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PILOT PLANT SUMP REMOVAL ACTION NO. 24 WORK PLAN [ABANDONED SUMP WEST OF PILOT PLANT] DRAFT FINAL OCTOBER 1992

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FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

PILOT PLANT SUMP REMOVAL ACTION NO. 24 WORK PLAN

[Abandoned Sump West of Pilot Plant]

DRAFT FINAL

October 1992

Prepared By

Westinghouse Environmental Management Company of Ohio
Cincinnati, Ohio

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REMOVAL ACTION NO. 24 WORK PLAN
[ABANDONED SUMP WEST OF PILOT PLANT]

Draft Final

Fernald Environmental Management Project

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ACRONYMS AND ABBREVIATIONS

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

ACRONYMS AND ABBREVIATIONS (Continued)

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

EXECUTIVE SUMMARY

This Removal Action Work Plan (RAWP) provides a response to a Removal Site Evaluation (RSE) and to the U.S. Department of Energy (DOE) letter DOE-667-92, "Proposed Phase III Removal Actions." This action is done in accordance with the Amended Consent Agreement between the U.S. Environmental Protection Agency (EPA) and the DOE. This RAWP was prompted by indications in the sump of rising and lowering liquid levels with no clear cause. This condition raised the possibility that the sump may be leaking and that prompt action was required. Consistent with best management practice the contents of this sump are being pumped on a monthly basis prior to the removal action using standard operating procedures.

This RAWP specifies the steps to be taken to remove the Pilot Plant Temporary Sump and associated equipment in a manner that meets applicable regulatory drivers and minimizes the risk to human health and safety and to the environment. In addition, this RAWP identifies the steps to be taken to evaluate the condition of the piping that leads from the Pilot Plant to this sump.

The scope of the sump removal action encompasses: 1) physical removal of the sump, including liquid contents and hardware components, 2) exploration of the inlet drain line, 3) capping of the floor drain system drain line that is to be left in place, and 4) removal of contaminated soil (if applicable) from a zone surrounding the sump and inlet line. Contaminated soil that may exist beyond this zone (the 4 ft diameter, 11-ft deep vertical cylinder encompassing the sump, and 1 ft of soil below the inlet line), is excluded from this removal action and will be addressed in the final remediation of the Operable Unit (OU)-5.

Removal of the sump is an interim action required to define the source of contamination, remove as much as possible for source control, determine the extent of the system, and attempt to determine if a release to the environment has occurred. Because the sump is a hazardous waste management unit (identified as the Abandoned Sump West of Pilot Plant), Closure Plan Information and Data will be submitted to OEPA on or before May 5, 1994, the original date provided OEPA in the August 1991 RCRA Compliance Schedule pursuant to Section II of the Proposed Amended Consent Decree (PACD) between the state of Ohio and the DOE. However, it is not the intention to close this unit at this time. Removal of the sump is necessary to determine if the sump is still physically connected to the abandoned and covered drain system under the Pilot Plant. Should this be the case, the boundaries of the current unit may require redefinition. Additionally, removal of the sump may be necessary from a physical standpoint to allow proper and complete exploration of the inlet drain line and more effective removal of contamination from the drain system.

This sump is located within OU-3. The Pilot Plant is located in the southwest corner of OU-3, and the sump is located approximately 15 ft outside the southwest corner of the Pilot Plant. This sump has been previously sampled and found to contain high levels of heavy metals, radioactive thorium and uranium, a flash point of approximately 118°F, quantities of lead and o-xylene greater than the Toxicity Characteristic Leaching Procedure (TCLP) limits, and an acidic pH of 3.

Section 1

10-A

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1.0 INTRODUCTION

This RAWP details the steps to be taken in safely removing the Pilot Plant Temporary Sump at the Fernald Environmental Management Project (FEMP). The need for this removal action was previously documented in a RSE which is enclosed as Attachment 1 to this work plan.

The removal action was identified in the DOE letter DOE-667-92, "Proposed Phase III Removal Actions," dated January 14, 1992. That letter proposed that the Pilot Plant Temporary Sump be removed with a work plan due to EPA on July 31, 1992. This RAWP fulfills that commitment and is being submitted in accordance with the provisions of the Amended Consent Agreement (EPA 1991), the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), and is consistent with the requirements of 29 C.F.R. § 1910.120.

The Pilot Plant Temporary Sump (identified as the Abandoned Sump West of Pilot Plant) was declared to be a hazardous waste management unit (HWMU). The sump was included in the list of HWMUs in the RCRA Part A Permit Application submitted to the OEPA in June 1991 and the RCRA Part B Permit Application submitted in October 1991. In August 1991, the sump was included in the RCRA compliance schedule submitted to comply with the PACD between the state of Ohio and DOE et al. (State of Ohio 1988).

The RCRA compliance schedule, submitted August 1991 pursuant to the PACD, requires that Closure Plan Information and Data (CPID) be submitted for all newly identified HWMUs. The CPID for the Pilot Plant sump will be provided to OEPA following completion of the removal activities detailed in this RAWP, which summarizes those activities and procedures and the applicable or relevant and appropriate requirements (ARARs) addressed in this removal action. Removal of the sump is an interim action required to define the source of contamination, remove as much as possible for source control, determine the extent of the system, and attempt to determine if a release to the environment has occurred. It is not the intention to close this unit at this time. CPID will be submitted to OEPA on or before May 5, 1994, the original date provided OEPA in the Compliance Schedule. Removal of the sump is necessary to determine if the sump is still physically connected to the abandoned and covered drain system under the Pilot

Plant. Should this be the case, the boundaries of the current unit may require redefinition. Additionally, removal of the sump may be necessary from a physical standpoint to allow proper and complete exploration of the inlet drain line and more effective removal of contamination from the system. Final remediation will be addressed in the Records of Decision for OU-3 and OU-5.

Review and comment from OEPA will be requested. Final approval of the CERCLA actions identified in this RAWP will be requested for the EPA, as required under the Code of Federal Regulations (C.F.R.) Part 300, the July 1986 Federal Facilities Compliance Agreement, and the September 1991 Consent Agreement.

1.1 OBJECTIVES

The primary objective of this RAWP is to specify the steps to remove the Pilot Plant Temporary Sump and associated equipment in a manner that meets applicable regulatory criteria and minimizes the risk to human health and safety and to the environment. Secondary objectives of this RAWP include soil sampling and analyses to identify possible environmental media contamination, and specification of procedures to evaluate the condition of the inlet piping to the sump and the cause of liquid level fluctuations. The information gained from these secondary objectives will provide input to planning for the potential demolition of the Pilot Plant and Pilot Plant floor drain system and integration of applicable RCRA requirements to complete HWMU closure under OU-3 remedial actions.

1.2 CONTENTS OF THE REMOVAL ACTION WORK PLAN

Section 2.0 of this RAWP provides both general and sump-specific background information including historical usage and current conditions. Section 2.0 also justifies this removal action based on the RSE, summarizes related actions (i.e., perched groundwater actions, and the Pilot Plant Temporary Sump pump-out), and discusses integration with final remediation. Section 3.0 explains the support activities needed to successfully implement this RAWP including project management, scheduling, and training requirements and the roles of the various participants (e.g., DOE, Westinghouse Environmental Management Company of Ohio [WEMCO], and OEPA). Section 4.0 details the field activities required for this removal action including site preparation, drain line inspections, and actual sump removal. Section 5.0 discusses waste management. Section 6.0 discusses the sampling and analysis needs including Data Quality Objectives (DQOs). Section 7.0 provides an overview of the health and safety aspects. Section 8.0 reviews and specifies requirements that will ensure this project meets applicable FEMP quality assurance (QA) requirements. Section 9.0 identifies applicable or relevant and appropriate requirements (ARARs). Section 10.0 lists the applicable references.

This RAWP includes the following attachments:

1) Removal Site Evaluation
2) Analytical Support Levels
3) Health and Safety Plan
4) Quality Assurance Project Plan
5) Applicable or Relevant and Appropriate Requirements
6) Standard Operating Procedure SOP 20-C-916, Cleaning Sump Systems
7) Engineering Data - Proposed Drain Line End Cap

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Section 2

13-A

2.0 BACKGROUND AND JUSTIFICATION

The FEMP was designated a Superfund site and placed on the National Priorities List (NPL) in November 1989. A Consent Agreement was implemented in April 1990 to amend the provisions of the July 1986 Federal Facilities Compliance Agreement. The amendments were necessary to meet the requirements of Section 120 of CERCLA applicable to NPL facilities. The Consent Agreement was further amended in September 1991. A key element of the Federal Facilities Compliance Agreement and the subsequent Consent Agreements includes grouping the site into five operable units for characterization and remediation. In accordance with 40 C.F.R. § 300.415, a number of removal actions have been identified which will be implemented before final remediation. The Pilot Plant Temporary Sump was proposed as a Phase III removal action in the DOE letter, DOE-667-92, dated January 14, 1992.

In addition, the sump was identified as a HWMU in the June 1991 RCRA Part A Permit Application and again in the RCRA Part B Permit Application in October 1991. The requirement to submit RCRA CPID for the sump (identified as the Abandoned Sump West of Pilot Plant) was included in a RCRA compliance schedule submitted in August 1991 pursuant to the state of Ohio PACD. The CPID for the Pilot Plant sump will be provided on or before May 5, 1994 following completion of the removal activities described in this RAWP. Final remediation will be addressed in the Records of Decision for OU-3 and OU-5.

The FEMP is located in a rural area of southwestern Ohio, approximately 18 mi 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. To facilitate CERCLA investigations and remedial action, the FEMP site has been divided into five operable units. The Pilot Plant sump is located in OU-3 Production area. The Pilot Plant is located in the southwest corner of OU-3 (Figure 2-1), and the sump is located outside, approximately 15 ft west from the southwest corner of the Pilot Plant (Figure 2-2).

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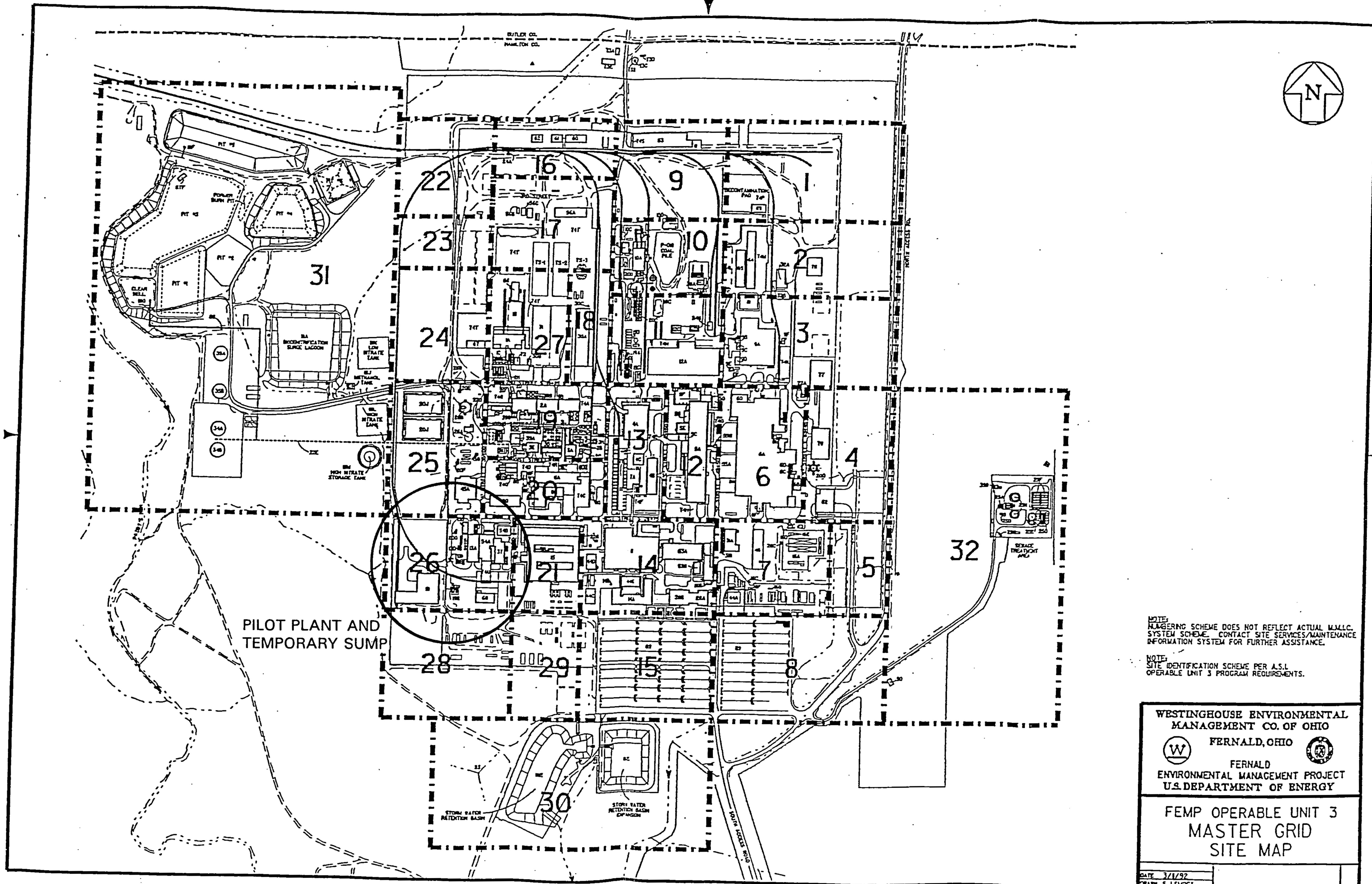

Figure 2-1. Master grid site map.

