUTHORITY
Draft	0	Procedure for cleaning sump systems required per Request P92-143 initiated by J. Ogg.

ATTACHMENT 7
1993 SOIL GAS SURVEY

CONTAMINATION AT THE
FIRE TRAINING FACILITY
Removal Action Work Plan and
Closure Plan Information and Data Package

Fernald Environmental Management Project

September 1993

4779

FIRE TRAINING FACILITY
SOIL GAS SURVEY

Final

Prepared for:

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

June 1993

Prepared by:
Ebasco Environmental
6120 S. Gilmore Road, Suite 155
Fairfield, Ohio

4770

CONTENTS

EXECUTIVE SUMMARY ES-1

1.0 PROJECT DESCRIPTION 1-1
- 1.1 INTRODUCTION 1-1
- 1.2 BACKGROUND/PREVIOUS ACTIONS 1-2
- 1.3 DATA NEEDS AND DATA QUALITY OBJECTIVES (DQOs) 1-3

2.0 ENVIRONMENTAL SETTING 2-1

3.0 SAMPLING APPROACH 3-1
- 3.1 SAMPLE GRID 3-1
- 3.2 SOIL GAS SURVEY 3-1

4.0 FIELD PROCEDURES 4-1
- 4.1 SAMPLE COLLECTION PROCEDURES METHODOLOGY 4-1
  - 4.1.1 Soil Gas Sample Collection 4-1
  - 4.1.2 Soil Sample Collection 4-2
- 4.2 SOIL GAS AND SOIL HEADSPACE ANALYSIS 4-3
- 4.3 EQUIPMENT AND PERSONNEL DECONTAMINATION 4-3

5.0 QUALITY ASSURANCE/QUALITY CONTROL 5-1
- 5.1 FIELD QA/QC SAMPLES 5-1
- 5.2 LABORATORY QA/QC SAMPLES 5-1
- 5.3 ANALYTICAL INSTRUMENTATION/EQUIPMENT CALIBRATION AND DOCUMENTATION 5-2
- 5.4 GENERAL QUALITY CONTROL CHECKS AND PROCEDURES . . . 5-2

6.0 ANALYTICAL RESULTS 6-1
- 6.1 SOIL GAS RESULTS 6-1
- 6.2 SOIL HEADSPACE RESULTS 6-1
- 6.3 CONCLUSIONS 6-9

4779

CONTENTS (continued)

7.0 REFERENCES 7-1

APPENDIX A - TEG Analytical Methodology

295

FIGURES

2-1 Master Grid Site Map 2-3
3-1 Map of the Fire Training Facility and the FERMCO Base Soil Gas Survey Grid Points 3-2
3-2 February 1993 Soil Gas Survey Sample Locations 3-4
6-1 February 1993 Soil Gas Survey Sample Locations and Results 6-8
6-2 Known and Suspected Contamination Areas 6-10

TABLES

1-1 Data Quality Objectives for Soil Gas Sampling 1-5
6-1 Results of the 1993 Soil Gas Survey at the Fire Training Facility 6-2

4779

ACRONYMS AND ABBREVIATIONS

ASL	Analytical Support Level
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CPID	Closure Plan Information and Data Package
DCA	1,2-Dichloroethane
DCE	1,1-Dichlorethene
DOE	U.S. Department of Energy
DQO	Data Quality Objective
ECD	electron capture device
FEMP	Fernald Environmental Management Project
FERMCO	Fernald Environmental Restoration Management Corporation
FTF	Fire Training Facility
GC	gas chromatography
HSL	hazardous substance list
HWMU	hazardous waste management unit
MCL	maximum contaminant level
MTBE	methyl tert-butyl ether
OEPA	Ohio Environmental Protection Agency
PCE	Tetrachloroethene
ppb	parts per billion
ppbv	parts per billion volumetric
QA	quality assurance
QC	quality control
RAWP	Removal Action Work Plan
RCRA	Resource Conservation and Recovery Act
RPD	relative percent difference
RSE	Removal Site Evaluation
SCQ	Site-wide CERCLA Quality Assurance Project Plan
SWCR	Site-wide Characterization Report
TCA	1,1,1-Trichloroethane
TCE	Trichloroethene
TCLP	Toxicity Characteristic Leaching Procedure
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound

EXECUTIVE SUMMARY

A Removal Action Work Plan/Closure Plan Information and Data Package (RAWP/CPID) is being prepared for the Fernald Environmental Management Project (FEMP) Fire Training Facility (FTF). This document is scheduled for submittal to the Ohio Environmental Protection Agency (OEPA) and the U.S. Environmental Protection Agency (USEPA) on June 30, 1993, and will describe the physical steps to be performed in removing surface sources of radiological and chemical contaminants from the FTF.

One of the data gaps identified during preparation of the RAWP/CPID was the lack of information on the areal extent of organic compounds in the surface soils. Prior characterization activities at the FTF included analysis of samples from eight soil borings and from perched water, and a surface soil radiological walk-over survey. The soil borings and perched water produced quantitative data indicating the presence of both radiological and chemical contaminants associated with solvents and oils burned during past FTF training exercises. The existing radiological walk-over survey also provided adequate screening level data on the areal extent of radiological contamination to allow initial excavation areas to be identified in the RAWP/CPID. However, similar screening level data were not available for the identified organic contaminants.

To fill this data gap and support the submittal of comprehensive FTF RAWP/CPID to OEPA and USEPA, Ebasco Environmental conducted a soil gas survey during February 1993. The objective of the survey was to provide screening level data on the areal extent of organic contaminants within the FTF area. These data would be used in conjunction with the existing soil boring and radiological survey data to identify 1) soils targeted for initial excavation, and 2) comprehensive sampling and analysis plans to be implemented during the removal action.

Direct soil gas collection and analysis was selected because 1) the organic contaminants previously detected in soil and perched water samples included a number of volatile organic compounds (VOCs) that could be used as "indicators" for the other organics, 2) direct soil gas extraction effectively "samples" a larger volume of soil than a point soil boring, 3) gas chromatography (GC) analysis could be performed on or near site

with near real-time date feedback to the sampling effort allowing sampling to be adjusted as necessary, 4) the GC analyses are analyte specific and provide sensitivity consistent with the objectives for screening level data, and 5) the survey can be mobilized, performed, and de-mobilized quickly, thereby supporting the RAWP/CPID production schedule.

With the objective of providing screening level data on the extent of organic contamination within the FTF surface soils, the existing soil boring and perched water data were examined to identify specific VOCs that could be used as indicator analytes for the organic contaminants. The following 11 analytes were selected for the soil gas survey:

1,2 Dichloroethane (DCA)	Acetone
1,1 Dichloroethene (DCE)	Benzene
Methylene chloride	Ethylbenzene
Tetrachloroethene (PCE)	Toluene
1,1,1-Trichloroethane (TCA)	Xylenes
Trichloroethene (TCE)	

Based on the parts per billion (ppb) levels of these analytes observed in soil boring samples, and assumption of general soil gas equilibrium with soil concentrations, analysis of soil gas samples was conducted using a laboratory grade GC configured to detect VOCs using a photoionization detector (PID) and electron capture device (ECD). This system provided analyte detection capabilities at the one ppb volumetric (ppbv) level, consistent with previously observed VOC levels, and analyte quantification at 25 ppbv or above. The exceptions were methylene chloride and DCA, which had minimum quantification limits of 1,000 ppbv.

This survey analyzed soil gas samples collected from 67 locations at a depth of approximately 4 feet. The soil gas survey grid was established on approximately 50-foot centers, with higher density provided in the area of the skid tank, open-top tank, and sump. Additional locations were added during the survey as necessary to provide more definition where needed, while other points were dropped due to inaccessibility or lack of detections at the grid perimeter. Samples were collected from a depth of approximately 4 feet to collect soil gas from below the ground surface but above the

perched water table. In a few locations, soil gas collection occurred below a thin perched water horizon.

The only detections above the quantitation limits for all analytes was for DCA at two locations: 26 and 38. The presence of TCA, TCE, and PCE was detected at numerous locations for levels well below the quantitation limit. In these cases, TCA, TCE, and PCE were detected at 5 ppbv or less and are reported as trace detections. Most detections occurred in the eastern portion of the site.

The distribution of soil gas detections identifies low concentrations of a few of the analytes in the area of the open-top tank and the skid tank and pond. A few outliers at very low concentrations were also detected. The survey shows that concentrations of VOCs in the soil gas are very low. The low-level detections generally correspond to locations of elevated radionuclide concentrations in the soil, with the possible exception that VOCs extend somewhat further north of the open-top tank and skid tank and pond. The results of the soil gas survey suggest that horizontal migration of VOCs in the perched groundwater has not occurred to a great extent. Instead, VOC contamination generally appears to be limited to the immediate area of contaminant discharge to the ground surface. Figure 6-2 shows the areas where known hazardous and mixed wastes are present, as well as, where suspected mixed wastes may be located.

1.0 PROJECT DESCRIPTION

1.1 INTRODUCTION

The Fernald Environmental Management Project (FEMP) is preparing a Removal Action Work Plan/Closure Plan Information and Data Package (RAWP/CPID) for the Fire Training Facility (FTF). The FTF was declared a hazardous waste management unit (HWMU) based on its operating history and the suspected presence of toxic materials in the soil and/or groundwater. The FTF 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 FTF was identified as an HWMU in the RCRA compliance schedule submitted pursuant to the Consent Decree negotiated between the state of Ohio and the U.S. Department of Energy (DOE) (State of Ohio, 1988). The RCRA compliance schedule requires that a CPID 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 FTF is also identified as a removal action in DOE letter DOE-2057-92, "Contamination at the FTF" (July 14, 1992) pursuant to the Amended Consent Agreement of the U.S. Environmental Protection Agency (USEPA) (USEPA, 1991). This proposal calls for a RAWP to be submitted to the USEPA. The RAWP is intended to detail the steps necessary to safely remove contamination that poses the greatest immediate threat. The need for the removal action is documented in a Removal Site Evaluation (RSE) (WEMCO, 1992).

Formulation of a combined RAWP/CPID is currently underway. One of the data gaps identified during preparation of the RAWP/CPID was the lack of information on the areal extent of organic compounds in the surface soils. Prior characterization activities at the FTF included analysis of samples from eight soil borings and from perched water, and a surface soil radiological walk-over survey. The soil borings and perched water produced quantitative data indicating the presence of both radiological and chemical contaminants associated with solvents and oils burned during past FTF training exercises. The existing radiological walk-over survey also provided adequate screening

level data on the areal extent of radiological contamination to allow initial excavation areas to be identified in the RAWP/CPID. However, similar screening level data were not available for the identified organic contaminants.

To fill this data gap and support the submittal of comprehensive FTF RAWP/CPID to OEPA and USEPA, Ebasco Environmental conducted a soil gas survey during February 1993. The objective of the survey was to provide screening level data on the areal extent of organic contaminants within the FTF area. These data would be used in conjunction with the existing soil boring and radiological survey data to identify 1) soils targeted for initial excavation, and 2) comprehensive sampling and analysis plans to be implemented during the removal action.

1.2 BACKGROUND/PREVIOUS ACTIONS

Previously, the FTF site was the location of the first administration building for the Fernald Site built in the late 1940s. The administration building was located just north of the perimeter fence and west of the north access road. In addition to the administration building, a parking lot and underground fuel tanks were also located in the area (Personal Communication, Don Bastin, FERMCO).

After the administration building was removed, the area became a FTF in 1966. It was used by FEMP and local fire fighting units for training exercises until 1990. A wide variety of materials were burned in these exercises, including fuels, solvents, oils, metals, wood, and furniture. Materials used in these training exercises often came in contact with the ground. The facility is currently out of service.

Eight piezometers have been installed in the FTF, with four surrounding the skid tank (boring numbers 1508 to 1511) and four surrounding the open top tank (boring numbers 1512 to 1515) (Figure 2-2). The borings are located in the most radiologically contaminated areas as indicated by the surface rad survey results (Section 2.2. 1). These borings ranged in depth from 9 to 20 feet and each was sampled once for full hazardous substance list (HSL) parameters in the soil and perched groundwater. Organic contaminants detected include 1,2-Dichloroethane (DCA) in borehole 1509 (6 parts per billion [ppb]), n-Nitrosodiphenylamine in borehole 1514 (46 ppb), and Aroclor 1260 in the soil sampling results from borehole 1508 (240 ppb). Several other organics were detected in the soil samples; however, the results are either below the

reporting limit or were also found in the laboratory blank. The soil sampling results show elevated levels of HSL Toxicity Characteristic Leaching Procedure (TCLP) metals including aluminum, calcium, iron, magnesium, manganese, sodium, and potassium. A background study (FEMP-SWCR-3, April 1992) reported that concentrations of aluminum, iron, magnesium, manganese, sodium, and potassium were naturally high in the FEMP area due to soil types and origin.

Soil samples were analyzed for total uranium and total thorium. Total uranium concentrations ranged from 16 μg/g to 68 μg/g with an average of 32 μg/g. Total thorium concentrations ranged from 7 μg/g to 136 μg/g with an average concentration of 35 μg/g. Table 2-1 of the RSE presents the analytical results for soil samples collected at boreholes 1508 to 1515. In general, total uranium concentrations decreased with depth and thorium concentrations showed little change with depth.

1.3 DATA NEEDS AND DATA QUALITY OBJECTIVES (DQOs)

Additional characterization of the FTF is required to satisfy the following data needs:

1) Identify and determine the lateral extent of organic compounds within the FTF surface and near surface soils. These data will be used to identify areas for initial soil excavation and quantitative sampling and analysis during removal.
2) Provide qualitative data, to be used in conjunction with existing boring and radiological survey data, for specifying quantitative analysis during removal

Direct soil gas collection and analysis was selected because 1) the organic contaminants previously detected in soil and perched water samples included a number of volatile organic compounds (VOCs) that could be used as "indicators" for the other organics, 2) direct soil gas extraction effectively "samples" a larger volume of soil than a point soil boring, 3) gas chromatography (GC) analysis could be performed on or near site with near real-time date feedback to the sampling effort allowing sampling to be adjusted as necessary, 4) the GC analyses are analyte specific and provide sensitivity consistent with the objectives for screening level data, and 5) the survey can be mobilized, performed, and de-mobilized quickly, thereby supporting the RAWP/CPID production schedule.

In accordance with the FEMP Site-wide Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Quality Assurance Project Plan (SCQ) (FEMP, 1992), DQOs at the FEMP incorporate the Analytical Support Levels (ASLs) A through E. The DQOs are summarized in Table 1-1.

Table 1-1. Data Quality Objectives for Soil Gas Sampling

Activity	Collect soil gas samples on a grid spacing using a hollow sampling probe to approximately 4 feet and applying a vacuum. Samples will be analyzed at the site using a gas chromatograph for the 11 analytes listed in Section 3.2. The soil gas survey will include a minimum of 57 sample points, and additional points will be added as needed to expand or fill in the grid.
Objectives	Define the general extent of organic compounds known to be present in the site soil or groundwater.
Prioritized Data Use(s)	Data will be used to support determination of initial soil excavation areas to be specified in the combined RAWP/CPID.
Appropriate Analytical Level	Volatile Organic Compounds: ASL B
Constituents of Concern	See list in Section 3.2
Required Detection Limits	Approximately 1 ppbv, except 1,000 ppbv for methylene chloride and DCA
Critical Samples	No individual sample is considered critical; however, an aggregate of samples is considered critical to characterize the area.

4729

305

2.0 ENVIRONMENTAL SETTING

The characterization area for this work plan is located in the northern area of the FEMP, just outside the north gate (Figure 2-1). The ground is flat and grassy. It is bounded by a shallow drainage ditch on the north and west sides. The area is underlain by approximately 12 meters of silty clay and clayey silt (glacial overburden). A shallow perched water zone occurs within the relatively impermeable glacial overburden. An unconfined aquifer is contained within glacial outwash sands and gravels approximately 20 meters below the site.

The land on the north side of the area is heavily wooded and is designated a wetland area. The main area of the FEMP lies to the south.

The principal receptor within the characterization area is shallow perched groundwater. Contaminants released to this perched water-bearing zone may potentially migrate to the unconfined aquifer.

Detailed information concerning the regional, physical, environmental, and demographic settings of the FEMP and adjacent areas, including the proposed study areas are provided in the *FEMP Site-Wide Characterization Report* (SWCR) (DOE, 1992). Topics discussed include climate, topography, surface water hydrology, geology, groundwater hydrology, soils, land use, population, vegetation, and wildlife.

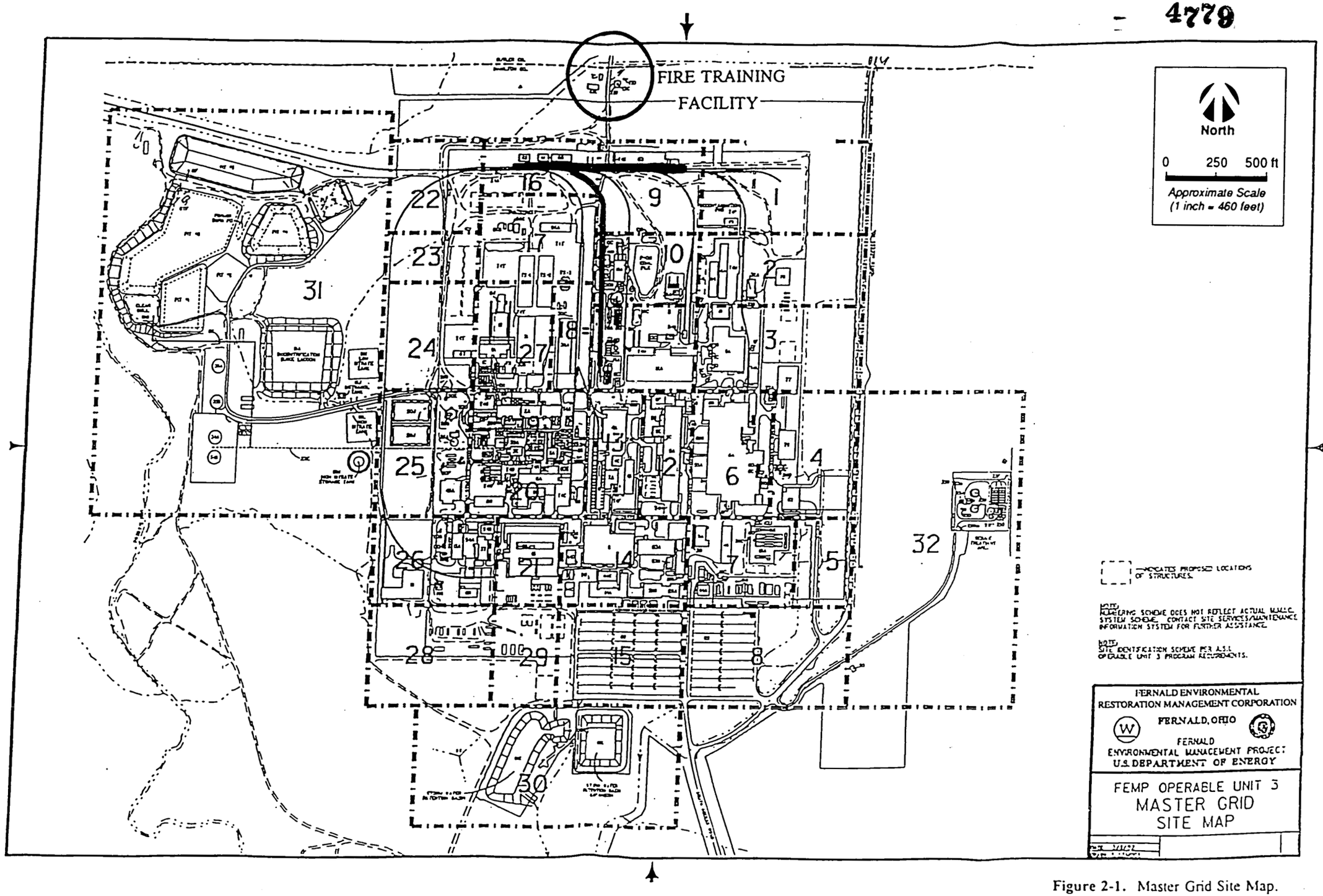

Figure 2-1. Master Grid Site Map.

3.0 SAMPLING APPROACH

This section describes the approach used in conducting the soil gas survey at the FTF. The fieldwork was conducted in accordance with the *Fire Training Facility Additional Characterization Work Plan* (FERMCO, 1992).

3.1 SAMPLE GRID

A north-south/east-west oriented sample grid with approximate 50-foot centers was established over the field area by Fernald Environmental Restoration Management Corporation (FERMCO) (Figure 3-1) for use in this soil gas survey and a soil radiological survey to be conducted by FERMCO at a later date. The base grid is bounded roughly to the north and west by the drainage ditch, to the south by the boundary fence, and to the east by the fence at the eastern edge of the exclusion zone. In the vicinity of the pond, the sump, and the open-top tank, the base sample grid was established on 25-foot centers to provide greater detail and definition. Based upon earlier surface radiological survey results and knowledge of the FTF operations, this area was believed to have the greatest potential for near-surface contamination. It was intended that the base grid be expanded or filled in as needed to provide the necessary definition to any contaminant detections. Numbers 21 and 22 were not used in the layout of the grid.

3.2 SOIL GAS SURVEY

The soil gas survey at the FTF was conducted to collect gas present in surface and near surface soil at the site and analyze it for VOCs. Direct soil gas collection and analysis was selected because 1) the organic contaminants previously detected in soil and perched water samples included a number of VOCs that could be used as "indicators" for the other organics, 2) direct soil gas extraction effectively "samples" a larger volume of soil than a point soil boring, 3) GC analysis could be performed on or near site with near real-time date feedback to the sampling effort allowing sampling to be adjusted as necessary, 4) the GC analyses are analyte specific and provide sensitivity consistent with the objectives for screening level data, and 5) the survey can be mobilized, performed, and de-mobilized quickly, thereby supporting the RAWP/CPID production schedule.