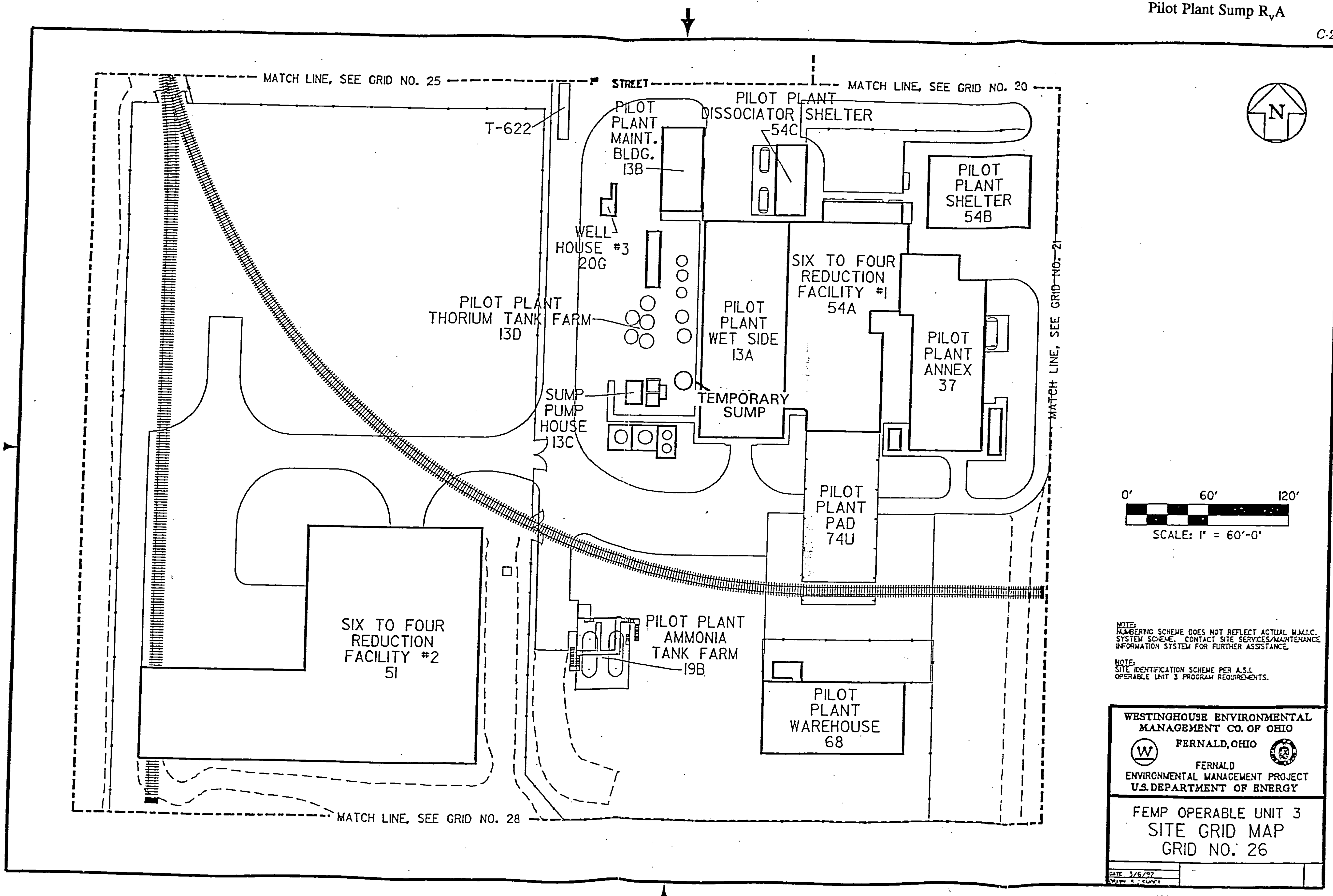

Figure 2-2. Grid no. 26.

Pilot Plant operations began in October 1951. Initial activities centered on training operators for machining operations to be set up in the fabrication plant (Plant 6). The Pilot Plant operated as a general use facility for testing and for smaller operations. Processes employed ranged from pilot scale to full scale. Often, tests of new processes were run in the Pilot Plant before they were implemented at full scale in the main plant.

Over the years of operation, Pilot Plant processes included aqueous/organic extractions of uranium and thorium, calcining, vacuum furnace casting, reduction of UF_6, reduction of UF_4 to uranium metal, briquetting, heat treating, centrifugal casting, reject core reclamation, and various wet tankage processes. A series of thorium processing operations also were undertaken in Pilot Plant equipment. Pilot Plant processes could produce purified thorium nitrate, oxalate, hydroxide, or metal. The following is a summary of the several processes that were conducted within the Pilot Plant:

- **Solvent Extraction** - (1964-1980) Purification of thorium or uranium digested liquors by liquid-liquid countercurrent extraction in perforated plate pulse columns. Diamyl-amyl phosphonate (DAAP) in kerosene and di-secbutyl phenyl phosphonate (DSBPP) in kerosene made up the extractants for thorium. TBP was also used to remove uranium. Raffinate was neutralized and filtered. Filter cake was drummed; effluent went to the general sump. Solvent was recovered by nitric acid and soda ash treatment and centrifuging. Extraction product (UNH or TNT) was concentrated by heating in tank W-10 (outside west). Two-inch columns were used for processing higher enriched UNH.

- **Sump Process** - All floor sumps were collected in 2 outside tanks (F101, F102) treated batchwise in 2 neutralizing tanks with MgO and MnO_2, and filtered.

- **Thorium Digestion** - (1964-1980) Thorium ores, thorium oxalate, and other thorium materials were dissolved in HNO_3 in a single digester for extraction feed. Vented to outside scrubber.

- **Thorium Oxalate** - (1971-1976) Thorium nitrate tetrahydrate (TNT) was precipitated with oxalic acid to form a wet thorium oxalate, which was filtered. The oxalate was calcined at another location.

- **Thoria Gel (hydrated oxide)** - (1964-1970, 1977-1979) TNT solution was precipitated with CO_2 and ammonia to form thorium hydroxide. This was slurried with water and ammonia, filtered, dried, and sent to another location for calcining to thorium oxide.

- **Thorium Tetrafluoride Precipitation** - (1969-1971) Thorium tetrafluoride (ThF_4) was precipitated by adding hydrofluoric acid to thorium nitrate tetrahydrate (TNT) solution. The ThF_4 was filtered and dried twice.

- **ZnF_2 Precipitation** - (1969-1971) Zinc fluoride was precipitated by dumping bags of zinc oxide into dilute HF. The ZnF_2 produced was filtered and dried twice for use in thorium metal production. This process used the same equipment used for ThF_4 precipitation.

- **Pot Liner Preparation** - Calcium fluoride from thorium derby breakout was prepared for pot liner material by crushing and ball milling.

- **Decladding Fuel Elements** - Aluminum-clad, nickel-plated uranium fuel elements were declad by placing in a stainless steel ventilated trough and circulating sodium hydroxide and nitric acid. Declad elements were returned to the production stream in Plant 5 and the spent solution went to Plant 8.

- **Enriched Oxidation Furnace** - (1956-1985) A small single hearth, gas-fired furnace used to process enriched scrap U_3O_3, U metal, and other residues.

- **Barium Chloride Conversion** - Barium chloride heat treating salts from the uranium extrusion operation at RMI were converted to barium sulfate.

The Pilot Plant sump is a temporary sump constructed and connected to the floor drain system for use from 1968 to 1970. During this time, the main sump was refurbished,

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and the facility floor and floor drain system were also covered over and replaced by a new floor and drain system. The sump is a 9 ft long and 2 ft diameter stainless steel Schedule 10 pipe, buried vertically in the ground, welded closed at the bottom and open at the top, extending approximately 4 in. above grade within a 4 ft square concrete apron. It has a single entry line of stainless steel approximately 4 ft below grade connected to the original floor drain line of Duriron pipe. Floor drain liquids flowed by gravity to the sump where they accumulated until pumped to a processing system for uranium/thorium recovery. The current condition and integrity of the sump walls, the welded bottom plate, and the attached inlet line are not known. However, based on their age and the corrosive nature of the sump contents described in Section 2.1 of this RAWP, they may be actual or potential pathways for release to the environment.

2.1 SUMMARY OF POTENTIAL THREATS AND PROJECT JUSTIFICATION

The FEMP site personnel had noted recently that the liquid level in the temporary sump was rising and falling (letter from S.W. Coyle to R.E. Tiller, WEMCO:EMT 91-634, October 16, 1991). This fluctuation was reported to the regulatory authorities as a potential release to the environment. Although there is no direct evidence of leakage from the sump, sampling and analysis was performed on the sump contents and existing data from the sampling and analysis of surrounding soils and groundwater were reviewed. The Removal Site Evaluation for the Pilot Plant sump is contained in Attachment 1 and is summarized in this section.

Two grab samples of sump liquid revealed that the sump liquid is ignitable (118°F flash point), has a pH of 3, contains heavy metals, and radioactive uranium and thorium. These samples also exceed the TCLP level for lead, barium, benzene, and mercury, and indicate appreciable levels of 1,1,1-Trichloroethane (200 ppm maximum), carbon tetrachloride (30 ppm maximum), and o-xylene (21 ppm maximum). These constituents are consistent with the by-products from operations known to have occurred in the Pilot Plant. In addition, the sump liquid is an "F" listed waste, nos. F002 and F003, under 40 C.F.R. § 261.31.

The results of analysis from soil samples collected during the installation of selected perched water monitoring wells in the vicinity of the temporary sump were also examined. Three of these wells (1252, 1253, and 1411) surround the sump at distances ranging from 15 to 30 ft. The locations of these monitoring wells relative to the sump are indicated in Attachment 1, Figure 2-1. The analytical results from these samples (chemical data from 1411 and 1252, and radiological data from 1411 and 1253) indicate elevated levels, relative to background, of radioactive or nonradioactive contaminants that are also found in the sump.

A range of radiological and chemical data are also available for water samples collected from piezometers at well 1411 as well as two other wells (1246 and 1250) located near the temporary sump. The installation of these wells and subsequent sampling and analysis were actions of the OU-3 RI/FS Program. These borings penetrate to the perched water encountered at a depth of 10 to 12 ft below grade, but do not penetrate to the groundwater. Data from analysis of those samples indicate low levels of certain volatile organic constituents associated with the sump. Average total uranium concentrations (ppm) were 0.68 in 1253 and 5.08 in well 1411, while the average total thorium concentration in well 1411 was 0.37. However, contamination data are limited and the flow and mixing characteristics of the perched water are not well known. As a result, while the top of perched water coincides with the bottom of the sump, the data do not allow identification of the source of contamination, or demonstrate migration from the sump.

The magnitude of the potential threat was evaluated based on sump sampling information. For a worst-case fire scenario, the potential concentrations of airborne thorium and lead would be greater than the permissible exposure limits (PELs), as established by 29 C.F.R. § 1910.1000. For the contaminants of concern, the PELs are at least as restrictive as the American Conference of Governmental Industrial Hygienists (ACGIH 1990) Threshold Limit Values (TLVs).

Consistent with 40 C.F.R. § 300.415 of the NCP, DOE determined that the removal action is appropriate. Of the eight factors considered in this determination, five have direct application to the Pilot Plant Temporary Sump including potential exposures, contamination of drinking water supplies, contamination of surface or near-surface soils, hazardous substances in a tank or other bulk storage container that may pose a threat of release, and the threat of fire. Also, because the planning period for this time-critical removal action is less than six months, an Engineering Evaluation/Cost Assessment will not be performed.

2.2 REMOVAL ACTION

The scope of the sump removal action encompasses: 1) physical removal of the sump, including liquid and some solid contents and hardware components, 2) exploration of the inlet drain line, 3) capping of the floor drain system drain line that is to be left in place, and 4) removal of contaminated soil (if applicable) from a zone surrounding the sump and inlet line. Contaminated soil that may exist beyond this zone (the 4 ft diameter, 11-ft deep vertical cylinder encompassing the sump, and 1 ft of soil below the inlet line), is excluded from this removal action and will be addressed in the final remediation of OU-5. Following removal of the sump, the Pilot Plant floor drain piping will be internally examined in an effort to characterize its contents and physical condition. However, because the piping is an integral part of the Pilot Plant's concrete and brick floor (Figure 4-3), it cannot be externally accessed prior to demolition of the facility. For this reason, removal of the floor drain system will be limited to the section of piping that connects to the sump outside the facility.

Removal of the Pilot Plant Temporary Sump and associated equipment in a manner that meets applicable regulatory criteria and minimizes the risk to human health and safety and to the environment is the primary objective of this RAWP, consistent with objectives for the future OU-3 Record of Decision. This objective shall be met through a three-phased approach. The first phase will be to prepare the sump for removal. This will include excavating soils around the sump, removing all equipment not directly attached to the sump, performing the necessary preparations to reduce the potential for contamination spread when the sump is disconnected from the sump inlet piping. The second phase will be the actual removal of the sump and investigating the condition of the inlet piping and possible cause of fluctuating liquid levels. The final phase will be backfilling the sump excavation.

Removal of the sump is an interim action required to define the source of contamination, determine the extent of the system and attempt to determine if a release to the environment has occurred. It is not the intention to close this unit at this time. CPID will be submitted to OEPA on or before May 5, 1994, the original date provided OEPA in the Compliance Schedule. Removal of the sump is necessary to determine if the sump is still physically connected to the abandoned and covered drain system under the Pilot Plant. Should this be the case, the boundaries of the current unit may require redefinition. Additionally, removal of the sump may be necessary from a physical standpoint to allow proper and complete exploration of the inlet drain line.