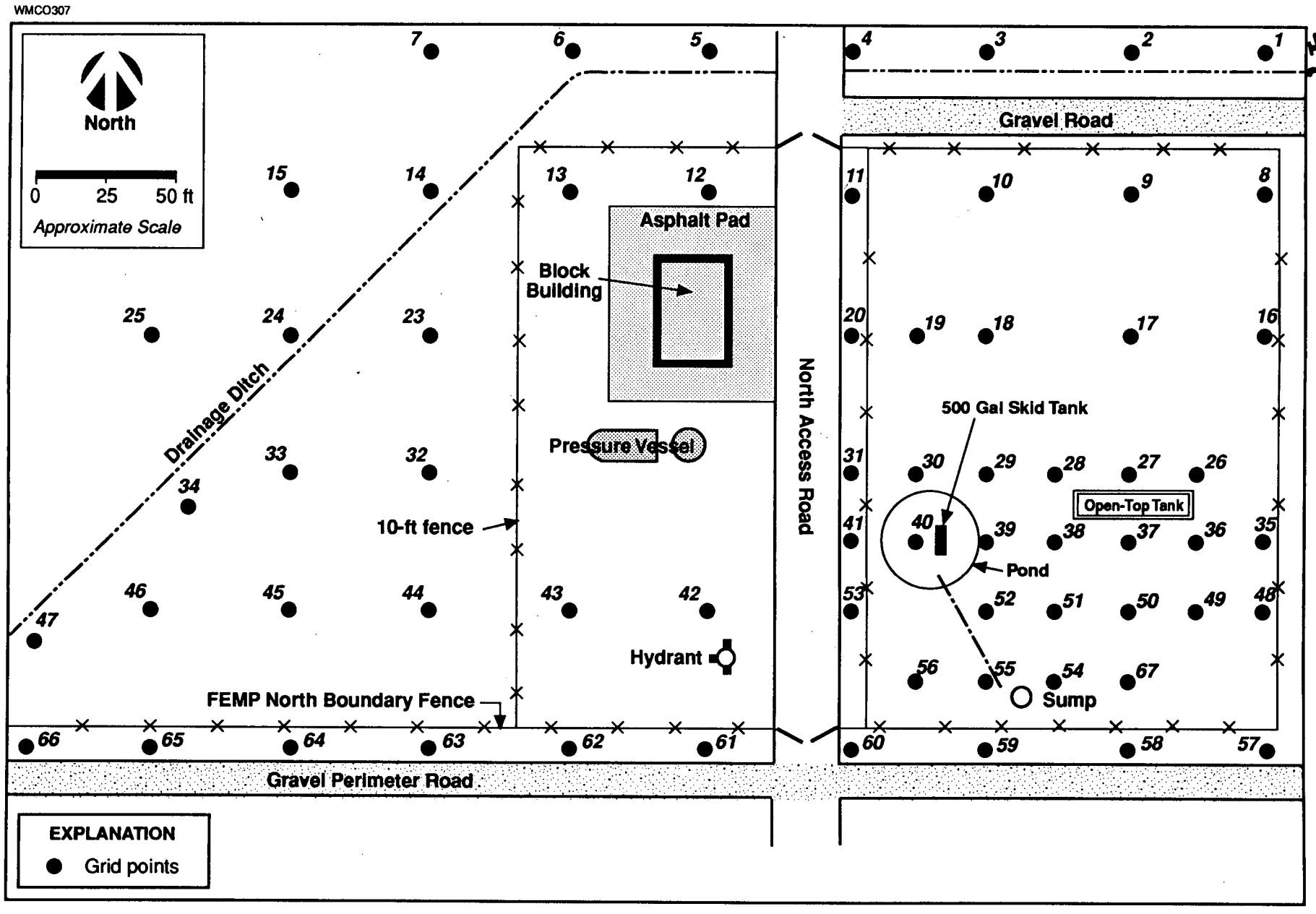

Figure 3-1. Map of the Fire Training Facility and the FERMCO base soil gas survey grid points.

Targeted analytes for the soil gas survey were derived from detections in soil and perched groundwater of VOCs reported in the RSE (WEMCO, 1992). The six VOCs identified in perched water samples in excess of maximum contaminant levels (MCLs) were selected, along with five other compounds that were detected in soil or perched water samples. The 11 analytes for the soil gas survey include:

DCA	Acetone
1,1-Dichloroethene (DCE)	Benzene
Methylene chloride	Ethylbenzene
Tetrachloroethene (PCE)	Toluene
1,1,1-Trichloroethane (TCA)	Xylenes
Trichloroethene (TCE)	

The detection limit selected was 1 part per billion volumetric (ppbv) for each VOC, with the exception of methylene chloride and DCA which had detection limits of 1,000 ppbv. Quantitation limits for analytes detected were 25 ppbv for each VOC, except for methylene chloride and DCA, which had quantitation limits of 1,000 ppbv. Detections for VOCs that occurred above the detection limit but below the quantitation limit were reported as trace detections but without a value.

This survey analyzed soil gas samples collected at 67 locations from the unsaturated zone. Sampling generally followed the grid described in Section 3.1, but included some adjustments. Additional locations were added during the survey as necessary to provide more definition, and the final survey grid is shown on Figure 3-2. The additions to the grid include points P1 to P4 within the asphalt pad, point 26A to the east of 26, and point 53A to the east of 53. Point 68 also was added for a supplemental soil headspace sample. Points 40 and 57 to 60 were dropped due to inaccessibility or lack of detections on the grid perimeter. Samples were analyzed using a GC in a mobile laboratory stationed near the site.

To supplement the soil gas detections, three soil headspace analyses were conducted using a shake extraction. These soil samples were collected from similar depths to soil gas samples and compared to soil gas results to evaluate their reliability.

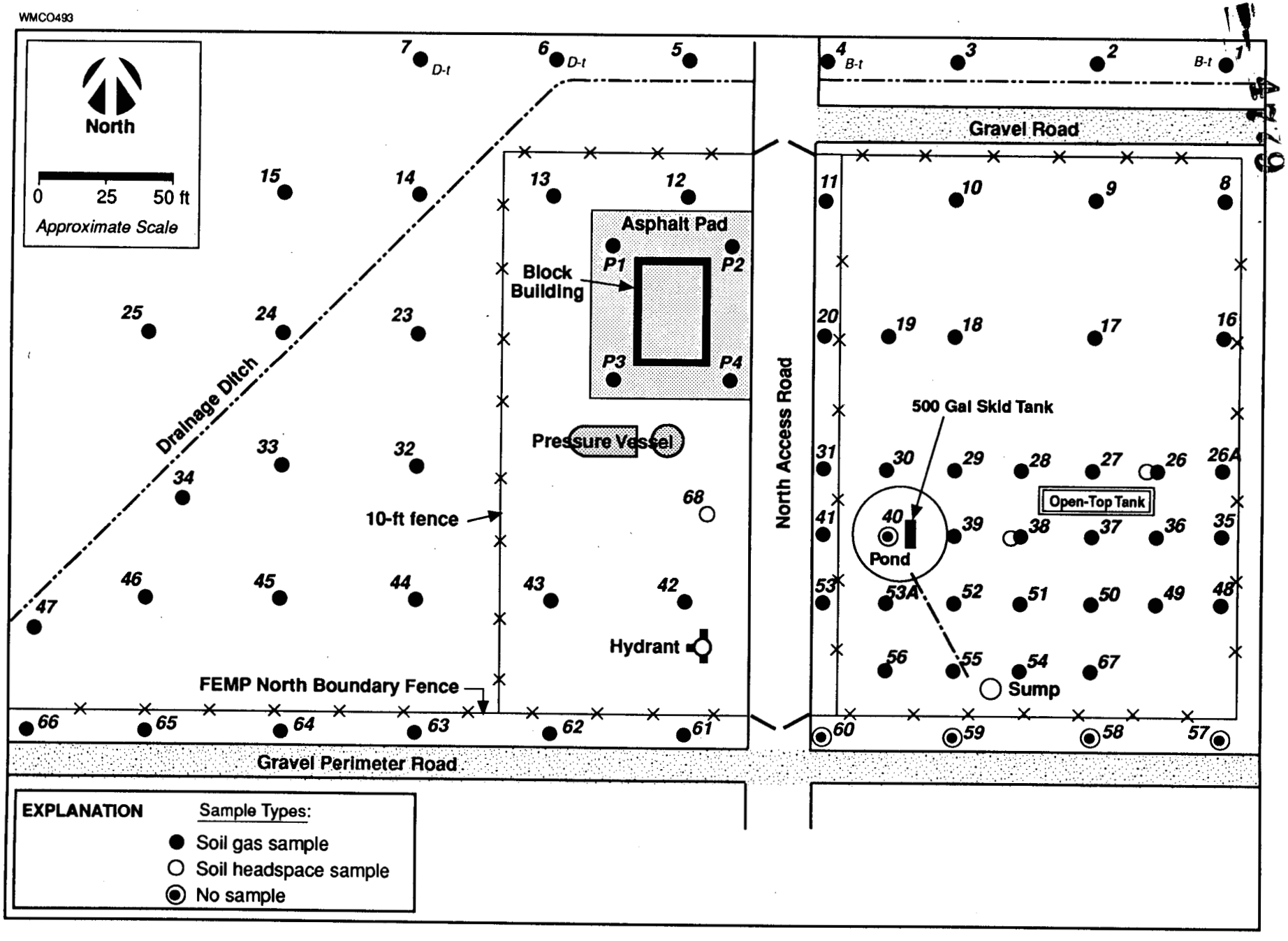

Figure 3-2. February 1993 soil gas survey sample locations and results.

4.0 FIELD PROCEDURES

This section provides the field procedures, in accordance with the FEMP SCQ, that were followed during this characterization. It describes the techniques used to conduct the soil gas survey and soil sampling for the presence of VOCs at the FTF.

4.1 SAMPLE COLLECTION PROCEDURES METHODOLOGY

Samples were collected from a depth of approximately 4 feet at points of the sample grid to collect gas from below the ground surface but above the perched water table. In locations 38, 37, soil gas collection actually occurred below a thin perched water horizon. As described in Section 3.2, additional points were added to the sample grid at locations where data gaps were considered to exist. Additionally, soil samples were collected from three locations for headspace analysis to allow comparison with results of the soil gas samples.

4.1.1 Soil Gas Sample Collection

The soil vapor survey sampling equipment included a slide hammer, 6-foot section of 3/8-diameter solid steel rod, 4-foot section of hollow 1/2-inch diameter steel probe, 4.5-foot section of 1/8-inch diameter solid steel rod, cap, extraction tube, and single-use disposable Hamilton 10 milliliter syringes. Samples were collected by applying a vacuum to a hollow probe driven into the ground. Below is the step-by-step procedure used.

1) Using the slide hammer, drive the 6-foot section of 3/8-inch diameter solid steel rod vertically into the ground at the vapor sampling location. Advance the rod to a depth of approximately 4 feet.

2) Withdraw the solid rod and replace with the 1/2-inch hollow steel probe, driving the hollow probe to a depth approximately 6 inches above the bottom of the hole created in Step 1.

3) Insert the 1/8-inch diameter solid steel rod inside the hollow steel probe to clear the tube of any soil.

4) Attach the cap and extraction tube assembly to the probe for sample extraction. Using the vacuum pump, purge three borehole volumes of soil gas from the sampling hole.

5) After purging, collect soil gas sample by inserting the gas tight, 10-milliliter Hamilton syringe into the pump septum and withdraw a 10-milliliter sample. Mark the syringe with a unique sample identification number corresponding to location numbers on the sample grid.

6) Cap the sample syringe with a rubber cap, store in a 1-quart cooler, and transport to the mobile laboratory. Deliver all samples to the mobile laboratory for analysis within 1 hour of collection. All samples are to be analyzed within 4 hours following collection.

4.1.2 Soil Sample Collection

Soil samples also were collected at three locations for supplemental analysis by a headspace extraction. Soil samples were collected at points 26 and 38, which had detections of DCA, TCE, and TCA, and point 68, which is near the locations of known releases to soil but in an area of no soil gas VOC detections (Figure 3-2). Samples for soil headspace analysis were collected by hand auger from a depth similar to soil gas collection. The soil samples were subjected to a shake extraction, from which the headspace gas was sampled and analyzed by the same method as for soil gas. The procedure for the soil sample collection was as follows:

1) Advance the solid steel probe to 3.5-foot depth using a slide hammer.

2) Use the hand auger to extract the soil at the 3.5 to 4 foot depth interval.

3) Pack soil tightly into 40 milliliter vial with a teflon septum and deliver to the mobile laboratory within 1 hour.

4) Open 40 milliliter soil vial and transfer 10 grams of soil to a 40 milliliter vial partially filled with 10 milliliters methanol.

5) Shake the 40 milliliter vial vigorously for 2 minutes to partition VOCs into the headspace gas.

6) Sample the headspace gas through the teflon septum of the vial using a 10-milliliter Hamilton syringe. Cap the syringe and store until analysis (within 4 hours of original soil collection).

4.2 SOIL GAS AND SOIL HEADSPACE ANALYSIS

Samples of soil gas and soil headspace extractions were analyzed in a mobile laboratory located on-site. A laboratory-grade GC was used to analyze samples for the targeted analytes. Two GCs were set up in parallel, with one GC using a photoionization detector (PID) and the other using an electron capture device (ECD). Analytical methodologies are described in Appendix A.

4.3 EQUIPMENT AND PERSONNEL DECONTAMINATION

Gross soil contamination was removed from soil gas sampling probes and other soil sampling equipment using dry brushes and paper towels. The 10 milliliter gas syringes were used to collect a single sample then disposed. No liquid wastes were generated. Procedures for equipment decontamination followed the specification in Section 10.2 of the Safe Shutdown Health and Safety Hazard Analysis Form prepared for the *Fire Training Facility Additional Characterization Work Plan* (FERMCO, 1992). Personnel decontamination procedures followed specifications in Section 10.1 of the Safe Shutdown Health and Safety Hazard Analysis Form.

5.0 QUALITY ASSURANCE/QUALITY CONTROL

This section discusses the field and laboratory quality assurance/quality control (QA/QC) measures implemented during this characterization. Detailed information concerning QA/QC requirements and protocol is provided in Sections 3.0, 4.0, 8.0, 10.0, 11.0, 15.0, 16.0, and Appendices A, C, D, E, F, I, and J of the FEMP SCQ.

5.1 FIELD QA/QC SAMPLES

Field QA/QC samples were run throughout the field operation to ensure the quality and reproducibility of the data. As a general rule, three QA/QC samples in some combination were run for every 10 unique samples. The QA/QC samples were run according to the following schedule or at additional occasions whenever the results fell outside of DQOs or if the field chemist determined the need:

- Sample duplicates (two samples from the same point) were collected a minimum of twice per day and at least once for every 20 sample locations to verify the reproducibility of the sampling and analysis procedures.

- Probe blanks consisted of pumping ambient air through the probe to check for carry-over between sampling locations. Probe blanks were run every 15 samples.

5.2 LABORATORY QA/QC SAMPLES

Laboratory QA/QC samples were run throughout the laboratory operation to ensure the quality and reproducibility of the data. The QA/QC samples were run according to the following schedule or at additional occasions if the results fell outside of DQOs or if the field chemist determined the need:

- Standards were run at the beginning of each day and at least once for every 15 samples to calibrate the GC.

- Blanks were also run to verify calibration of the GC. Blanks consist of three types: method blanks, sample syringe blanks, and injection syringe blanks. Instrument blanks consist of running an analysis, but not injecting a sample into the GC. Instrument blanks monitor the potential for carry-over from one sample run to another sample run within the GC and were conducted at least twice a day. Sampling syringe blanks consist of collecting an ambient air sample in an unused sampling syringe to demonstrate that the syringe was not contaminating to the sample. A sampling syringe blanks was run every 15 samples. Injection syringe blanks consist of injecting ambient air into the GC to monitor potential carry-over in the injection syringe. An injection syringe blank was run every 15 samples.

5.3 ANALYTICAL INSTRUMENTATION/EQUIPMENT CALIBRATION AND DOCUMENTATION

Analysis of soil gas was accomplished by using two Varian 3400 GCs set up in a mobile laboratory located temporarily near the site. The GCs were configured in parallel, with one using a PID and the other using an ECD. The PID used a 10.6 EV lamp. The GCs were calibrated for the analytes to standards using commercially-available, spectroscopic-grade reagents. The GCs were calibrated each morning and at intervals throughout the day (at least once for every 15 samples). Results were reported in μg/L (volumetric parts per billion).

5.4 GENERAL QUALITY CONTROL CHECKS AND PROCEDURES

Equipment decontamination was performed prior to collection of every sample throughout the field operation. DQOs were met for all blank samples. The sampling probes were decontaminated between each sampling location by brushing visible dirt off the probes and flushing them with ambient air.

6.0 ANALYTICAL RESULTS

Soil gas sample collection and analysis were conducted between February 23 and February 26, 1993. Results are presented below.

6.1 SOIL GAS RESULTS

Results of the soil gas survey are presented in Table 6-1 and portrayed on Figure 6-1. As indicated, DCA, TCA, TCE, and PCE were identified above detection limits at numerous locations. The only detections for the 11 analytes above the quantification limits were for DCA at two locations: 1,170 ppbv at point 38 and 1,900 ppbv at point 26. The three other analytes, TCA, TCE, and PCE were detected at numerous locations, although always at trace levels that represent concentrations of 5 ppbv or below. Table 6-1 and Figure 6-1 denote these as trace detections.

The soil gas survey shows the presence of DCA, TCA, TCE, and PCE at low concentrations primarily in the eastern portion of the site (Figure 3-1). No detections of the remaining analytes were observed. Near the open-top tank, DCA, TCA, TCE, and PCE were all detected. Near the skid tank, TCA and PCE were both detected. TCA was also detected 50 feet to the north and south of the open-top tank, by the north drainage ditch and also west of the block building. PCE was also north and northwest by the drainage ditch.

QA/QC samples were run according to the schedule presented in Section 5.0. All QA/QC results were acceptable indicating adequate control of the analytical process.

6.2 SOIL HEADSPACE RESULTS

None of the three soil samples for which analysis of headspace was performed following a shake extraction had detections of any of the analytes. This was true even though soil gas at point 26 had detections of DCA and TCE, and point 38 had detections of DCA, TCA, and TCE. Point 68, which filled in an area between soil gas points, also had no detections for the headspace sample.

Table 6-1. Results of the 1993 Soil Gas Survey at the Fire Training Facility.

Sample Point Number	Blank	26	27	28	29	29DUP	30	36	37	38	39	49	50	51
Date	2/23/93	2/23/93	2/23/93	2/23/93	2/23/93	2/23/93	2/23/93	2/23/93	2/23/93	2/23/93	2/23/93	2/23/93	2/23/93	2/23/93
Probe Depth (feet)	-	4	4	4	4	4	4	4	4	4	4	4	4	4
Volumes Purged	-	3	3	3	3	3	3	3	3	3	3	3	3	3
Acetone	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1,1 Dichloroethene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Methylene Chloride	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1,1,1 Trichloroethane	nd	nd	nd	nd	t	t	nd	nd	t	t	t	t	nd	nd
1,2 Dichloroethane	nd	1897	nd	nd	nd	nd	nd	nd	nd	1174	nd	nd	nd	nd
Trichloroethene	nd	t	nd	t	t	t	nd	t	t	t	nd	nd	nd	t
Tetrachloroethene	nd	nd	nd	t	nd	nd	t	t	t	nd	t	t	nd	nd
Benzene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Toluene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Ethylbenzene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Total Xylenes	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd

"t" indicates compound detected at a trace level of 5 ppbv or less, but above the detection limit of 1 ppbv.
"nd" indicates not detected at detection limit of 1 ppbv for each compound, except methlyene chloride and 1,2 dichloroethane which had detection limits of 1,000 ppbv.
a/ indicates soil sample collected for headspace analysis.
"DUP" indicates field duplicate sample.

318

4279

Table 6-1. Results of the 1993 Soil Gas Survey at the Fire Training Facility.

Sample Point Number	52	53A	54	55	56	Blank	9	10	11	12	13	13DUP	14	17
Date	2/23/93	2/23/93	2/23/93	2/23/93	2/23/93	2/24/93	2/24/93	2/24/93	2/24/93	2/24/93	2/24/93	2/24/93	2/24/93	2/24/93
Probe Depth (feet)	4	4	4	4	4	-	4	4	4	4	4	4	4	4
Volumes Purged	3	3	3	3	3	-	3	3	3	3	3	3	3	3
Acetone	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1,1 Dichloroethene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Methylene Chloride	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1,1,1 Trichloroethane	nd	nd	nd	t	t	nd	nd	nd	nd	nd	nd	nd	nd	t
1,2 Dichloroethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Trichloroethene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Tetrachloroethene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	t
Benzene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Toluene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Ethylbenzene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Total Xylenes	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd

"t" indicates compound detected at a trace level of 5 ppbv or less, but above the detection limit of 1 ppbv.
"nd" indicates not detected at detection limit of 1 ppbv for each compound, except methlyene chloride and 1,2 dichloroethane which had detection limits of 1,000 ppbv.
a/ indicates soil sample collected for headspace analysis.
"DUP" indicates field duplicate sample.

Table 6-1. Results of the 1993 Soil Gas Survey at the Fire Training Facility.