2.3 RELATED ACTIONS

As a precursor to the removal action, consistent with best management practices, the contents of the Pilot Plant Temporary Sump are being pumped on a monthly basis using Standard Operating Procedure (SOP) 20-C-916 (Attachment 6). This is being done to reduce the existing source term and threat of release as soon as practical and provide additional information to determine the specific actions necessary for removing the sump.

An evaluation of the initial liquid level elevation within the sump (576.5 ft msl), and the layout and elevation of the floor drain piping (579 ft msl and 574.5 ft msl starting and ending elevations respectively) resulted in an estimate of approximately 500 gal of liquids within the sump and attached drain line. The sump has been pumped during the weeks of July 20, September 2, and September 28, and a total of approximately 500 gal of liquids and suspended solids have been removed. Subsequent to the second pumping, the level in the sump remained approximately 1.5 ft below the starting level. It is anticipated that the liquid level will become lower with each successive pumping, such that when the removal action is implemented, most if not all of the liquid in the sump and inlet line will be gone.

Other related actions include *Safe Shutdown Program Removal Action 12* (WEMCO 1991), *Removal of Waste Inventories Removal Action 9* (WEMCO 1991a), *Improved Storage of Soil and Debris Removal Action 17* (WEMCO 1992). Removal Action 12, Safe Shutdown Program, was created to perform the safe shutdown of all process facilities in preparation of final remediation. Safe Shutdown essentially entails the engineering, planning, and scheduling for isolation of process equipment, piping systems, and associated utilities; and removing residual and excess materials, supplies, and combustibles to appropriate disposition and approved storage locations. Safe Shutdown activities include: develop appropriate safety documentation (Risk Assessment, Risk Management Plan, Health & Safety Plan); prepare Training Plan and Task-Specific Lesson Plans; review Standard Operational Procedures (SOPs) and updates; perform preliminary assessment for all process buildings and process equipment; evaluate and dispose of all capital equipment in process facilities; and establish database for Safe

Shutdown and remediation support. All buildings are being inventoried for residual materials and excess equipment. Necessary documentation is being processed for this equipment/material to identify proper disposition.

The Safe Shutdown Program evaluates the preliminary assessment and prepares Task Orders to address equipment isolation and cleanout, continue efforts to dispose of the surplus equipment and materials, evaluate process buildings for future use or demolition, and initiate the development of engineering studies and packages to guide equipment isolation/de-energization activities. Field work activities include: the continuing isolation of process equipment; removing excess equipment and materials, supplies, and combustibles; initiating the process of removing residual materials from process equipment; and initiating decontamination efforts.

Removal Action 9, Removal of Waste Inventories, involves the packaging, shipment, and disposal of low-level radioactive wastes generated by production, maintenance, and construction actions at the FEMP. Primary activities associated with this removal action include the development and submittal of an initial compendium of operating plans and procedures to the U.S. EPA and the yearly update of this compendium.

Removal Action 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 which are being constructed. Phase II addresses soil and debris management from the time the facilities are constructed until final remedial alternatives for FEMP are selected. This RA provides specific criteria for the assessment of soil and debris contamination and identifies options for its disposition including decontamination, disposal offsite, or storage in controlled stockpiles or an improved storage facility. There are three specific objectives indentified in the work plan for RA 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. The primary criteria used for reuse of the soils are: 1) maximum radiological limit of, a) total uranium of less than or equal to 100 pCi/g, b) total thorium less than or equal to 50 pCi/g, and c) total radium less than or equal to 5 pCi/g; and 2) the soil is not contaminated with nonradiological regulated waste materials.

2.4 INTEGRATION WITH FINAL REMEDIATION

As part of the Amended Consent Agreement, the Pilot Plant is within the scope of OU-3. One potential data gap for the eventual demolition of this facility is the condition of the drain system that feeds the Pilot Plant Temporary Sump. This drain system is covered with concrete inside of the Pilot Plant and is not accessible. The condition and contents of this system are unknown. As part of this RAWP, the condition of this piping system will be investigated to provide data for demolition planning.

An internal investigation of the pipe will provide information on the current condition of the pipe and the amount of sludge remaining in the pipe. The inlet piping is constructed of a silicon/iron material called Duriron. This material is used extensively when high chemical corrosion resistance is needed. This material is very hard, with a Brinell Hardness number of approximately 520 (carbon steel is typically <200), but it is also comparatively brittle, with a Tensile Strength of 930 psi (carbon steel is typically 70,000 psi). Sections of this type of piping are held together with a spigot and bell arrangement sealed with a combination of special acid resistant rope and lead (Product Information, Duriron Company). Based on this material and its construction, if the pipe is broken or leaking, the likely causes of failure are either the failure of one of the joints or the crushing of the pipe due to some external force.

The information obtained from this RAWP and related remedial investigation (RI)/feasibility study (FS) activities will be used to determine the requirements to complete demolition of the Pilot Plant and remediation of the area. Additional actions necessary to satisfy RCRA closure requirements will be identified and addressed as ARARs to demolition and final remediation pursuant to the Record of Decision for OU-3 and OU-5 (covering contaminated environmental media).

Section 3

24-A

3.0 SUPPORT ACTIVITIES

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

3.1 ROLES OF PARTICIPANTS

The following organizations will be involved with various activities associated with the RAWP.

- **The DOE** is the owner of the FEMP, and is responsible for overseeing all site activities.
- **Westinghouse Environmental Management Company of Ohio (WEMCO)** is the site integrator contracted to the DOE. WEMCO had operated the site from 1985 until production ceased in 1989 and now is tasked with managing the site during its restoration.
- **The EPA** has approval authority for this RAWP.
- **The OEPA** is encouraged to provide guidance and will participate in the development and review of this RAWP.

3.2 PROJECT MANAGEMENT

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

3.2.1 Organization

The organizational structure for the personnel performing this removal action will be determined by WEMCO to ensure that proper lines of authority and safety responsibilities are clearly identified. The removal action 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 staff are not WEMCO personnel.

3.2.1.1 Project Manager

The Project Manager is responsible for the overall operation of the Pilot Plant sump removal. The Project Manager will act as the point of contact with WEMCO.

3.2.1.2 Removal Site Supervisor

The Removal Site Supervisor is responsible for the day-to-day safe operation of the removal action. The Removal Site Supervisor shall ensure that the Health and Safety Officer is present during all activities indicated in Section 2.2. The Removal Site Supervisor will interact and coordinate the project and schedule with WEMCO site organizations.

3.2.1.3 Health and Safety Manager

The Health and Safety Manager is responsible to complete and oversee the implementation of the Health and Safety Plan (HASP) subject to WEMCO review and approval. The Health and Safety Manager is responsible for selecting the Health and Safety Officer and overseeing that individual's site performance.

3.2.1.4 Health and Safety Officer

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

3.2.2 Planning

Included in this activity will be the preparation of detailed task listings and delineation of responsibilities. These project planning documents will be established as the internal DOE control mechanism to ensure that the removal action is implemented to meet the scheduled milestones identified in Section 3.3.

3.2.3 Training of Personnel

Employees of WEMCO and identified subcontractors will receive training in accordance with the applicable WEMCO policies and the requirements specified by 29 C.F.R. § 1910.120, 29 C.F.R. § 1926.21, and the Ohio Administrative Code (O.A.C.) 3745-54-16A. The training will include radiation worker training. In general, training will take place following the selection of the removal organization and prior to start of work. A detailed training plan and schedule will be prepared at a later date in conjunction with development of detailed work plans and procedures.

3.3 MILESTONES

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

3.3.1 WEMCO Select Removal Organization

Following work plan approval, FEMP will select the organization for removing the Pilot Plant Temporary Sump. It is anticipated that the removal will be performed by combined WEMCO and subcontractor forces under the overall management of WEMCO. If the removal organization is a subcontractor, it will be selected in accordance with Federal Acquisition Regulations.

3.3.2 Perform Removal Preparations and Final Design

Following the selection of the removal organization, all removal site preparations will be completed. Concurrent with removal preparations, definitive design documents will be prepared based on the approved approach and procedures described in this RAWP.

Substantive deviations from the approach described in this document will not occur without an attendant revision of the RAWP. The estimated duration of removal preparations and design is one month.

3.3.3 Remove Sump/Evaluate Pipe Interior/Cap Inlet Pipe/Perform Soil Sampling

A four-month window from the time preparations are completed has been identified for this activity to ensure adequate time for analysis of soil samples and validation of laboratory data before backfilling. Sampling of the drums and remaining soils will be performed under a separate plan to determine storage and disposal requirements and to document the condition of the work site in preparation for future Pilot Plant demolition activities. All soil wastes will be managed in accordance with Removal Action No. 17.

3.3.4 Backfill Area and Return Area to Normal

Once the soil sampling evaluation has been completed and backfilling is approved by WEMCO, this area shall be backfilled with soil from within OU-3 as defined in the Removal Action 17 Work Plan Sections 3.1 and 3.4 (WEMCO 1992). Removal Action 17 is summarized in Section 2.3 of this RAWP. Soils used for backfill will not contain any CERCLA hazardous waste substance or total uranium above 100 pCi/g, total radium above 5 pCi/g, or thorium above 50 pCi/g. In addition to backfilling, any services or capabilities disrupted due to this removal action will be returned to a normal configuration.

3.4 SCHEDULE

A proposed milestone schedule for the removal action is presented in Table 3-1. Actual dates are not specified because they are tied to EPA approval of this RAWP.

Table 3-1. Milestones for the removal action schedule.

Milestone	Activity Duration (months)	Cumulative Duration (months)[1/]
Work Plan Approval	Start	0
WEMCO Select Removal Organization	2	2
Perform Removal Preparations/Design	1	3
Remove Sump/Evaluate Pipe Interior/Cap Inlet Pipe/Perform Soil Sampling	4	7
Backfill Area and Return Area to Normal	1	8

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

Section 4

29-A

4.0 FIELD ACTIVITIES

The goal of this removal action is to remove the abandoned sump from its position, buried in the ground just west of the Pilot Plant West Area building, and dispose of it properly. The existing drain line into the sump will be cut, and the severed end capped off. This procedure is intended to accomplish the work while maintaining worker exposure as low as reasonably achievable (ALARA) by minimizing the amount of soil that is disturbed. This should also be the quickest and least-expensive method of removal.

The removal of the sump and associated equipment will proceed stepwise as follows:

1) Site preparation—remove access barriers
2) Remove liquids from the sump
3) Remove the sump pump and associated equipment
4) Clean out drain line—partial
5) Remove concrete apron around pump opening
6) Excavate to uncover drain line; continue excavating to loosen sump (after capping drain line)
7) Cut drain line and remove elbow; cap the severed end
8) Remove the sump
9) Inspect the drain line internally
10) Backfill the site.

These steps of the procedure are listed in Table 4-1, with the principal equipment and disposal containers required. 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, monitor the site for radiation and flammable gases, ventilate the sump, etc. These requirements are described in the attached Health and Safety Plan.

The pump and motor currently installed within the temporary sump have previously been almost completely disconnected from surface piping and wiring. Only the abandoned

Table 4-1. Sump removal sequence.

Operation	Equipment/Tools Required	Disposal Materials Required*	Procedure (Stepwise)
Site preparation	None	None	Remove access barriers, tarp, etc., monitor and deploy ground covers.
Remove liquids	None	Bags of absorbent material	Inspect the sump.
			Decide whether re-pump is required.
			If yes, re-pump using existing approved procedure SOP 20-C-916.
			If no, use bagged absorbent to remove residual unpumpable liquid.
Remove pump etc.	Cherry-picker & rigging, hand tools, haul-away truck	Containers, tarp or cover(s)	Place cover over sump mouth to catch dropped tools etc.
			Disconnect/cut power wiring and put in disposal container.
			Disconnect/cut instrument wiring and put into disposal container.
			Remove loose piping from sump and put into white metal box container for transport to approved storage area pending final disposition.
			Remove attached piping and dispose, or plan to lift it with the pump assembly, in one piece.
			Loosen circular steel flange from the support structure.
			Lift pump assembly clear of steel support and put into disposal container. Remove steel support structure and put into white metal box container for transport to approved storage area pending final disposition.
Clean drain line	Apparatus, guide into 8 in. line outlet	Bags/drums	Insert compressed nerf ball.
			Decompress.
			Pull out to swab the line.
			Repeat.
			Cover the sump mouth.

Table 4-1. Sump removal sequence.

Operation	Equipment/Tools Required	Disposal Materials Required*	Procedure (Stepwise)
Break up concrete apron	Pavement breaker (air hammer) Air supply Cutting torch Haul-away truck Cherry-picker	Bags/drums	Wet down concrete pad and break up concrete pad. Mist concrete pad during break up. Cut rebar free of sump, lift onto haul-away truck. Dispose of broken concrete into drums, lift onto haul-away truck.
Excavate (partial)	Manual auger Air supply Shovels	Bags/drums Plastic tarps	Dig with auger/shovels to uncover SS elbow and its connection to double hub. Place removed dirt directly into drums for disposal. Slope walls of excavation to conform with safe practice and provide working space. Excavation will be interrupted while elbow is cut and removed, then resumed.
Cut drain line	Cutting torch Hand tools	Tarps	Place tarp under elbow and locations to be cut to catch the cuttings. Two layers, minimum. Cut the SS dutchman, 4 in. from the Duriron double hub. Cut the SS elbow to free it from sump, leaving 2 in. stub on sump. Cut holes for lifting sump. Remove 1st tarp layer, with elbow & cuttings. Dispose. Elbow will be placed in a metal box container for removal to approved storage area pending final disposition. Cap the sump stub with plastic and duct tape. Cap the dutchman stub with a Romac end cap coupling. Remove remaining tarp.
Excavate (completed)	Manual auger Power or air for auger.	None	Auger down to 9-ft depth, all around sump. Leave disturbed soil in place.