Sample Point Number	18	19	20	20DUP	23	31	41	49	53	BLANK	1	2	3	4
Date	2/24/93	2/24/93	2/24/93	2/24/93	2/24/93	2/24/93	2/24/93	2/24/93	2/24/93	2/25/93	2/25/93	2/25/93	2/25/93	2/25/93
Probe Depth (feet)	4	4	4	4	4	4	4	4	4	-	4	4	4	4
Volumes Purged	3	3	3	3	3	3	3	3	3	-		3	3	3
Acetone	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1,1 Dichloroethene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Methylene Chloride	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1,1,1 Trichloroethane	t	t	nd	nd	t	t	nd	t	nd	nd	t	nd	nd	t
1,2 Dichloroethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Trichloroethene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Tetrachloroethene	nd	nd	nd	nd	nd	nd	nd	t	nd	nd	nd	nd	nd	nd
Benzene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Toluene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Ethylbenzene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Total Xylenes	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd

"t" indicates compound detected at a trace level of 5 ppbv or less, but above the detection limit of 1 ppbv.
"nd" indicates not detected at detection limit of 1 ppbv for each compound, except methlyene chloride and 1,2 dichloroethane which had detection limits of 1,000 ppbv.
a/ indicates soil sample collected for headspace analysis.
"DUP" indicates field duplicate sample.

Table 6-1. Results of the 1993 Soil Gas Survey at the Fire Training Facility.

Sample Point Number	5	6	7	8	15	16	24	25	32	33	34	35	44	45
Date	2/25/93	2/25/93	2/25/93	2/25/93	2/25/93	2/25/93	2/25/93	2/25/93	2/25/93	2/25/93	2/25/93	2/25/93	2/25/93	2/25/93
Probe Depth (feet)	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Volumes Purged	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Acetone	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1,1 Dichloroethene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Methylene Chloride	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1,1,1 Trichloroethane	nd	nd	nd	nd	nd	nd	nd	nd	t	nd	nd	t	nd	nd
1,2 Dichloroethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Trichloroethene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Tetrachloroethene	nd	t	t	nd	nd	nd	nd	t	nd	nd	nd	nd	nd	nd
Benzene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Toluene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Ethylbenzene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Total Xylenes	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd

"t" indicates compound detected at a trace level of 5 ppbv or less, but above the detection limit of 1 ppbv.
"nd" indicates not detected at detection limit of 1 ppbv for each compound, except methlyene chloride and 1,2 dichloroethane which had detection limits of 1,000 ppbv.
a/ indicates soil sample collected for headspace analysis.
"DUP" indicates field duplicate sample.

42729

Table 6-1. Results of the 1993 Soil Gas Survey at the Fire Training Facility.

Sample Point Number	46	47	47DUP	48	BLANK	26A	42	43	61	62	63	64	65	66
Date	02/25/93	2/25/93	2/25/93	2/25/93	2/26/93	2/26/93	2/26/93	2/26/93	2/26/93	2/26/93	2/26/93	2/26/93	2/26/93	2/26/93
Probe Depth (feet)	4	4	4	4	--	4	4	4	4	4	4	4	4	4
Volumes Purged	3	3	3	3	--	3	3	3	3	3	3	3	3	3
Acetone	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1,1 Dichloroethene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Methylene Chloride	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1,1,1 Trichloroethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1,2 Dichloroethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Trichloroethene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Tetrachloroethene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Benzene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Toluene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Ethylbenzene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Total Xylenes	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd

"t" indicates compound detected at a trace level of 5 ppbv or less, but above the detection limit of 1 ppbv.
"nd" indicates not detected at detection limit of 1 ppbv for each compound, except methlyene chloride and 1,2 dichloroethane which had detection limits of 1,000 ppbv.
a/ indicates soil sample collected for headspace analysis.
"DUP" indicates field duplicate sample.

Table 6-1. Results of the 1993 Soil Gas Survey at the Fire Training Facility.

Sample Point Number	67	P1	P2	P3	P4	26Soil[a/]	38Soil[a/]	68Soil[a/]
Date	2/26/93	2/26/93	2/26/93	2/26/93	2/26/93	2/26/93	2/26/93	2/26/93
Probe Depth (feet)	4	4	4	4	4	3.5-4	3.5-4	3.5-4
Volumes Purged	3	3	3	3	3	-	-	-
Acetone	nd	nd	nd	nd	nd	nd	nd	nd
1,1 Dichloroethene	nd	nd	nd	nd	nd	nd	nd	nd
Methylene Chloride	nd	nd	nd	nd	nd	nd	nd	nd
1,1,1 Trichloroethane	nd	nd	nd	nd	nd	nd	nd	nd
1,2 Dichloroethane	nd	nd	nd	nd	nd	nd	nd	nd
Trichloroethene	nd	nd	nd	nd	nd	nd	nd	nd
Tetrachloroethene	nd	nd	nd	nd	nd	nd	nd	nd
Benzene	nd	nd	nd	nd	nd	nd	nd	nd
Toluene	nd	nd	nd	nd	nd	nd	nd	nd
Ethylbenzene	nd	nd	nd	nd	nd	nd	nd	nd
Total Xylenes	nd	nd	nd	nd	nd	nd	nd	nd

"t" indicates compound detected at a trace level of 5 ppbv or less, but above the detection limit of 1 ppbv.
"nd" indicates not detected at detection limit of 1 ppbv for each compound, except methlyene chloride and 1,2 dichloroethane which had detection limits of 1,000 ppbv.
a/ soil sample collected for headspace analysis.
"DUP" indicates field duplicate sample.

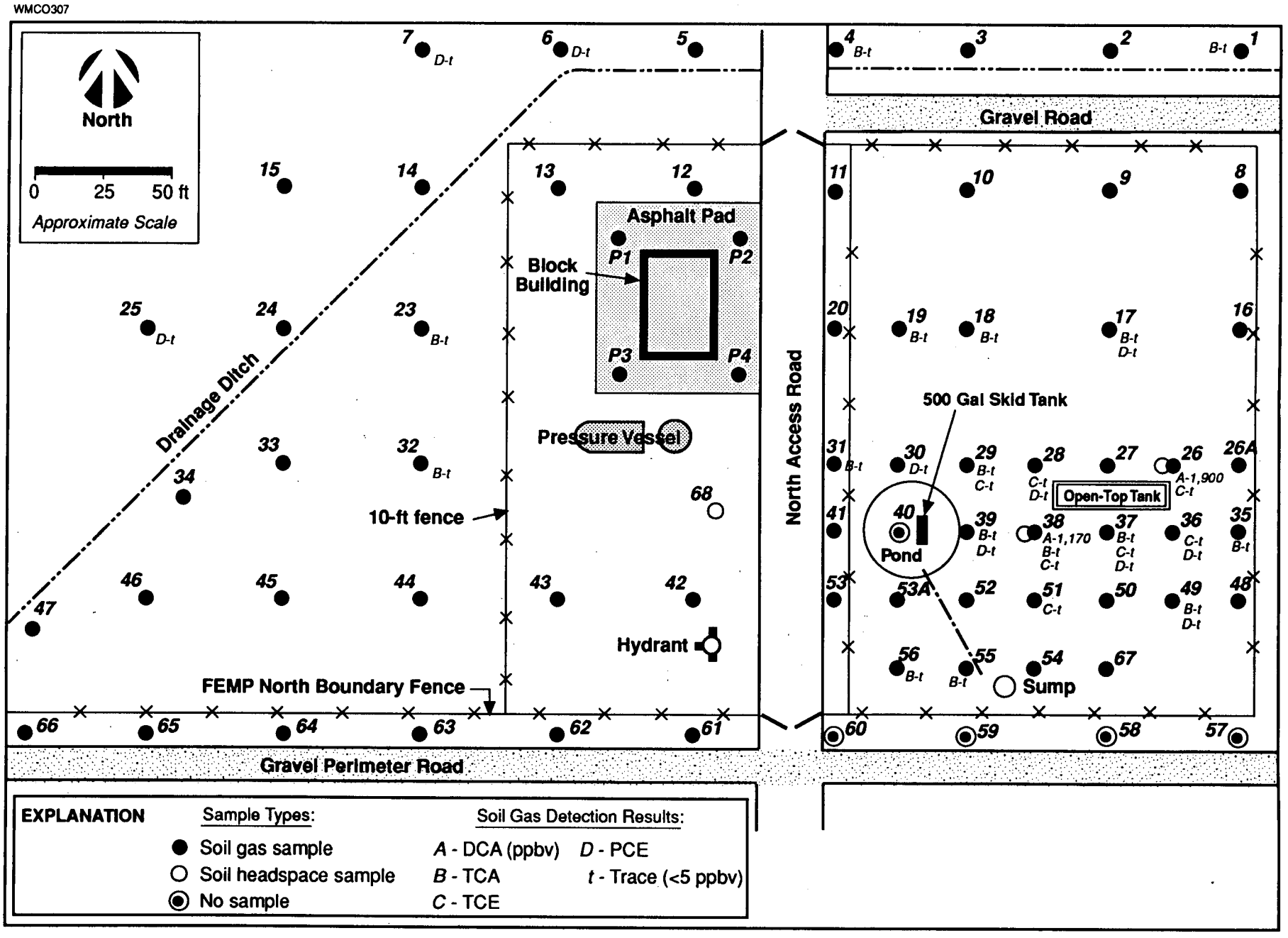

Figure 6-1. February 1993 soil gas survey sample locations and results.

6.3 CONCLUSIONS

Based on the distribution of target VOCs detected in soil gas, the survey indicates that organic contaminants are primarily present in the area of the skid tank and the open-top tank, extending south of the skid tank to the sump and slightly to the north of both tanks. Some single detections occurred in outlying areas. These outliers occurred at various locations, including scattered trace detections near the drainage ditch on the north of the site and in the open area west of the block building (Figure 3-2).

The multiple detections located around the skid tank and open-top tank correspond to the surface facilities that were used to burn liquid fuels at the site for fire training exercises. The detections also generally correspond with areas of elevated radionuclides reported in the RSE. Areas of known mixed, known hazardous, and suspected mixed waste are shown on Figure 6-2.

The results of the soil gas survey do not indicate significant horizontal migration of organic contaminants from the contaminant release points. The VOCs were detected in the primary areas of discharge to the ground, which is around the skid tank and open-top tank. Detections in outlying areas are separated by areas of no detections. Migration to outlying points could have occurred above ground at the time of release, or in the subsurface in the vadose zone or perched groundwater. However, they may also be the result of release events not associated with the FTF. Based on the scattered nature of outlying detections, it is apparent that horizontal migration of VOCs in the soil or perched groundwater has not occurred to a great extent. The absence of detectable VOCs in the soil samples collected to supplement the soil gas samples may indicate that the source of the VOCs in soil gas samples may actually be the underlying perched water rather than the surface and near surface soils.