Table 4-1. Sump removal sequence. Page 3 of 3

Operation	Equipment/Tools Required	Disposal Materials Required*	Procedure (Stepwise)
Sump removal	Cherry-picker Welder Haul-away truck	Wrappings for sump	Position cherry-picker for straight-up lift.
			Pull sump out of disturbed ground.
			Swing sump over solid ground.
			Lower sump to horizontal.
			Lift onto haul-away truck.
Inspect drain header	Crawler w/TV camera, assoc. gear, guide into 8 in. line outlet, power	For removal of crawler & cable.	To be identified.
			Sample Soil in accordance with the Sampling and Analysis Plan.
Backfill			Backfill hole with fill from within 0U3.

* = These materials shall be selected according to FEMP standard site practices.

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8 in. floor drain header remains connected to the sump liquid inlet elbow (Figure 4-1). The pump discharge hose and power supply wiring have been disconnected. The power wiring has been coiled and placed on the pump assembly. Instrumentation conduits and small piping have been thrust into the sump, and need only to be cut free and removed to disposal. The pump, pump suction line, and some associated piping are mounted on a circular flange and will be removed, with the flange, in one piece.

The pump assembly sits on a steel-channel structure about 3 ft high, over the open sump. The structure was provided to fit an existing pump from a 12-ft sump into the temporary sump, which is only 9 ft deep.

The principal area of concern, and the area where skillful work is required, is the excavation and cutting of the 8 in. floor drain entry line. This must be done carefully, in such a way that the bell-and-spigot joints of the abandoned Duriron floor drain header are not subjected to stresses that would cause them to leak. For this reason, the procedure requires manual excavation in the areas near the drain line and its entry into the sump, and the procedure holds to a minimum the amount of the Duriron line that will be uncovered.

4.1 SITE PREPARATION

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

1) Cherry-picker
2) Truck to haul away contaminated material
3) Truck-mounted auger (optional)
4) Cutting torch, gas bottles, and welding blanket
5) Welding machine (if required)
6) Air compressor (run leads in from street)
7) Portable generator (run leads in from street)
8) Manual tools: shovel, pick, auger, hand tools, etc.

All equipment must be suitable for use in handling and working around the sump liquid with a flash point of 118°F. Only the cherry-picker will be at the sump during the entire operation. It should be positioned where it 1) will not block access of the haul-away

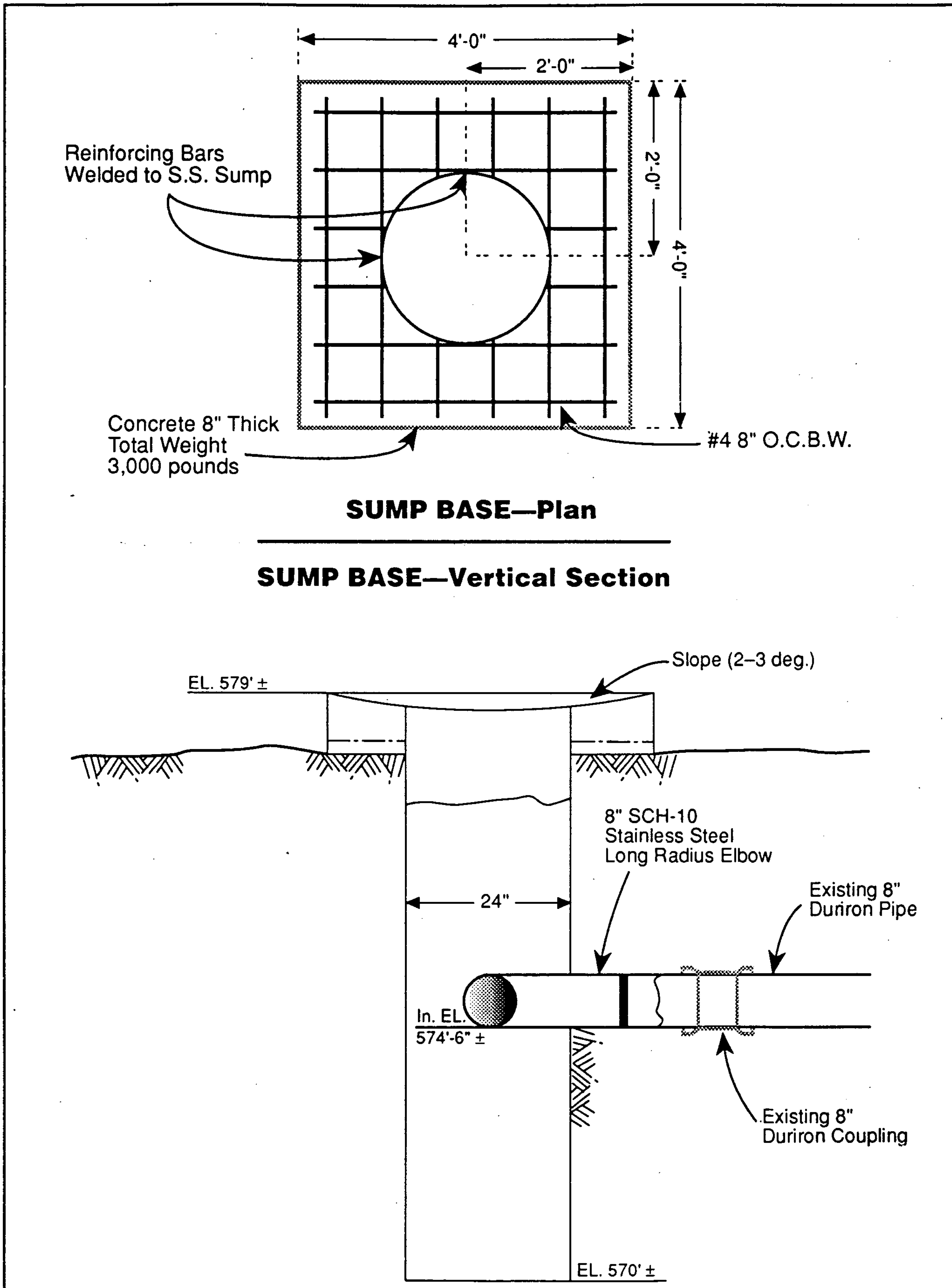

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Figure 4-1. Pilot Plant sump—plan and cross section.

truck, 2) will not block access of the truck-mounted power auger, 3) can swing hoisted material over the laydown area, and 4) can hoist packaged items onto the haul-away truck. Available locations include to the east between the sump and the Pilot Plant building and to the south of the sump (Figure 4-2).

Before work can be started, access to the sump area must be provided for the cherry-picker and the haul-away truck. This will require that existing access barriers be removed: chains, support stanchions, and warning signs, then the tarpaulin covering and the sandbags that hold it in place. Overhead clearances are adequate for the proposed equipment and for hoisting the sump pump and motor.

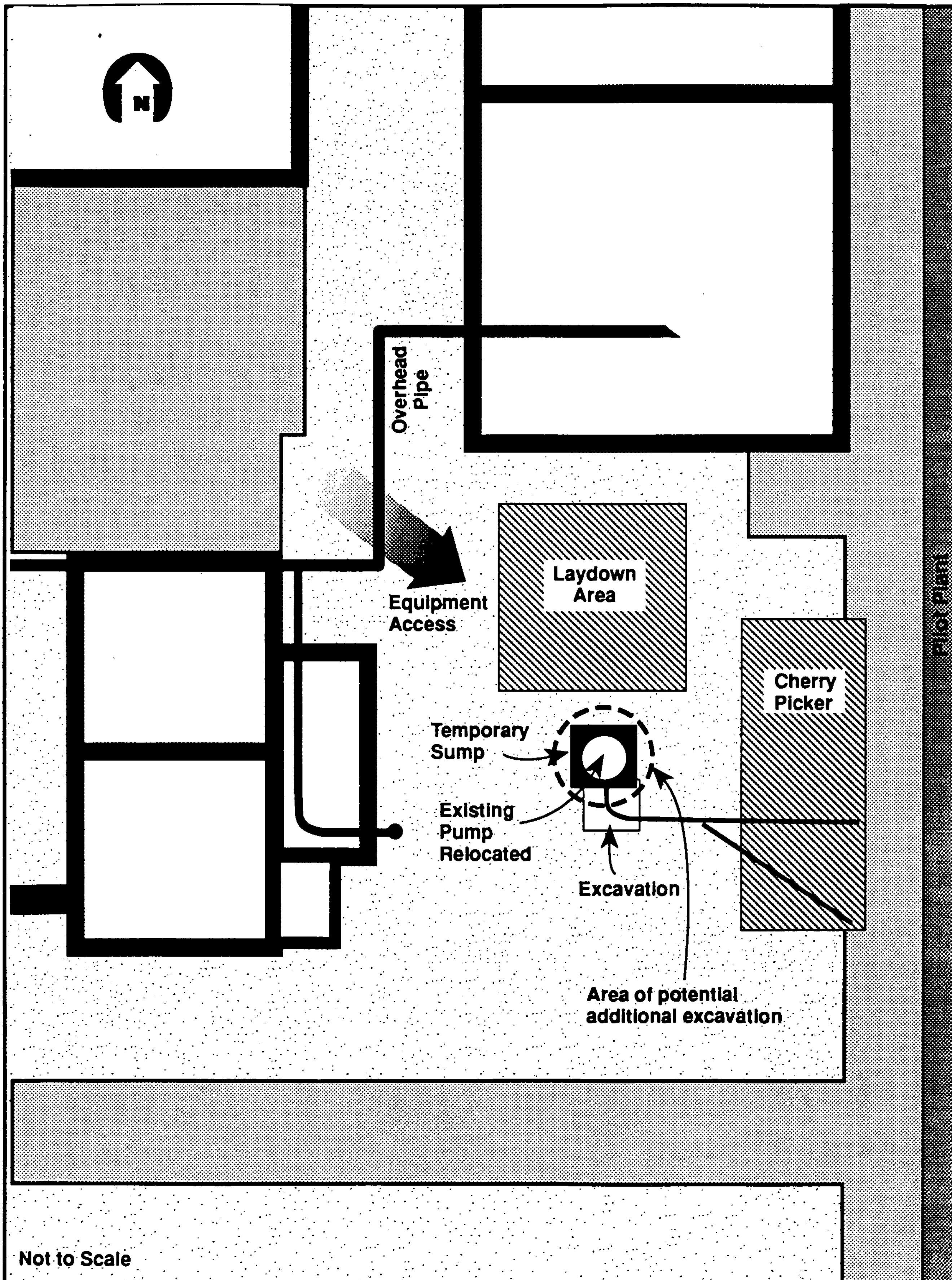
Equipment laydown and work areas will be prepared by spreading impermeable heavy duty fire retardant ground coverings. These coverings shall be selected and deployed according to standard site management practices detailed in Removal Action No. 12 and No. 17 (Section 2.3). These covered areas will include 1) the soil area around the concrete apron for spill control, 2) an equipment laydown/drum filling areas where a secondary containment (metal trough) will be placed during drum filling (if necessary), and where the sump pump and sump will be placed following removal prior to being placed into a white metal box for shipment to storage, and 3) the ground between these areas over which contaminated material will be carried.

4.2 SUMP PUMP-OUT/CONTENTS REMOVAL

The liquid contents of the sump will be pumped out and the floor sewer drained into the sump before this removal action is started. Before anything further is done, the condition of the sump should be inspected.

It is expected that at the end of the pre-removal pump-out operation, a small amount of unpumpable liquid will remain in the bottom of the sump, drained from the pump and suction piping. Drainage from the floor drain line should be complete. In addition, the sump may contain small amounts of suspended solids and sediments.

In the event that the sump continues to refill with drainage from the floor drain line, the sump will be pumped out again, using the same procedure previously used (SOP 20-C-916, Attachment 6). The only anticipated source of drainage is the floor drain.



37 **Figure 4-2.** Sump removal work area layout.

There are no other known source of process input to the sump. The concentrated nature of the sump contents is believed to be an indication that there are no environmental inputs to the sump. If the sump has not refilled, bags of absorbent material will be used to remove any remaining small quantities of unpumpable liquids. A small volume of water may be added as necessary to facilitate pumping solid materials.

During operations, a designated fire watch individual will be present adjacent to the Exclusion Zone. This individual will maintain radio contact with the FEMP Safety Engineering and Fire Services by having a radio adjacent to the Exclusion Zone during all Exclusion Zone operations. The designated individual will not have other operational responsibilities during the Exclusion Zone operations.

4.3 REMOVAL OF SUMP PUMP

Most of the equipment in and around the sump will be removed at this time. Items to be removed include:

- Existing sump pump and suction line
- Vent line or priming line entering the pump suction line
- Level switch housing line
- Insulated line
- Two other small pipes or conduit
- Electric power supply line
- Instrument line
- Pump discharge hose, if still in place
- Channel-iron pump support stand.

The concrete apron around the sump is to be left in place, for now. Its removal is described in Section 4.5.

The pump, electrical and instrument wiring, and discharge hose all appear to have been disconnected. Only the material now sitting on the pump structure needs to be removed.

The heaviest lifts at this time will be the pump with motor and suction line attached. The highest lift will be the pump with suction line attached; once clear of the sump it will be moved to a horizontal position for placement into a white metal box for transport to an approved storage area pending final disposition. The suction line will be cut as necessary in order to fit within the box.

Packages to be hoisted and their estimated weights are as follows:

1)	Pump, motor, mounting plate and suction line (empty)	950 lb
2)	Supporting framework	540 lb
3)	Sump and inlet elbow (empty)	630 lb

The maximum load is the pump assembly, at 950 lb. The maximum height of lift is 13 to 15 ft to raise the pump assembly clear of the support framework.

When the sump has been cleared of all materials, the opening should be covered to prevent the entry of dropped tools or other items. The access barriers and supporting stanchions should be placed around the sump whenever it is left unattended.

4.4 DRAIN LINE ADDITIONAL CLEANOUT

Removal of residual liquids and solids will be attempted for a distance of several feet from the sump. The residual materials are expected to be finely-divided solids that have settled to the bottom of the line. The intent of the cleaning is to minimize the amount of radioactivity released to the surroundings when the drain pipe is severed. Because of the bell-and-spigot construction of the Duriron drain pipe, contaminants will remain in each joint.

The cleaning operation will be more difficult because the 90° long-radius elbow entry into the sump blocks the view of the drain line. The selected method of cleaning is to insert a compressed open-cell foam sphere ("nerf" ball) of greater than 8 in. diameter, a distance of several feet up the drain line. The ball is then decompressed and retrieved, scouring the pipe wall as it returns. This operation will be performed three times, or until the pipe is considered adequately cleaned, using a clean ball each time. Material pulled from the line will accumulate at the bottom of the sump.

At the completion of cleaning, it is expected that the Duriron pipe joints will remain quite contaminated, but the smooth 8 in. stainless steel pipe and elbow will be relatively clean. The stainless steel line will therefore be cut and plugged off, which should result in ALARA releases and exposures (see Section 4.7 for further details).

When the cleaning operation is complete the sump opening will again be covered to prevent tools and other items from falling in accidentally.

4.5 REMOVAL OF CONCRETE SUMP APRON

Around the top of the sump is a 4 ft x 4 ft x 8 in. apron of reinforced concrete, sloped to drain into the sump. The apron was poured on the surface of the ground; it is not buried. The rebar forms a grid of #4 (0.5 in.) reinforcing bars on 8 in. centers. Total length of the rebar is approximately 45 ft, and the total weight is approximately 30 lb. The rebar grid is welded to the sump.

The apron will be removed by breaking it up with an air hammer and burning the rebar free of the sump. Monitoring will be conducted prior to cutting the rebar to ensure that explosive gas levels are 0% of the lower exposure limit (LEL). Monitoring will be conducted in accordance with the HASP. Short rebar stubs may be left attached to the sump, if desired, to assist in lifting the sump when it is clear.

Total weight of concrete rubble will be about 1,550 lb. This will be placed in drums for disposal and removed from the sump area.

The concrete pad will be wet down prior to break up. During break up activities water misting of the concrete will continue.

4.6 EXCAVATION

The excavation of the sump will be done in two stages. First, sufficient excavation will be done to uncover the floor drain inlet elbow and line, to allow cutting the elbow, and to allow capping the cut pipe end. After this work is done, the excavation will continue using a hand-held powered auger to loosen the soil all around the sump, thereby enabling it to be hoisted out of the ground by the cherry-picker.

The first phase of the excavation will be done using mechanical and manual methods. The fill material directly over the inlet elbow will be loosened to a depth of about 3 ft using a hand-held motor-driven auger. Manual methods will then be used to remove the loosened soil and to uncover the drain pipe, the top of which is approximately 37 in. below the surface. The excavation floor area will be 20 in. by 32 in., sloping outward to 30 in. by 48 in. at the top. Estimated volume of soil to be removed is approximately 25 ft^3, which will fill four, 55-gallon drums.

When the pipe has been uncovered, the hole will be deepened to provide working room to cut the elbow. To a depth of 4 ft, sloping the sides of the hole is not required. For working convenience, however, the sides should be sloped to provide access to cut and cap the pipe. The excavation will require daily inspections, per 29 C.F.R. 1926.650.

When adequate working space has been excavated, the pipe will be cut using procedures described in Section 4.7.

After the pipe has been cut and capped and the elbow and tarps removed, the excavation will be completed. Using the auger, holes should be drilled all around and close to the sump, to a depth of 8.5 ft minimum.

A truck-mounted power auger may be used for a second phase of the excavation, if access is adequate.

4.7 CUT/DISCONNECT DRAIN LINE

The inlet line will be cut in two places. Before any cuts are made, two layers of plastic tarp and a welding blanket will be placed under the line. These ground coverings will catch the cuttings and will be used to wrap the severed elbow after cutting is complete. Before cutting, explosive gas levels will be monitored to ensure that they are 0% of the LEL. Air monitoring will be conducted in accordance with the HASP, which requires that the source of any detectable explosive gases be identified before operations proceed.

If any combustible gases are detected, fans and blowers will be used, as appropriate, to disperse the gases prior to cutting, and the use of a cutting torch will be prohibited.

The first cut will be made through the 8-in. diameter stainless steel 90° long-radius elbow shown in Figure 4-1, about 4 in. from the Duriron double hub (2.5 to 3 in. minimum), using a cutting torch and making the cut reasonably square. The second cut will be through the 90° long-radius elbow, about 2 in. from the outside wall of the sump. The cuttings and the severed elbow will be removed together, wrapped in the first plastic tarp and transferred to a white metal box for transport to an approved storage area pending final disposition. By removing the elbow at this time, clearance is created to allow capping of the severed ends of the pipe. After the ends are capped, the second tarp will be removed.

The open pipe end will be capped by a Style EC501 End Cap Coupling manufactured by Romac Industries, Inc., in Seattle, Washington (Attachment 7). This coupling will slip over the cut end of the pipe, and will be held in place by the compression of an acid-resistant gasket when the flange bolts are tightened. It may be necessary to smooth the outside corner of the cut pipe opening to slip the gasket into place. The end cap is furnished with 2 in. IPT female threads with plug.

The stub of the elbow remaining on the sump may be capped by a circle of plastic or other easily-disposed material, and held in place by duct tape. The only reason for this closure is to prevent any contaminated material from falling out of the sump while it is being transferred to the white metal box.

At this time the cutting torch should be used to cut two holes near the top of the sump, each 1 in. in diameter, which will be used later to attach a bridle for lifting the sump. Cuttings may be allowed to fall into the sump.

4.8 SUMP REMOVAL

The cherry-picker will be positioned where it can lift the sump straight up until it is clear of the ground. The sump will then be moved, while on the hook, over the laydown area where it can be lowered to horizontal and placed into the white metal box. As the exact weight to which the crane will be loaded is uncertain, the crane will need an "annual type" inspection before and after the lift.

Soil from the bottom of the excavation will be sampled and sent to the lab for analysis, to determine whether further excavation of contaminated soil will be required. Further excavation, if required, will be limited to a 1 ft zone surrounding the sump and the removed section of inlet line (Figure 4-2). Contaminated soil (as defined by criteria documented in Removal Action No. 17 [Section 2.3]) that may exist beyond this zone (a 4 ft diameter, 11 ft deep vertical cylinder encompassing the sump, and 1 ft of soil beneath the removed inlet line) is excluded from this removal action and will be addressed in the final remediation of OU-5. The excavation will be covered to prevent the intrusion of rainwater or run off prior to being backfilled.

4.9 DRAIN LINE INTERNAL INSPECTION

After the sump is disconnected from the building floor drain system and removed, the interior of the floor drain header will be inspected by a remote TV camera. The purposes of the inspection are several:

1) To determine whether the drain has been plugged with concrete or grout

2) To determine the condition of the drain system, so it will be known when removal of the pilot plant building is planned

3) To evaluate the amount of wastes remaining in the line, and to judge whether they can be removed

4) To evaluate the cause of liquid level fluctuations.

A plan view of the floor drain system is shown on Drawing 13x 5500 P 00619, Rev. 0 dated March 22, 1968 (Figure 4-3). The TV camera crawler will enter the drain line from the sump and inspect all the interior of the 8 in. drain line to the 90° turn under the Pilot Plant building, a distance of approximately 60 ft. Whether the crawler can be maneuvered past the 90° turn is questionable; if it can, the floor drain will be inspected as far as the crawler can be moved.

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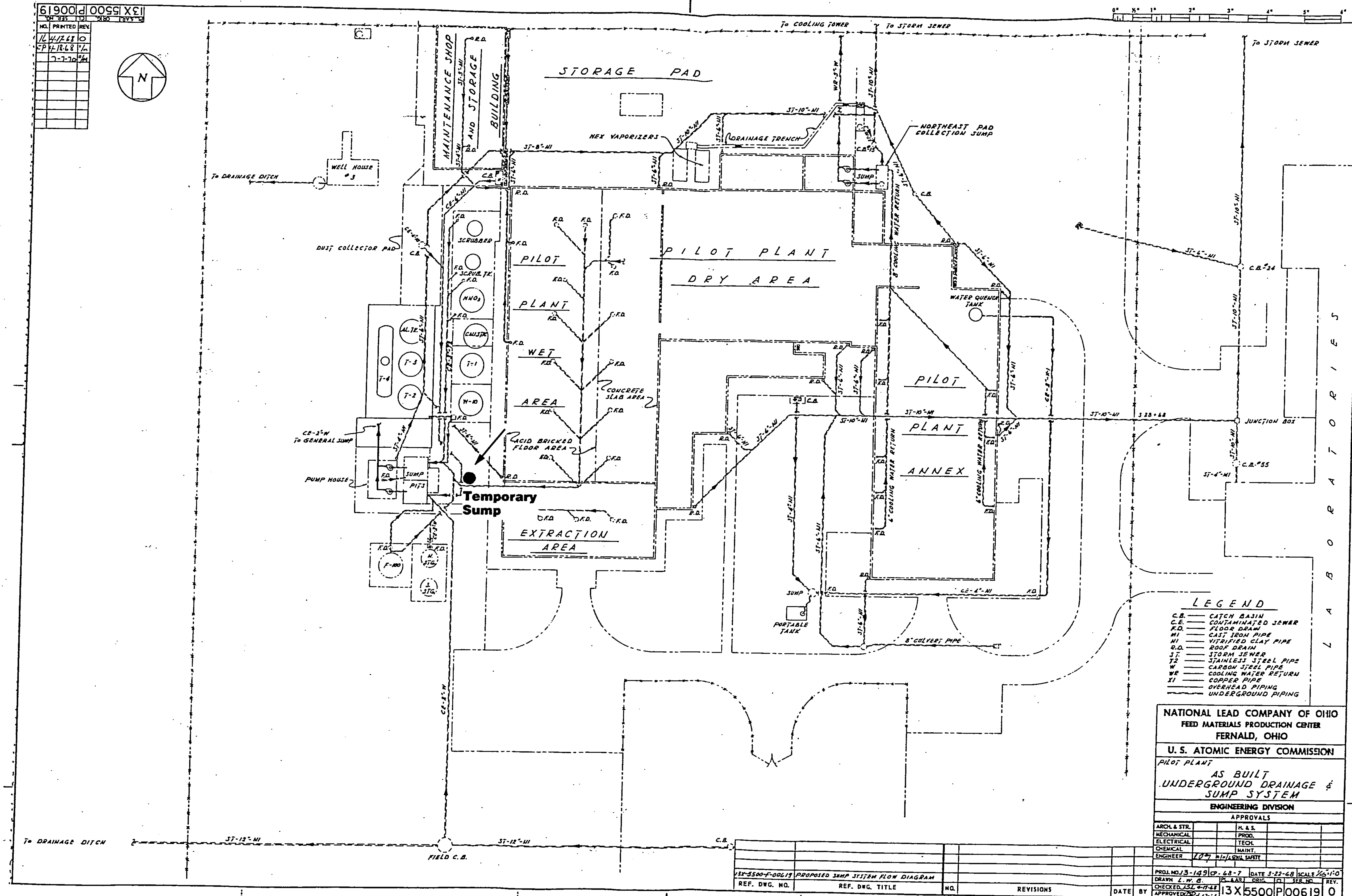

Figure 4-3. Pilot Plant floor drain system.

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About 10 ft from the sump a 4-in. branch enters from the extraction area floor drains. Farther on, a number of 4-in. branches enter from the floor drain hubs. The crawler cannot enter these lines, but the TV camera will be positioned to look into each line, as far as the illumination allows.

Prior to removal of the end cap coupling (Section 4.8), the soil area beneath the drain line will be prepared by spreading an impermeable heavy duty ground covering that is diked around its perimeter to form a basin to retain any materials that may drain from the pipe. A HEPA filtered glove bag will then be fit over and tape-sealed to the pipe. The glove bag will have a semi-rigid frame and ports for two gloves, an exhaust filter intake, and equipment load-in/load-out. The end cap will be de-coupled from the pipe within the glove bag, bagged out via the equipment port, and transferred to the FEMP decontamination facility. The camera equipment will be introduced into the drain line via the equipment port, then bagged out along with its cable following completion of inspection activities.

In the event that additional removable contamination is observed within the drain line, further cleaning activities will be initiated following the drain line inspection. The procedures described in Sections 4.2, Sump Pump-Out/Contents Removal, and 4.4, Drain Line Additional Cleanout, will be implemented as appropriate to achieve the further removal of drain line contamination.

4.10 BACKFILL

When authorization to backfill is received, the open excavation will be backfilled and the equipment removed. Backfill material will be transferred in accordance with the guidance and criteria presented in Removal Action No. 17 summarized in Section 2.3 of this RAWP. If no further excavation is done, approximately 52 ft^3 (2 yd^3) of fill material will be required. In the event that the full removal zone is excavated, approximately 100 ft^3 will be additionally removed and the total backfill required will increase to approximately 160 ft^3 (6 yd^3).