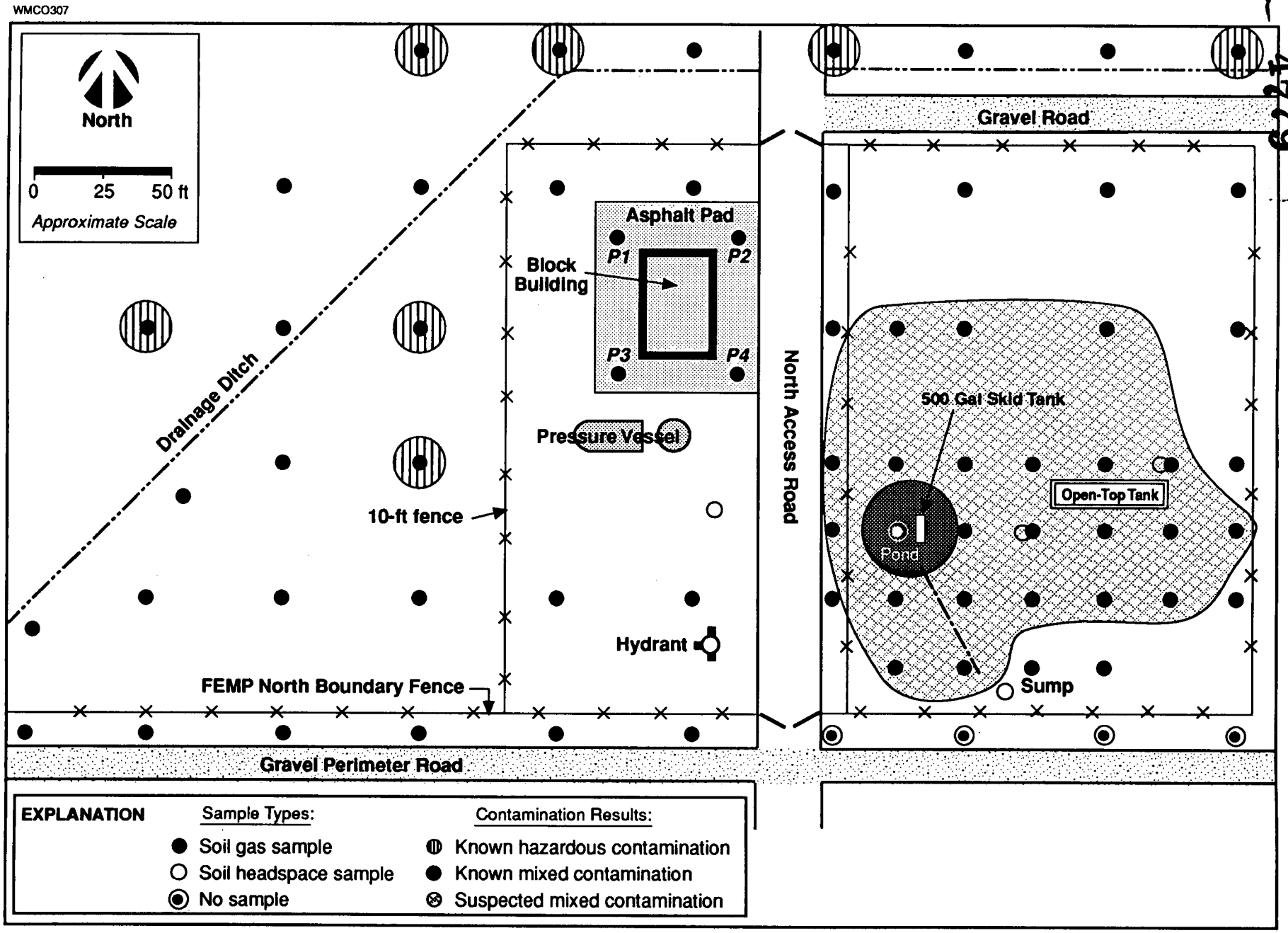

Figure 6-2. Known and Suspected Contamination Areas

7.0 REFERENCES

DOE. 1992. *FEMP Site-Wide Characterization Report* (SWCR). U.S. Department of Energy.

FEMP. 1992. *Site-Wide CERCLA Quality Assurance Project Plan (SCQ)*, Volumes I-V, Westinghouse Environmental Management Company of Ohio, Fernald, Ohio.

FERMCO. 1992. *Fire Training Facility Additional Characterization Work Plan*, Fernald Environmental Management Project, Fernald, Ohio.

USEPA. 1991. *U.S. Department of Energy Feed Materials Production Center, Fernald, Ohio (O.H.G. 890 008 976), Consent Agreement as amended under CERCLA Sections 120 and 106a*. Administration Docket number: V-W-90-C-057.

WEMCO. 1992. *Removal Site Evaluation Work Plan*, Westinghouse Environmental Management Company of Ohio, Fernald, Ohio.

APPENDIX A

TEG Analytical Methodology

METHOD REFERENCES

This Appendix provides an outline of the analytical methods used in the TEG mobile laboratory.

The analytical methods used by TEG are based on procedures in the following references:

- **U.S. EPA Document SW-846**, Test Methods for Evaluating Solid Waste, Third Edition, November, 1986, and Draft Revision 1, December 1987;
- **U.S. EPA Document 600/4-79-020**, Methods for Chemical Analysis of Water and Wastes, March 1983;
- **U.S. Code of Federal Regulations 40**, Protection of Environment, Part 136, Guidelines Establishing Test Procedures for the Analysis of Pollutants, July 1, 1989;
- **U.S. Code of Federal Regulations 40**, Protection of Environment, Part 141, National Primary Drinking Water Regulations, July 1, 1989; and
- **California State Water Resources Control Board**, Division of Water Quality, Leaking Underground Fuel Tank Field Manual, December 17, 1987.

EPA METHODS 601 AND 8010

Introduction. The purpose of this procedure is to describe the GC method for determination of purgeable halogenated hydrocarbons in soils, solid wastes, and waters using the HALL Detector. Details of the method are found in EPA Document SW-846. Presented below is an overview of the method in terms of calibration, operating conditions, compound identification, and calculations. This method can be modified to include analysis of EDB with an ECD in accordance with the requirements in certain states.

Calibration. Calibration may be accomplished by either internal or external standard techniques. Standards are prepared at three or five concentrations spanning the linear range of the instrument. The standards are then analyzed and the response factor evaluated for linearity. If linearity is not achieved a second set of analyses is run. If linearity is still not achieved, a second set of standards is prepared and the process is

repeated. Linearity is acceptable when response factor values are within 15 percent standard deviation for internal standard calculations or if the mean residual from the linear regression is within 15 percent.

Water Sample Preparation. For aqueous samples, a 5 ml aliquot is generated and spiked with internal standards and (or) surrogates in a gas tight syringe. Purge and Trap operation is performed in general accordance with EPA method 5030. The sample is purged for eight minutes at a flow rate of 30 ml per minute.

Soils and Solid Wastes. A solvent extraction is first performed using methanol. The methanolic extraction is achieved by placing ten grams of the soil sample into a 40 ml volatile organic analysis (VOA) vial, adding 10 μl of surrogate soil spike (1,000 ng/μl in methanol), and 10 ml of reagent purge-and-trap grade methanol. The VOA is then hand shaken for two minutes and placed in a water-bath sonicator for ten minutes. Depending on anticipated concentration, 10 to 50 μl of the extract is then added to 5 ml of volatile free water in the purge and trap or 3 μl of the extract is directly injected into the gas chromatograph.

Purge and Trap Conditions.

Instrument:	Tekmar LSC 2000
Purge flow:	20 ml/min to 30 ml/min
Purge time:	8 minutes
Dry purge time:	8 minutes
Desorb time:	3 minutes
Desorb temperature:	275°C
Bake time:	10 minutes
Baker temperature:	290°C

Gas Chromatography

Instrument:	Gas Chromatograph
Column:	50 to 100 m by 0.053 mm, RT 502.2, megabore capillary
Carrier flow:	Nitrogen at 15 ml/min
Detector:	Electron Capture

Detector temperature:	275°C
Injector temperatures:	175°C
Column oven:	45°C for 2 minutes
	45 to 145°C at 5/minute

Standard Preparations. Primary 8010 standards at 100 mg/l (ppm) in methanol are purchased from a certified supplier.

Secondary Standards (1 ng/μl): dilute primary standard by 100 times (100 μl to 10 ml).

Water Matrix Spikes. For 1 μg/l (1 ppb) water concentration, add 5 μl of 1 ng/μl (ppm) secondary 601 standard to 5 ml of water (1,000 times dilution).

Soil Matrix Spikes. For 1 mg/kg (1 ppm) soil concentration, add 100 μl of 100 ng/μl primary standard to 10 g of soil.

Calculations of Sample Concentrations.

Water Samples

Concentration (μg/l) = [(Ax *)/(As * Vs)] * D

Soil Samples

Concentration (ng/g) = [(Ax * A * Vt * D)/(As * Vi * W)]. Where:

Ax	is the area counts for the sample - method blank
A	is the amount of standard injected (ng)
As	is area counts for the standard
Vi	is the volume of extract injected (μl)
D	is the dilution factor on the sample
Vt	is the volume of total extract (μl)
Vs	is the volume of water extracted (ml)
W	is the weight of soil extracted (g)

For the standard procedures employed by TEG, these equations reduce to:

Water Samples: Concentration (μg/l; ppb) = measured mass (ng)/5

Compound Identification. This method is used to identify and quantify the analytes listed in Table 5-1.

EPA METHODS 602 AND 8020

Introduction. The purpose of this procedure is to describe the GC method for determination of volatile aromatic hydrocarbons in soils, solid wastes, and waters using a photoionization detector. Details of the method are found in EPA Document SW-846. Presented below is an overview of the method in terms of calibration, operating conditions, compound identification and calculations. This method can be modified to include methyl tert-butyl ether (MTBE) in accordance with the requirements of certain states.

Calibration. Calibration may be accomplished by either internal or external standard techniques. Standards are prepared at three or five concentrations spanning the linear range of the instrument. The standards are then analyzed and the response factor evaluated for linearity. If linearity is not achieved a second set of analyses is run. If linearity is still not achieved, a second set of standards is prepared and the process repeated. Linearity is acceptable when response factor values are within 15 percent standard deviation for internal standard calculations or if the mean residual from the linear regression is within 15 percent.

Sample Preparation

Water Samples. A 5 ml aliquot of water is spiked with 5 μl of 1 ng/μl surrogate standard (chlorobenzene) and extracted by purge and trap.

Soils Samples. 10 g of soil are weighed to the nearest 0.1 g and placed into a clean VOA vial with 10 ml of purge and trap grade methanol or freon-113. The VOA vial is shaken for 2 minutes, placed into a water bath and sonicated for 10 minutes. After sonication, the slurry is allowed to settle and 10 to 50 μl of solvent are withdrawn,

added to 5 ml of water, and extracted by purge and trap or 3 μl of the extract is directly injected into the gas chromatograph.

Purge and Trap Conditions.