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Section 5

45-A

5.0 WASTE MINIMIZATION AND MANAGEMENT

This section discusses the methods that will be used for this RAWP to minimize and manage waste generated during the course of the Pilot Plant sump removal action. The areas that are covered are waste minimization and management responsibility (Section 5.1); a review of existing FEMP waste minimization and management programs (Section 5.2); the specific work activities that will produce waste (Section 5.3); assumptions made regarding the waste (Section 5.4); and categories of waste produced and information regarding these categories (Section 5.5). The categories of waste produced are sampling waste, sump internal content waste, excavation soil waste, sump hardware waste, protective clothing waste, and decontamination wastes. For each of these categories, the waste sources, waste characteristics, estimated volumes, and waste reduction waste control methods will be described. All materials originating within the process area, which encompasses the Pilot Plant and sump, are presumed to be radiologically contaminant until surveys demonstrate otherwise.

Contaminated soil, liquids, sludge, and components will all be generated and require some form of management during this removal operation. Liquids and sludge from the Pilot Plant Temporary Sump were tested and found to contain levels of radioactivity and hazardous materials in concentrations requiring management as hazardous mixed waste. Components that are in contact with the sump liquids will also be managed as hazardous mixed waste unless decontamination and monitoring indicate an alternative classification. Existing samples of the soils in the area indicate varying levels of both hazardous materials and radioactivity (Section 2 and Attachment 1). Removal Action No. 17 (Section 2.3) identifies the levels of soil radioactivity that are exempt from requirements for removal and placement in an improved storage facility as total uranium below 100 pCi/g, total thorium below 50 pCi/g, and total radium below 5 pCi/g. Any detectable non-radioactive hazardous material is considered to require removal and improved storage. Additional samples of the soil beneath the sump and piping are required. This sampling is discussed in Section 6.0 of this RAWP. Sampling and analysis of waste generated by this removal action, as necessary to select appropriate final disposal options, will be addressed in a separate comprehensive plan developed in parallel with the removal action.

5.1 WASTE MINIMIZATION AND MANAGEMENT RESPONSIBILITY

Waste minimization is the responsibility of each individual working at FEMP. The principle responsibilities for implementing and enforcing waste management during this removal action 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.

5.2 EXISTING PROGRAMS

A major element of the FEMP waste minimization program is the prevention of any unnecessary additional contaminated components, soils, and water. That objective has been incorporated into this RAWP. Specific actions that will minimize additional wastes include the removal of all noncontaminated components prior to the actual removal of the sump, strict limitations on any additional liquids or components added to the sump, and the covering of noncontaminated areas to prevent contamination through spills or releases.

Due to the significant volumes of soil and debris that must be handled, moved, stored, and treated at the FEMP, an aggressive soil and debris waste management program has been initiated. The work plan for improved storage of soil and debris (Removal Action No. 17), as currently proposed, has been prepared and specifically addresses this issue (WEMCO 1992). The basic principles of the Removal Action No. 17 Work Plan are summarized in Section 2.3 of this RAWP. The primary criteria used for reuse of the soils are: 1) maximum radiological limit of, a) total uranium of less than or equal to 100 pCi/g, b) total thorium less than or equal to 50 pCi/g, and c) total radium less than or equal to 5 pCi/g; and 2) the soil is not contaminated with nonradiological regulated waste materials.

5.3 WORK ACTIVITIES PRODUCING WASTE

Several work activities associated with this RAWP will produce wastes of differing composition, contamination and disposal requirements. The specific waste produced is dependent upon the activity. This section reviews the removal process, in a generally

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chronological order, and identifies those processes generating waste and the categories of waste generated.

The preremoval phase of the field activities, as discussed in Section 4.0, will perform all setups for the removal. These preparations include removing all noncontaminated items that may interfere with the sump removal. The majority of residual pumpable liquid and sludge from the temporary sump will be removed before implementing this RAWP. That pumping is being conducted using Standard Operating Procedure (SOP) 20-C-916 (Attachment 6). That procedure will be implemented during this removal action as necessary to remove any residual liquids within the sump.

The removal phase, as described in Section 4.0, includes removal of the existing sump pump and hardware, excavating as necessary, decontaminating the sump and equipment as necessary, cutting and removing the sump, investigating the inside of the temporary sump inlet pipe, and capping the cut inlet pipe. This phase also includes taking post removal soil samples to determine the condition of soil beneath the sump and conditions of materials placed in storage containers for possible disposal.

The backfill phase is not anticipated to generate significant volumes of waste. The soil used for backfilling will be obtained from within OU-3 using criteria identified in the *Removal Action No. 17 Work Plan* (WEMCO 1992).

During all phases, personnel protective equipment (e.g., gloves, booties, and respirators), and noncontaminated wastes will be generated. During the preremoval phase, significant personnel protective equipment use is not anticipated due to the current radiological posting and minimization of temporary sump intrusion. During the removal phase, significant quantities are anticipated. During the backfill stage, minor amounts of personnel protective equipment are expected.

5.4 ASSUMPTIONS MADE REGARDING THE WASTE

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

- Unless contacted with the sump contents, disposable personnel protective equipment will be treated as radiologically contaminated waste. Nondisposable personnel protective equipment will be cleaned for reuse.

- Concrete, subsurface soil and liquid will be treated as mixed waste until analyses, or representative sampling, can support an alternative classification.

- Equipment to be stored for reuse is not considered to be waste for the purposes of this RAWP.

- This RAWP covers waste minimization and management activities except treatment, storage, transportation and disposal.

- Decontamination wastes shall be treated as mixed waste until analyses of representative samples can support an alternative classification.

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

5.5 CATEGORIES OF WASTE

This removal action will produce several types of waste. Addressing these different types of waste in terms of categories will provide a logical means for identifying waste minimization and management methods. The categories of waste produced for this removal action are: 1) sampling waste; 2) sump internal contents waste; 3) excavation soil waste; 4) sump hardware waste; 5) protective clothing waste; 6) decontamination wastes.

5.5.1 Sampling Waste

Samples will be collected from the liquid contents of the sump prior to removal, and from the soil underlying/surrounding the sump following removal. 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 primarily from loose material clinging to the sampling equipment as it is retracted from the sample collection point. Although some residual material may cling to the exterior of the sampler and be transferred to the laboratory, it is expected that the bulk of this material will fall back into the sump or soil sample casing, or be collected within the plastic sheeting used to surround and contain the sampling apparatus.

The intact sample will be packaged and sent to the analytical laboratory for analysis. Thus, for the purpose of this RAWP, the intact sample is not classified as waste.

Based on previous sampling in the area, the soil samples are expected to contain little or no amounts of chemical or radiological contaminants. However, there is a potential for chemicals and radionuclides from the temporary sump, and from surrounding tanks, to be in the soil. These potential contaminants include kerosene and the contaminants identified during prior sump sampling (Attachment 1).

It is difficult to quantify the sampling waste that will be generated during sampling. However, due to the relatively small sample quantities, the total volume of excess material removed from the ground and sump that may need collecting is not expected to exceed 0.5 ft^3.

Waste will be reduced through two methods: proper sampling techniques, and sample waste screening and segregation. Waste samples will be taken in a manner that minimizes the potential for resampling and minimizes the number of samples required. The Sampling and Analysis Plan, described in Section 6.0 of this work plan, identifies the number of samples required.

Each sample taken will initially be screened with appropriate radiological and chemical survey instrumentation. For the radiological screening, a NaI Gamma Scintillation Radiation monitoring instrument will be used as a minimum. For the chemical survey, a flame ionization detector (FID), or photoionization detector (PID) with the highest level lamp (typically 10.8 eV) shall be used. All instrumentation shall be calibrated and approved for use in this work area.

The sample waste shall be segregated based upon the minimum screening level measurements for these instruments. For the FID/PID, a level of 1 ppm is typically used. For the NaI Gamma Scintillator, a level of 2 times background is typically used. Sample wastes that indicate levels less than the minimum screening levels shall be segregated from sample wastes indicating levels equal to or higher than the minimum screening levels. In addition, samples will be further segregated as to radiological waste, hazardous waste, and mixed waste depending upon monitoring levels. The sump contents sample is considered to be mixed. All sample waste shall be labeled and temporarily stored in approved containers until characterization is complete.

As an alternative to segregation, if it is anticipated that the total sample volume is expected to be very small and relatively homogeneous, it can be assumed that all of the sample waste is mixed waste. It would then all be labeled and temporarily stored in an approved on-site storage location until characterization is complete.

5.5.2 Sump Internal Contents Waste

The Pilot Plant Temporary Sump was used to store floor drain waste from the Pilot Plant during 1968 to 1970. Every type of chemical used in the Pilot Plant during this time may have been pumped to this sump. Recent samples indicate that the sump liquid has a low pH (3), is flammable (flash point of approximately 118°F) and contains significant levels of organic and nonorganic materials. The sump liquid and sludge also contain relatively large concentrations of heavy metals, and radioactive thorium and uranium. In addition, the sump liquid and sludge has been determined to be an "F" listed waste, Nos. F002 and F003 (FMPC Material Evaluation Form No. 1229, November 1991). A more thorough characterization is contained in Section 2.0 and in the RSE (Attachment 1).

Before implementing this RAWP, the majority of pumpable contents of the sump will be removed. If initial inspections of the sump at the outset of removal action indicate that pumpable volumes remain in the sump (with the exception of a small heel), the pumpable volume shall be removed using SOP 20-C-916 (Attachment 6).

Once all pumpable liquids are removed, the remaining material is expected to consist primarily of dense, moist sludge in the bottom of the sump and moist sludge of unknown density in the inlet piping. The expected volume of sludge is less than 1 ft^3. This is based on qualitative examinations of the sump contents and the results of pre-removal pumping activities. If a small volume of residual liquid remains, it will be absorbed using an appropriate absorbent (e.g., absorbent beads) and removed. This absorbent will add approximately no more than another 2 ft^3 of waste to provide an estimated maximum volume of 3 ft^3.

The pumping of all pumpable liquids and sludge from the sump prior to this RAWP will provide the most effective waste reduction method. Other methods incorporated in this RAWP that will reduce this waste are: 1) openings to the sump shall be covered whenever access or inspections of the sump contents are not in progress; 2) materials and tools that can be easily decontaminated (e.g., simple wipe down) shall be used as much as practical; 3) the number of storage containers used for this waste shall be minimized; and 4) all items removed from the sump shall be promptly contained and decontaminated to reduce the potential for contamination spread.

All materials that are either removed from the sump or have come in contact with the sump contents shall be handled, packaged, labeled, and stored as mixed waste, pending final disposition.

5.5.3 Excavation Soil

There are several methods that will be used to minimize the volume of excavation soil waste. These methods are: 1) use auger and hand digging methods to minimize the volume of soil removed; 2) excavate around the inlet pipe first to a depth not to exceed the depth requiring additional shoring or sloping (i.e., 4 ft); 3) cover the appropriate soil areas whenever there is a potential for spreading contamination; and 4) use the criteria stated in *Improved Storage of Soil and Debris Removal Action 17 Work Plan* (WEMCO 1992) for determining the ability to reuse this soil within OU-3. The objectives and approach of Removal Action 17 are summarized in Section 2.3 of this RAWP.

All excavation soil will be collected in drums approved for mixed waste. These drums will be filled to the recommended capacity and labeled and temporarily stored until characterization can be completed. Characterization sampling will be conducted in accordance with a detailed sampling and analysis plan to be developed in parallel with this removal action.

As discussed in Sections 4.6 and 4.10 of this RAWP, excavation will be limited to the soils immediately surrounding the sump and inlet piping, with any contaminants present in the soil beyond the area of excavation left in place. Because listed wastes were contained in the sump, the volume of soil used as excavation backfill will likely be classified as a hazardous or mixed waste. The total volume of backfill soil potentially subject to this classification is estimated to be 160 ft^3 (6 yd^3). The backfill soil will be obtained from soils stockpiled within OU-3.

5.5.4 Sump Hardware Waste

The sump component waste includes the sump with attached inlet pipe stub, the installed pump and its associated piping, and the concrete sump apron. All components that have come in contact with the sump contents are assumed to be mixed waste. Parts of the installed pump that have not come in contact with the sump contents are assumed to contain radioactive contamination until monitoring indicates acceptable levels. The concrete sump apron is assumed to be mixed waste unless subsequent characterization indicates an alternative classification.

It is anticipated that the sump, the installed pump, and its associated piping will each be handled, as much as feasible, as single units. This will require the use of approved transport containers of a large enough volume capacity to handle these components. The concrete apron, with rebar, occupies a volume of approximately 10 ft^3. Because this material will occupy a larger volume upon removal, a broken volume of approximately 20 ft^3 is estimated. This broken volume will be dependent upon the sizes and geometries of the broken pieces and the geometry of the container.

Waste reduction methods that will be used with the sump are: 1) capping the openings of the sump to minimize any unwanted items from entering the sump and minimize the spread of contamination from inside to outside the sump; 2) if decontamination or recycling are considered feasible, decontaminate the sump. The FEMP decontamination facility staff will make recycle and decontamination decisions in accordance with Removal Action No. 9 guidance. Than guidance indicates that in general thin gauge metal hardware and piping (less than 0.25 in thickness) is more appropriately dispositioned as scrap metal for recycle rather than for reuse.

Waste reduction methods that will be used with the installed pump and its associated piping are: 1) either disconnect or seal all noncontaminated and potentially radioactive-only contamination separately from the potentially mixed contaminated components as much as feasible to minimize the cross contamination of components; 2) seal the mixed contaminated components, particularly the piping inlets, upon removal from the sump to minimize the spread of contamination; and 3) if decontamination or recycling is considered feasible, decontaminate the pump and piping.

Waste reduction methods that will be used for the concrete apron are: 1) store the concrete apron waste in separate containers; 2) break up the concrete into pieces small enough to minimize the number of containers required; and 3) cover the concrete apron when other events that may spread contamination are in progress.

The sump, the installed pump, and its associated piping will be packaged, labeled, transported and controlled in containers approved for this purpose. The concrete apron will be labeled and temporarily stored in DOT containers (e.g., approved 55-gallon drums) until characterization is complete.

5.5.5 Protective Clothing Waste

The use, handling, storage, and disposal of contaminated protective clothing is a routine function of WEMCO addressed in existing Standard Operating Procedures (FMPC-0516, FMPC-2128, RM-0009I, FMPC-2152). Protective clothing is divided into two categories: disposable and reusable. Examples of disposable protective clothing are paper coveralls and surgeon's gloves. Examples of clothing that can be decontaminated and reused are booties and respirators.

For the purposes of this RAWP, all protective clothing used in the identified radiologically controlled area is considered radioactively contaminated until monitored. Protective clothing that has come in contact with the sump contents is considered mixed waste and is handled accordingly.

It is difficult to estimate the total volume of contaminated protective clothing from this operation. If it assumed that each week one 55-gallon drum is filled with disposable protective clothing (not considering compaction), the total volume of material to be buried can be substantial. Waste volume analyses associated with reusable protective clothing must include the waste generated by decontamination efforts. This decontamination may generate more waste volume than the volume of the contaminated item.

Methods that will be used to reduce this volume are: 1) identify zones of increasing levels of protective clothing; 2) cover openings to the sump when feasible to allow work in the area using reduced levels of clothing; 3) cover and seal contaminated components that may cause of spread of contamination to the soil; 4) evaluate the use of dust reduction methods when excavating to reduce the level of respiratory protection; and 5) minimize personnel entering the area to those that have a demonstrated need for the particular action.

Protective clothing will be controlled using WEMCO standard procedures. Mixed waste protective clothing will be handled, stored, labeled and transported as mixed waste.

5.5.6 Decontamination Wastes

Decontamination wastes will be generated by field decontamination activities. These decontamination activities will consist of dry or wet wipe downs, simple two-stage soap and water stations, and high or low pressure water/detergent spray systems. It is anticipated that field decontamination will only be performed on materials that have contacted the sump contents and are expected to be both radiologically and chemically contaminated. As a result, decontamination waste will be handled, treated (e.g., absorbed), labeled, and stored as mixed waste.

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Section 6

55-A

6.0 SAMPLING AND ANALYSIS

A number of direct measurement and sampling and analysis activities will be required as part of the sump removal action. The two primary requirements for measurement and laboratory data are associated with worker health and safety monitoring, and demonstration of compliance with regulatory criteria. Worker health and safety, and applicable or relevant and appropriate regulatory criteria are discussed in detail in Sections 7.0 and 9.0 of this RAWP, respectively.

To ensure that the data needs of worker health and safety monitoring and ARARs compliance are adequately addressed during the sump removal action, and that the data are sufficient in terms of both quantity and quality, a Sampling and Analysis Plan (SAP) has been prepared in accordance with applicable requirements of the FEMP Site-Wide CERCLA Quality Assurance Project Plan (SCQ). The SCQ is currently undergoing EPA review and is used here in lieu of the currently approved Quality Assurance Project Plan which is to be replaced by the SCQ. Specific portions of the SCQ that are applicable to this removal action are discussed in Section 8.0 of this RAWP.

6.1 SAMPLING AND ANALYSIS OBJECTIVES

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

A detailed review of existing data from routine and special sampling programs was conducted to define the extent of additional sampling required to meet the data needs, and to identify potential target analytes. Included in this review were contamination levels in water from nearby piezometer sites, soil contamination levels from samples taken during piezometer installation, and analytical results from samples of sump liquid and sludge. Historical information and process knowledge concerning chemicals, wastes, and radioisotopes involved in Pilot Plant operations were used to further identify contaminants of potential concern. Existing analytical data are shown in the RSE (Attachment 1). The data needs described in this section are comprised of information that is required but not included in the existing sources listed above.

6.1.1 Health and Safety Support

For the removal action, monitoring for health and safety is required in order to detect radiological or chemical contamination in the area surrounding the temporary sump, on equipment and personnel, or in the air. The number and frequency of contamination measurements will be determined by specific site conditions as assessed by the Health and Safety Officer, but as a minimum will include the surveys specified in Table 6-1.

Survey methods include direct reading survey instruments equipped with detectors specific for alpha or beta/gamma-emitting radionuclides, explosive vapors, or volatile organics. Air samples are obtained with either grab sampling methods or continuous air samplers. Due to the nonspecific nature of survey instrumentation, health and safety survey data are to be considered semiquantitative, at best. All health and safety monitoring shall be performed in compliance with applicable sections of the SCQ as well as the HASP (Attachment 3).

6.1.2 ARARs

The ARARs include specific performance criteria that the removal action must meet either from the standpoint of worker health and safety or protection of the environment. The ARARs for the sump removal action are detailed in Section 9.0 and Attachment 5 of the work plan.

Data required to demonstrate compliance with the ARARs include data from a sample of sump contents and from soil samples taken after sump removal. The radiological species found in the sump contents include isotopes of uranium (Uranium-234, Uranium-235, and Uranium-238) and Thorium-232. Soil samples will be analyzed for these radionuclides, as well as decay products that present the potential for radiation dose to on-site or off-site personnel. The radioisotopic analyses for parent species with the decay products of interest are the following:

Table 6-1. Minimum requirements for health and safety monitoring.

Item/Area	Frequency	Analytes
Site surface areas	Prior to work and at completion each day	Alpha, Beta/Gamma, Organic Vapor Monitoring
Work area	Prior to work and at completion each day	Gamma
Fixed equipment	Prior to work and at completion each day	Alpha, Beta/Gamma, Organic Vapor Monitoring
Access/egress	Prior to work and at completion each day	Alpha, Beta/Gamma, Organic Vapor Monitoring
Equipment transfer	Prior to removal from exclusion zone	Alpha, Beta/Gamma, Organic Vapor Monitoring
Personnel	On exit from exclusion zone	Alpha, Beta/Gamma
Air	Daily with continuous particulate sampler	Alpha
	Prior to welding/cutting	Explosivity
Sump opening	Prior to work and at completion each day	Alpha, Beta/Gamma, Organic Vapor Monitoring, Explosivity
	Prior to entry	Oxygen Level
	Prior to welding	Explosivity

- Uranium-238, plus Thorium-230, Radium-226, Lead-210
- Uranium -235, plus Protactinium-231, Actinium-227
- Uranium-234
- Thorium-232, plus Thorium-228, Radium-228.

Chemical contaminants identified in the sump contents include organic compounds and metals. Only the metals present at levels above the TCLP limits will be target analytes. The chemical analytes are the following:

Organics	Metals
1,1,1-Trichloroethane	Barium
Carbon Tetrachloride	Lead
O-Xylene	Mercury
Benzene	

The number of each type of sample is discussed in Section 6.2, Sampling Procedures. Waste characterization sampling and analyses will be required in support of final waste disposition. Waste characterization will be addressed in a separate sampling and analysis plan to be developed in parallel with this removal action.

6.1.3 Data Quality Objectives

All sampling and analysis activities must be conducted and documented in a manner that ensures 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 that specify the quality of the data required to support decisions during remedial response activities.

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

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

ARARs. The data required to assure compliance with ARARs must be of sufficient quality to determine the type, amount, and distribution of contaminants in and around the Pilot Plant Temporary Sump. Based on the information provided in Attachment 2, the ASLs necessary to achieve the required data quality will consist of Levels A through D, with emphasis on C and to a lesser extent on Level D. For instance, samples exhibiting contamination as determined by radiological and chemical survey methods (ASL-A) will be submitted for Level C analyses. Level D analyses will only be performed on the sump sample and the two soil samples collected directly beneath the sump.

6.2 SAMPLING PROCEDURES

This section identifies specific sampling procedures required to meet the data needs described above. The number of samples, sample location, sample collection procedures are discussed. Waste characterization sampling to determine disposal options is not discussed here, but will be discussed in a separate comprehensive waste characterization SAP, prepared in parallel with this removal action.

6.2.1 Health and Safety Monitoring

Monitoring to assure the health and safety of workers typically employs data from hand-held survey instruments to detect contamination on surfaces, equipment, and personnel; external radiation exposure, or in the case of organic vapors, air contamination. Grab or continuous air samplers are used to collect samples to determine airborne radiological contaminants. Other survey methods include those for explosive gases and "sniffer" tubes for toxic vapors and gases.

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

Alpha Particles	ZnS Scintillator Continuous Air Monitor (CAM)
Beta Particles	Gieger-Mueller
Gamma Rays	Gieger-Mueller NaI

Surveys for chemical contamination typically employs an organic vapor analyzer (OVA). Detection is based on ionization of the organic species and the subsequent impact on an electric field. Ionization is achieved by either photoionization or flame ionization. Sensitivity of either instrument is strongly dependent upon the ionization potential of the target analytes as related to that of the substance used for calibration. The OVAs used during the sump removal action will be calibrated to yield the most conservative result within the context of assuring employee safety. Instrumentation calibration requirements are found in the SCQ, Section 8.

Specific procedures for performing organic vapor or radiological surveys are normally included within the scope of the qualification program for the individuals responsible for performing them. Additional requirements for performing radiological and chemical contamination surveys are found in the FEMP SCQ. The frequency of collecting survey data during the removal action will be determined by the professional judgment of the environmental or radiological technicians within the limitations specified in Section 6.1.1 above.

6.2.2 ARARs Related Sampling

A sample of the sump contents will be collected prior to the final removal of residual sump liquids. This liquid grab sample will be submitted to the laboratory for full HSL screening analyses as detailed in Table 6-2. Soil samples will be collected after removal of the sump and ancillary equipment using a split-spoon sampler according to the procedure in the FEMP SCQ, Section K.5.3.1. A single core sample will be obtained from the bottom of the sump pit (10-ft below grade) to a depth of 12 ft. The sampling equipment will be operated from a platform placed over the sump pit to allow the sample to be collected from the center of the pit. The 2-ft section of core collected from the bottom of the pit at 10 ft below grade to the bottom of the sampled depth at 12 ft below

Table 6-2. Analytical procedures for sump contents and soil HSL screening (ASL D).

Analytes	Media	Method	SCQ Volume No.
Pesticides	Sump Contents/Soil	FM-ORG-0030	III
Semi-Volatile Organics	Sump Contents/Soil	FM-ORG-0060	III
Volatile Organics	Sump Contents/Soil	FM-ORG-0010	III
Metals	Sump Contents/Soil	FM-INO-0010 FM-INO-0030 FM-INO-0040	III
Cyanide	Sump Contents/Soil	FM-CON-0015	III
Isotopic Uranium	Sump Contents	FM-RAD-0110	V
Isotopic Uranium	Soil	FM-RAD-0100	V
Isotopic Thorium	Sump Contents/Soil	FM-RAD-0080	V

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

grade, will be segmented into two 1-ft sections (10- to 11-ft, and 11- to 12-ft sampling depths respectively) for analysis. These samples will undergo Level D analyses (as identified in Attachment 2) following the analytical procedures listed in Table 6-3.

Contamination surveys will also be conducted on the exterior of the sump and inlet piping following their removal. Screening of the soil surrounding the sump shall be done using a NaI radiation detector field correllated to soil uranium concentrations, and a PID/FID instrument to detect the pressure of volatile organic compounds. If contamination is detected on the sump exterior in excess of the Removal Action 17 screening criteria, additional soil samples will be collected by split spoon at four equally spaced locations (one every 90°) around the perimeter of the sump pit. The objective of this sampling is to obtain soil at each location from the surface to a depth of 12 ft. Each 12 ft core will be surveyed for radiological and chemical contamination using the instrumentation noted above. The 1 ft segment that exhibits the highest levels of contamination shall be submitted for ASL C analyses (as identified in Attachment 2) of the target analytes as identified in Table 6-2. Soil samples will be collected in accordance with FEMP SCQ Appendix K.5 Solid Matrix Environmental Samples. A total of 4 1-ft interval samples will be analyzed using the procedures identified in Table 6-3.

If contamination is detected on the piping exterior, a sample will be collected directly beneath the section of removed pipe. The objective of this sampling is to obtain soil at this location to a depth of 2 ft below the pipe. The core will be surveyed for radiological and chemical contamination. The 1 ft segment which exhibits the highest levels of contamination shall be submitted for ASL C analyses (as identified in Attachment 2) of the target analytes identified in Table 6-3. Sump contents and soil sampling and analyses are summarized in Table 6-4.

6.2.3 Concrete Samples

Considering the small quantity of concrete and the difficulty in obtaining a representative sample, concrete will be presumed to be mixed waste based on process knowledge.

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Table 6-3. Analytical procedures for soil analyses (ASL C).

Analytes	Media	FEMP SCQ Procedure	SCQ Volume No.
Isotopic uranium	Soil	FM-RAD-0110	V
Isotopic thorium	Soil	FM-RAD-0080	V
Radium-226	Soil	FM-RAD-0060	V
Lead 210	Soil	To be determined	
Protactinium-227	Soil	To be determined	
Actinium-227	Soil	To be determined	
1,1,1-Trichloroethane	Soil	FM-ORG-0010	III
o-Xylene	Soil	FM-ORG-0010	III
Benzene	Soil	FM-ORG-0010	III
Mercury	Soil	FM-INO-0040	III
Lead	Soil	FM-INO-0010	III
Barium	Soil	FM-INO-0010	III

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

Table 6-4. Summary of sampling and analyses.