Instrument:	Tekmar LSC 2000
Purge flow:	20 ml/min to 30 ml/min
Purge time:	8 minutes
Dry purge time:	8 minutes
Desorb time:	3 minutes
Desorb temperature:	275°C
Bake time:	10 minutes
Baker temperature:	290°C

Gas Chromatography

Instrument:	Gas chromatograph
Column:	60 to 100 meter by 0.053 mm, RT 502.2, megabore capillary
Carrier flow:	Nitrogen at 15 ml/min
Detector:	Electron capture
Detector temperature:	275°C
Injector temperatures:	175°C
Column oven:	45°C for 2 minutes 45 to 145°C at 5/minute

Standard Preparations. Primary 8020 standards at 100 mg/l (ppm) in methanol are purchased from a certified supplier.

Secondary Standards (1 ng/μl): dilute primary standard by 100 times (100 μl to 10 ml).

Water Matrix Spikes. For 1 μg/l (1 ppb) water concentration, add 5 μl of 1 ng/μl (ppm) secondary 602 standard to 5 ml of water (1,000 times dilution).

Soil Matrix Spikes. For 1 mg/kg (1 ppm) soil concentration, add 100 μl of 100 ng/μl primary standard to 10 g of soil.

Calculations of Sample Concentrations.

Water Samples

Concentration (μg/l) = [(Ax * A)/(As * Vs)] * D

Soil Samples

Concentration (ng/g) = [(Ax * A * Vt * D)/(As * Vi * W)]. Where:

Ax	is the area counts for the sample - method blank
A	is the amount of standard injected (ng)
As	is area counts for the standard
Vi	is the volume of extract injected (μl)
D	is the dilution factor on the sample
Vt	is the volume of total extract (μl)
Vs	is the volume of water extracted (ml)
W	is the weight of soil extracted (g)

For the standard procedures employed by TEG, these equations reduce to:

Water Samples: Concentration (μg/l; ppb) = measured mass (ng)/5

Soil Samples: Concentration (mg/kg; ppm) = measured mass (ng)/Vi

Compound Identification. This method is used to identify and quantify the analytes listed in Table 5-1.

SOIL VAPOR ANALYTICAL METHODOLOGY

Operating Conditions & Instrumentation

8010/8015/8020 (halogenated, total petroleum hydrocarbons [TPH], and Aromatic hydrocarbons)

Instrument:	Gas Chromatograph
Column:	60 to 100 meter by 0.053 mm, RT 502.2, megabore capillary
Carrier flow:	Nitrogen at 15 ml/min
Detector:	Electron Capture
Detector temperature:	275°C
Injector temperatures:	175°C
Column oven:	45°C for 2 minutes 45 to 145°C at 5/minute

Standard Preparation

Primary (stock) standards (100 mg/l of each component in methanol) are purchased from a certified supplier (Chem Service).

Secondary (working) standards (1 μg/ml) are made at least monthly by diluting primary standard by 100 times (40 μl primary to 4 ml solvent).

Neat (Pure) standards of many compounds are carried in the laboratory to enable on-site preparation of compound-specific standards as appropriate.

Lot numbers and preparations of all standards are recorded on a log sheet.

Instrument Calibration

Three point calibration curves for each target component are prepared by analyzing low, mid, and high calibration standards prepared from the primary standards. Typical standard ranges depend upon detector as follows:

Flame ionization detector (FID):	1 ppmv to 100 ppmv
PID:	0.1 ppmv to 10 ppmv
HALL:	0.1 ppmv to 10 ppmv
ECD:	0.012 ppmv to 1 ppmv

Continuing Calibration is performed at the start of each day by injecting mid-range calibration standard. Acceptable containing calibration agreement: $\pm$15 percent.

Out-of-Limits Procedures

If daily calibration falls outside 15 percent limits, corrective action is taken as follows:

1. Check flows, clean detectors as appropriate, reanalyze.
2. Analyze QA/QC check sample to check accuracy of standard.
3. Mix a new working standard and reanalyze.
4. If problem not solved, analyze primary standard.
5. If problem not solve, service instrument.

Injection of Soil Vapor Samples

Vapor samples are withdrawn from the sampling syringe with a 1 cc syringe and injected directly into a sampling port on the gas chromatograph. The injection syringe is flushed 2 times with the sample prior to injection. Injection syringes are baked between injections and discarded if values greater than 100 ppmv of any compound are measured.

Compound Confirmation

All 8010/8020 analyses are performed with PID/HALL detectors in series in parallel on 60 to 100 meter columns following EPA Method 8021 protocols. This configuration gives required separation and dual-detector confirmation.

Blanks

A method blank is performed each morning and more often as appropriate during the course of the day. Blanks exceeding 0.1 ppmv for any target compound except methane and TPH are repeated until less than this level. For methane and TPH, the acceptable blank values are 10 ppmv.

Duplicates

Duplicate samples are analyzed when inconsistent data are observed or as requested by the client or regulatory agency. Because soil vapor duplicates can vary widely, TEG's nominal relative percent difference (RPD) acceptance criteria is $\pm$ a factor of 2.

Sample Holding Time

Soil vapor samples are not stored, but analyzed immediately upon collection.

Sample Identification

Each sample is given unique identification specifying location and depth.

Calculation of Soil Vapor Concentrations

Micrograms/liter-vapor (μg/l-vapor): ng injected/cc of vapor injected

Parts per million volume (ppmv):

μg/l-vapor * R/MW

R is the universal gas constant (24 at ambient T)

MW is the molecular weight of each compound

A conversion table for all common compound follows.

4779

Soil Vapor Data Conversion μg/l vapor to ppmv.

freon 12	R/100	0.240
vinyl chloride	R/62	0.387
freon 11	R/118	0.203
-1,1 dichloro ethene	R/97	0.247
methylene chloride	R/84	0.286
trans 1,2 dichloro ethene	R/97	0.247
1,1 dichloro ethane	R/99	0.242
chloroform	R/120	0.200
cis 1,2 dichloroethene	R/97	0.247
1,1,1 trichloro ethane	R/134	0.179
carbon tetrachloride	R/154	0.156
1,2 dichloro ethane	R/99	0.242
benzene	R/78	0.308
trichloro ethene	R/132	0.182
1,2 dichloro propane	R/113	0.212
bromo dichloro methane	R/164	0.146
cis dichloro propene	R/111	0.216
toluene	R/92	0.261
trans dichloro propene	R/111	0.216
1,1,2 trichloro ethane	R/134	0.179
tetrachloro ethene	R/166	0.145
chlorobenzene	R/112	0.214
ethyl benzene	R/106	0.226
xylenes	R/106	0.226
tetrachloro ethane	R/168	0.143
Acetone		0.414

R is the universal gas constant (~24 at ambient temp)

ATTACHMENT 8
FTF AREA OF CONTAMINATION

CONTAMINATION AT THE
FIRE TRAINING FACILITY
Removal Action Work Plan and
Closure Plan Information and Data Package

Fernald Environmental Management Project

September 1993

1.0 BACKGROUND

The FTF removal and closure activities discussed in this plan will generate quantities of contaminated and non-contaminated soil wastes and debris. Removal Action No. 17, Improved Storage of Soil and Debris, provides the site-wide management concept and implementation strategy for soil and debris at the FEMP. That management concept implements the objectives of CERCLA that include both mitigation of potential risks to people and the environment, and the minimization of wastes. The FEMP will minimize the generation of soil wastes by returning excavated soil to its source (where applicable).

The FEMP may establish an Area of Contamination (AOC) in the event that a large quantity of soil containing hazardous waste is excavated. The AOC concept is presented in the US EPA Superfund Land Disposal Restriction (LDR) guides and the National Contingency Plan preamble (55 FR 8758, 8760). The AOC would be delineated by contiguous contamination with respect to contaminants and concentrations.

The FEMP will notify the US EPA and the Ohio EPA Division of Hazardous Waste Management if an AOC is delineated for the control and management of soil that is contaminated with hazardous waste. The notification will include a map of the delineated AOC and the characterization data that was used to determine the areal extent of the AOC.

2.0 FTF AOC

This document serves as the notice to the USEPA and the OPEA that the FEMP is designating the FTF HWMU as an AOC. The boundaries of the FTF AOC are shown in Figure 1. These boundaries coincide with the boundaries of the FTF HWMU, and were selected to encompass the contamination present within the FTF, and provide sufficient space for stockpiling of excavated soils prior to final characterization and disposition.

The characterization data that were used to determine the areal extent of the AOC are summarized in Section 2.2 of this plan. The sampling and analysis efforts that produced these data are detailed in the RSE (Attachment 1) and the soil gas survey (Attachment 7).

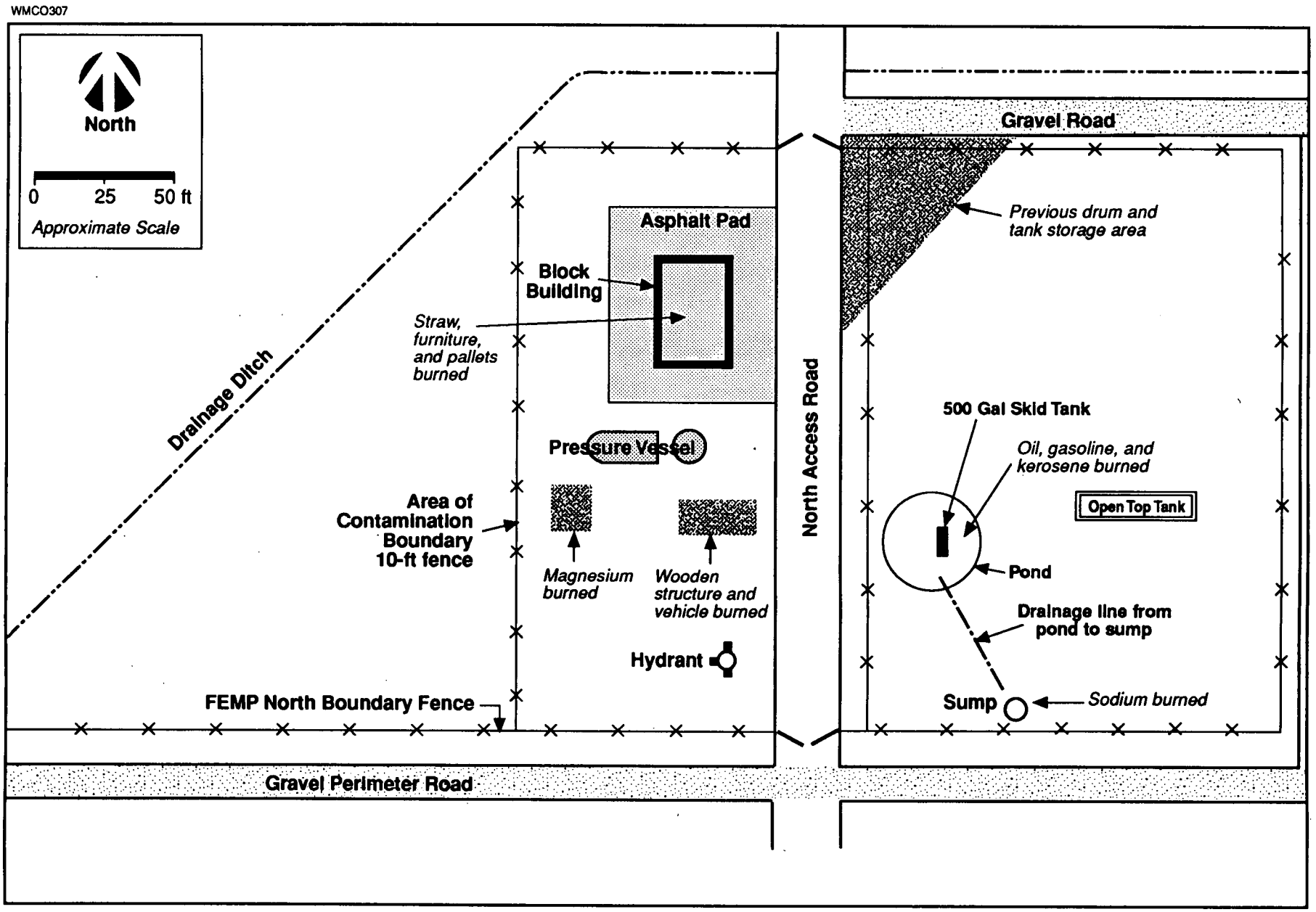

Figure 1. Fire Training Facility Area of Contamination (AOC).

ATTACHMENT 9
RCRA CLOSURE GUIDANCE CHECKLIST

CONTAMINATION AT THE
FIRE TRAINING FACILITY
Removal Action Work Plan and
Closure Plan Information and Data Package

Fernald Environmental Management Project

September 1993

CLOSURE PLAN CHECKLIST

DISPOSAL SURFACE IMPOUNDMENTS

CLOSURE PLAN CHECKLIST
DISPOSAL SURFACE IMPOUNDMENTS

SUBJECT REQUIREMENT	40 CFR PART 265 [OAC 3745]	SUBJECT REQUIREMENT LOCATION IN CPID
1. FACILITY DESCRIPTION	§ 265.111 [66.11]	Section 2.0 - Facility description
1.1 General description (e.g., size, location)		Section 2.1 - waste management unit description
1.2 Topographic map		N/A - Topographic map not required as drainage, soil contamination issues will be addressed under FTF Removal Action.
1.3 List of other HWM units and wastes handled in each		N/A - CPID addresses only Fire Training Facility HWMU
1.4 Hydrogeologic information:		Section 2.1.3 - Geology and hydrology Section 2.1.3.2 - provides discussion of aquifer systems
• Groundwater and soil conditions		Section 2.1.3.1 - provides geologic information Section 2.1.3.2 - provides discussion of aquifer systems
• Groundwater monitoring systems		Section 2.2.4 - groundwater sampling Figure 2-2 - piezometer locations
• Corrective Actions		Section 2.6 - removal action justification Section 3.2.2 - discussion of field activities
1.5 Surface impoundment description:		Section 2.1.2 - description and function of burn areas
• Wastes managed (EPA hazardous waste numbers and quantities)		Section 2.2 - waste inventory Table 2-1 - list of analytes from Wells 1887 and 1890
• Number and size (aerial dimensions and depth) of impoundments (including engineering drawings)		Section 2.1.2 - description and function of burn areas
• Liner systems and leachate collection systems design		Section 2.1.2 - description and function of burn areas
• Run-on and run-off control systems		Section 2.1.2 - description and function of burn areas
1.6 References to other environmental permits (NPDES, UIC, TSCA)		N/A

4729

344

SUBJECT REQUIREMENT	40 CFR PART 265 [OAC 3745]	SUBJECT REQUIREMENT LOCATION IN CPID
1.7 Anticipated waivers or exemptions		Section 3.2.1.3 - request to Director for waiver of 180-day closure requirments Section 5.0 - waiver from Director of 180-day closure requirements required
2. CLOSURE PROCEDURES		Section 3.1 - Closure Objectives Section 3.2 - Closure Methodology
2.1 Estimates of maximum quantity of inventory (by waste type) to be removed:	265.112(b)(3); 265.228 [66-12(b)(3); 65-28]	Sections 3.2.1 and 3.3.2 - procedures discussed Section 3.4 - waste disposal and management Table 3-10 - summary of waste minimization with volume estimates
• Pumpable wastes in the impoundments		N/A
• Bottom sludges/residues in the impoundments		N/A
2.2 Procedures for handling inventory to be treated/stabilized and replaced in the impoundments (consistent with Land Disposal Restrictions under 40 CFR Part 268)	265.112(b)(3); 265.228 [66-12(b)(3); 65-28]	Section 3.4 - discussion of waste disposal and management
• Waste types and quantities		Section 3.4 - discussion of waste disposal and management Table 3-10 - summary of waste minimization with volume estimates
• Treatment methods		Section 3.1.2.3 - discussion of work plan/FTF removal action
• Type and amount of stabilization reagent		N/A
2.3 Procedures for handling other removed inventory (address quantities, waste types, and methods):		Section 3.1.2.3 - discussion of work plan/FTF removal action Section 3.4.3 - waste disposal and management
• On-site treatment/disposal		Section 3.1.2.3 - discussion of work plan/FTF removal action Section 3.4.3 - waste disposal and management

4279

SUBJECT REQUIREMENT	40 CFR PART 265 [OAC 3745]	SUBJECT REQUIREMENT LOCATION IN CPID
• Off-site transportation		Section 3.1.2.3 - discussion of work plan/FTF removal action Section 3.4.3 - waste disposal and management
• Off-site treatment/disposal		Section 3.1.2.3 - discussion of work plan/FTF removal action Section 3.4.3 - waste disposal and management
2.4 Procedures for decontamination and/or disposal:	265.112(b)(4); 265.114; 265.228 [66-12(b)(4); 66-14; 65-28]	Section 3.0 - removal action information Section 3.1.2.3 - discussion of work plan/FTF removal action Section 3.2.2 - discussion of field activities Section 3.4 - procedures for waste disposal
• Equipment/structures decontamination (address sampling protocol)		Section 3.3 - sampling and analysis Section 3.3.2 - sampling procedures Section 3.1.2.3 - discussion of work plan/FTF removal action
• Cleaning agent/rinsewater treatment or disposal (address quantities, waste types, and methods):		Section 3.1.2.3 - discussion of work plan/FTF removal action
-- On-site treatment/disposal		Section 3.1.2.3 - discussion of work plan/FTF removal action Section 3.2.2 - discussion of field activities
-- Off-site treatment/disposal		Section 3.1.2.3 - discussion of work plan/FTF removal action Section 3.2.2 - discussion of field activities
• Equipment/structures demolition and removal (address quantities and methods):		Section 3.1.2.3 - discussion of work plan/FTF removal action Section 3.2.2 - discussion of field activities Section 3.2.2.4 - removal of structures
-- On-site treatment/disposal		Section 3.1.2.3 - discussion of work plan/FTF removal action Section 3.2.2 - discussion of field activities Section 3.2.2.4 - removal of structures

346

4279

SUBJECT REQUIREMENT	40 CFR PART 265 [OAC 3745]	SUBJECT REQUIREMENT LOCATION IN CPID
-- Off-site treatment/disposal		Section 3.1.2.3 - discussion of work plan/FTF removal action Section 3.2.2 - discussion of field activities Section 3.2.2.4 - removal of structures
• Contaminated soil removal:		Section 3.2.2 - discussion of field activities Section 3.2.2.5 - soil excavation
-- List or sketch of potentially contaminated areas		Figure 3-1 - Location of contaminated areas
-- Estimated amount of contaminated soil to be removed (address sampling protocol)		Section 3.2.2.5 - estimate of quantity of soil to be removed
-- Soil removal methods		Section 3.2.2 - discussion of field activities Section 3.2.2.5 - soil excavation
-- On-site disposal		Section 3.2.2.5 - final disposition of soil will follow Removal Action No. 17
-- Off-site disposal		Section 3.2.2.5 - final disposition of soil will follow Removal Action No. 17
2.5 Final cover design (including engineering drawings):	265.228 [65-28]	Section 2.1.2 - description and function of burn areas; cover not required
• Area covered		N/A
• Cover characteristics		N/A
-- Material type		N/A
-- Permeability		N/A
-- Depth		N/A
-- Slope		N/A
-- Drainage structures		N/A
-- Vegetation		N/A
• Installation procedures (equipment and labor requirements)		N/A

347

42729

SUBJECT REQUIREMENT	40 CFR PART 265 [OAC 3745]	SUBJECT REQUIREMENT LOCATION IN CPID
2.6 Groundwater Monitoring:	265.112(b)(5) [65-12(b)(5)]	Section 3.3.2.4 - discussion of groundwater sampling
• Types of analyses:		Section 3.3.2.4 - discussion of groundwater sampling
-- Number, location, and frequency		Section 3.3.2.4 - discussion of groundwater sampling
-- Procedures for analyses		Section 3.3.2.4 - discussion of groundwater sampling
• Maintenance of equipment		N/A
2.7 Description of security systems:	265.14(b) and (c) [66-14(b) and (c)]	Section 2.4 - describes FTF security
• Posted signs and 24-hour surveillance system		Section 2.4 - security patrols and posted warning signs
• Fence or natural barrier		Section 2.4 - 10-foot security fence surrounds FTF
2.8 Survey plat	265.116 [66-16]	
2.9 Closure Certification:	265.115 [66-15]	Section 4.0 - Closure Certification
• Activities to be conducted		Section 4.1 - RCRA closure standards Section 4.2 - certification inspections
• Testing and analyses to be performed		Section 3.3 - sampling and analysis to be conducted Section 3.3.2 - sampling procedures
• Schedule of inspections		Section 4.2 - certification inspections during performance of response actions Section 5.0 - forecasted closure schedule
• Types of documentation		Section 4.3 - documentation to be provided with certification Section 4.4 - certification statement to be provided

348

42729

SUBJECT REQUIREMENT	40 CFR PART 265 [OAC 3745]	SUBJECT REQUIREMENT LOCATION IN CPID
3. CLOSURE SCHEDULE	265.112(b)(6) [66-12(b)(6)]	Section 5.0 - discussion of anticipated closure schedule - request for extension of 180-day closure requirements - rational for extension request Table 5-1 - forecasted schedule/status for removal actions used to accomplish closure with time required for intervening closure activities specified
3.1 Expected year of closure	265.112(b)(7) [66-12(b)(7)]	Table 5-1 - forecasted schedule/status for removal actions used to accomplish closure with time required for intervening closure activities specified
3.2 Frequency of partial closures		N/A
3.3 Milestone chart showing time for:		Table 5-1 - Forecasted Closure Schedule
• Removal, treatment or disposal of inventory	265.113(a) [66-13(a)]	Table 5-1 - schedule for conducting excavation and removal activities
• Decontamination equipment/structures and soil removal/disposal		Table 5-1 - schedule for conducting excavation and removal activities
• Total time to close	265.113(b) [66-13(b)]	Table 5-1 - current schedule/status for removal actions used to accomplish closure with time required intervening closure activities specified
3.4 Request for extension to deadlines for handling inventory or completing closure	265.113(c) [66-13(c)]	Section 5.0 - request to Director for extension of 180-day closure requirements