Sample ID	Media	Location	Type	Sampling Procedure[a]	Analytical Procedure[b]	ASL Level	Comments
Sump-1	Liquid/Sludge	Sump	Grab	K.5.5[c]	Table 6-3	ASL D	Sample will be collected from sump prior to final sump pump-out.
Soil-1a	Soil	Bottom center of sump excavation - upper 1 ft segment	Soil Core - 2 ft	K.5.3.1[d]	Table 6-3	ASL D	Sample will be collected following removal of the sump.
Soil-1b	Soil	Bottom center of sump excavation - lower 1 ft segment	Soil Core - 2 ft	"	Table 6-3	ASL D	Sample will be collected following removal of the sump.

Table 6-4. Summary of sampling and analyses.

Sample ID	Media	Location	Type	Sampling Procedure[a]	Analytical Procedure[b]	ASL Level	Comments
Soil-2	Soil	Perimeter of sump excavation - north - maximum[c] 1 ft segment	Soil Core - surface to 12 ft depth	"	Table 6-2	ASL C	Sample will collected in the event that contamination is found on the external surfaces of the sump following excavation, indicating potential leakage.
Soil-3	Soil	Perimeter of sump excavation - south - maximum[c] 1 ft segment	Soil Core - surface to 12 ft depth	"	Table 6-2	ASL C	See comment for sample Soil-2, above.
Soil-4	Soil	Perimeter of sump excavation - east - maximum[c] 1 ft segment	Soil Core - surface to 12 ft depth	"	Table 6-2	ASL C	See comment for sample Soil-2, above.

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Table 6-4. Summary of sampling and analyses.

Sample ID	Media	Location	Type	Sampling Procedure[a]	Analytical Procedure[b]	ASL Level	Comments
Soil-5	Soil	Perimeter of sump excavation - west - maximum[e] 1 ft segment	Soil Core - surface to 12 ft depth	"	Table 6-2	ASL C	See comment for sample Soil-2, above.
Soil-6	Soil	Bottom center of drain line excavation	Soil Core - surface to 12 ft depth	"	Table 6-2	ASL C	Sample will collected in the event that contamination is found on the external surfaces of the drain line following excavation, indicating potential leakage.

a - FEMP Site-Wide CERCLA Quality Assurance Project Plan, FD-1000
b - All analyses specified in referenced table will be run.
c - FD-1000, Volume 2, Appendix K, Section K.5.5, Drum Sampling
d - FD-1000, Volume 2, Appendix K, Section K.5.3, Subsurface Soil Sampling
e - Based on field screening techniques and criteria presented in the Removal Action No. 17 Work Plan

6.2.4 Chain of Custody

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

6.2.5 Waste Management

Sampling activities will generate small quantities of solid and liquid wastes which contain radioactive materials, hazardous substances, or both. All sampling wastes shall be handled in accordance with Section 5.0 of the work plan.

6.3 ANALYTICAL PROCEDURES

This section defines the analytical procedures to be employed for analysis of target analytes. All procedures either currently exist in Volumes 3 and 5 of the FEMP SCQ or are in the process of being finalized for inclusion into that document. Summaries of required analyses are presented in Tables 6-2 and 6-3. The listed methods are consistent with those required or prescribed by EPA. Analyses with "to be determined" methods will be performed by accepted and validated methods derived from standard sources such as the EPA's SW-846, DOE Emission Measurement Laboratory HASL/300, or American Society for Testing and Materials standard methods. An off-site laboratory qualified to perform work under the EPA's Contract Laboratory Program will be used.

6.4 QUALITY ASSURANCE

The quality assurance program for sampling and analysis is described in detail in the SCQ. The Pilot Plant Temporary Sump removal action will comply with all aspects of the program.

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Section 7

68-A

7.0 HEALTH AND SAFETY

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

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

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Section 8

69-A

8.0 QUALITY ASSURANCE

This removal action will be conducted according to the overall quality assurance program at the FEMP as described in the FEMP SCQ (FD-1000, March 4, 1992). The SCQ is currently undergoing EPA review and is used here in lieu of the currently approved Quality Assurance Project Plan which is to be replaced by the SCQ. The Quality Assurance Project Plan is based on the criteria specified in American Society of Mechanical Engineers NQA-1, federal EPA guideline QAMS-005/80, and DOE Orders 5700.6 and 5400.1. Detailed requirements are implemented by the WEMCO Site Policies and Procedures Manual, FMPC-2054; and WEMCO departmental procedures and topical manuals. Specific quality assurance requirements will be incorporated into written and approved procedures and during personnel training. The site Quality Department will conduct periodic surveillances to verify compliance with the Quality Assurance Project Plan.

Section 9

70-A

9.0 ARARs ANALYSIS

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

Table 9-1. Regulatory requirements for the Pilot Plant sump removal action.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
10 CFR §§ 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 CFR §§ 20.1301 to .1302	Relevant and Appropriate	Chemical	NRC	Dose Limits for Individual Members of Public	Conduct operations to limit dose exposure.	NRC public dose rates are relevant to the operation of activities during the removal action.
10 CFR §§ 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 CFR §§ 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 CFR § 20.1901	Relevant and Appropriate	Action	NRC	Caution Signs	Provides requirements for signs and labels for radioactive material.	Pilot Plant area should be properly labeled during the removal action.
10 CFR § 20.1902	Relevant and Appropriate	Action	NRC	Posting Requirements	Provides requirements for posting radioactive areas.	NRC posting requirements for radioactive areas should be considered to secure area during removal activities.
10 CFR § 20.1904 to .1905	Relevant and Appropriate	Action	NRC	Labeling	Requires labeling of containers storing radioactive waste.	Pilot Plant waste is radioactive.

Table 9-1. Regulatory requirements for the Pilot Plant sump removal action.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
10 CFR 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 will need to be permanently disposed.
10 CFR § 830.340	To Be Considered[1/]	Action	DOE	Maintenance Agreement	Requires DOE contractors to develop, implement and conduct operations in accordance with a facility maintenance program.	Removal activity planning should consider DOE operations requirements.
10 CFR § 835.101	To Be Considered[1/]	Action	DOE	Radiation Protection Programs	DOE activities must comply with RPP. RPP contents must be equivalent in nature with activities performed.	Removal activity planning should consider the Fernald Radiation Protection Program.
10 CFR § 835.202	To Be Considered[1/]	Chemical	DOE	Limits for Occupational Workers	Specifies exposure limits by an occupational worker to radiation resulting from routine DOE nuclear and radiation activities. Sets forth stochastic and nonstochastic annual limits. Exceptions: background and therapeutic and diagnostic exposures.	Pilot Plant activities will require compliance with radiation protection standards.
10 CFR § 835.203	To Be Considered[1/]	Action	DOE	Internal and External Dose Equivalents Resulting from DOE Activities	Specifies how the EDE is determined.	Pilot Plant activities will require compliance with radiation protection standards.
10 CFR § 835.204	To Be Considered[1/]	Action	DOE	Planned Special Exposures	Specifies when planned special exposures resulting in individuals exceeding EDE are permitted, prior written approval from DOE documentation must be obtained.	Pilot Plant activities will require compliance with radiation protection standards.

Table 9-1. Regulatory requirements for the Pilot Plant sump removal action.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
10 CFR § 835.205	To Be Considered[1/]	Action	DOE	Determination of Compliance for Nonuniform Exposure of the Skin	Provides for the assessment of nonuniform skin exposures from x-rays, beta radiation, and/or radioactive materials.	Pilot Plant activities will require compliance with radiation protection standards.
10 CFR § 835.209	To Be Considered[1/]	Action	DOE	Concentrations of Radioactive Material in Workplace Air and Water	Establishes DAC values in Appendices A and C of 10 CFR 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 CFR § 835.401	To Be Considered[1/]	Action	DOE	General Requirements (for Monitoring in the Workplace)	Requires workplace area to be routinely monitored as necessary to identify and control potential sources of occupational exposure. Establishes standards for instruments used for monitoring and contamination control.	10 CFR 835.401 monitoring requirements may be considered to plan removal action.
10 CFR § 835.402	To Be Considered[1/]	Action	DOE	Individual Monitoring	Provides monitoring requirements for external radiation and internal radiation exposure.	Workers may be subject to radiation exposure during removal activities. Monitoring may be required.
10 CFR § 835.403	To Be Considered[1/]	Action	DOE	Area Monitoring	Provides procedure for measuring radioactivity concentrations in workplace and ambient air.	Workers may be subject to radiation exposure during removal activities. Monitoring may be required.

Table 9-1. Regulatory requirements for the Pilot Plant sump removal action.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
10 CFR § 835.404	To Be Considered[1]	Action	DOE	Surface Radioactive Contamination Control and Monitoring	Provides controls capable of preventing transfer of removable surface contamination to areas outside radiological areas.	In removing materials contaminated with surface radioactivity, may consider these regulations in determining transportation of materials within the facility.
10 CFR § 835.501	To Be Considered[1]	Action	DOE	Radiological Areas	Personnel entry control shall be maintained for each radiological area. The degree of control shall be commensurate with existing and potential radiation hazards within the area.	Pilot Plant is located in a radiological area.
10 CFR § 835.601	To Be Considered[1]	Location	DOE	General Requirements (Posting and Labeling)	Work areas that require posting because of the presence, or potential presence, of radiation are set forth. Individual labeling of radioactive items or containers of radioactive materials when adequate warning unavailable.	Pilot Plant is located in a radiological area.
10 CFR § 835.602	To Be Considered[1]	Location	DOE	Controlled Area	Each access point to a controlled area must be posted as a controlled area, whenever radiation other than natural background may be present. Contractor may select the required signs with approval of the head of the appropriate DOE field organization.	Pilot Plant is located in a radiological area.

Table 9-1. Regulatory requirements for the Pilot Plant sump removal action.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
10 CFR § 835.603	To Be Considered[1/]	Location	DOE	Radiological Area	Requires posting of each access point to a radiological area. Specific postings are mandated to reflect different dose ranges.	Pilot Plant is located in a radiological area.
10 CFR § 835.901	To Be Considered[1/]	Action	DOE	Occupational Workers	All occupational workers entering a controlled area at a DOE facility must receive orientation in radiation safety at that facility prior to admission. Retraining required when there is a significant change to radiation protection policies and procedures affecting occupational workers.	Pilot Plant removal action will occur in a controlled area.
10 CFR § 835.902	To Be Considered[1/]	Action	DOE	Radiation Workers	Radiation worker training program and retraining shall be established and conducted at a sufficient frequency to familiarize the worker with the fundamentals of radiation protection and the ALARA process. Generic radiation worker training may be substituted.	Pilot Plant removal action will occur in a controlled area.
10 CFR § 835.1001	To Be Considered[1/]	Action	DOE	Design and Control of Workplace	Radiation exposure in controlled workplace areas shall be ALARA through facility design and control.	Workplace for removal action should attempt to maintain radiation exposure ALARA.

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Table 9-1. Regulatory requirements for the Pilot Plant sump removal action.

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

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Table 9-1. Regulatory requirements for the Pilot Plant sump removal action.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
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 Pilot Plant must comply with 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 Pilot Plant must comply with 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 Pilot Plant must comply with OSHA requirements.
29 CFR Part 1910, Subpart L	Applicable	Action	OSHA	Fire Protection	Provides requirements for fire protection in workplace.	Removal action at Pilot Plant must comply with 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 Pilot Plant must comply with 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 Pilot Plant must comply with 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 Pilot Plant must comply with 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.

Table 9-1. Regulatory requirements for the Pilot Plant sump removal action.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
40 CFR § 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 CFR §§ 261.2 to 261.8	Relevant and Appropriate	Chemical	EPA	Definition of Solid and Hazardous Waste and Exclusions and Exemptions	Provides definitions for solid and hazardous waste and exclusions and exemptions to these definitions.	Pilot Plant contains hazardous wastes which are defined in this regulation.
40 CFR Part 261, Appendix II	Relevant and Appropriate	Action	EPA	Method 1311	Provides procedure for conducting TCLP for determination of hazardous waste based on a toxicity characteristic.	Procedure relevant to determining TCLP levels during sampling and analysis phase of removal action.
40 CFR Part 261, Appendix III	Relevant and Appropriate	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 Pilot Plant area.
40 CFR Part 261, Appendix VIII	Relevant and Appropriate	Chemical	EPA	Hazardous Constituents	Provides a listing of hazardous constituents regulated under RCRA.	Relevant to determining hazard waste designations at Pilot Plant.
40 CFR § 261.15	Relevant and Appropriate	Action	EPA	General Inspection Requirements	Requires that the TSD facility perform routine inspections.	Hazardous waste from the sump pump will be stored at an on-site TSD facility.
40 CFR § 261.16	Relevant and Appropriate	Action	EPA	Personnel Training	Requires that personnel at the TSD facility be trained.	Hazardous waste from the sump pump will be stored at an on-site TSD facility.

Table 9-1. Regulatory requirements for the Pilot Plant sump removal action.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
40 CFR § 261.17	Relevant and Appropriate	Action	EPA	General Requirements for Ignitable, Reactive, or Incompatible Wastes	Requires precautions be taken to prevent accidental ignition or reaction of ignitable, reactive, or incompatible waste.	The sludge/liquid may be an ignitable waste.
40 CFR § 261.20	Relevant and Appropriate	Chemical	EPA	Characteristics of Hazardous Waste - General	Provides general definitions for characteristic hazardous waste.	Wastes contained at Pilot Plant are characteristic wastes.
40 CFR § 261.21	Relevant and Appropriate	Chemical	EPA	Characteristics of Ignitability	Provides definition of ignitability characteristic for hazardous waste determination.	Wastes at Pilot Plant may be ignitable.
40 CFR § 261.23	Relevant and Appropriate	Chemical	EPA	Toxicity Characteristic	Provides definition of toxicity characteristic for hazardous waste determination based on the TCLP test.	Wastes at Pilot Plant meet TCLP designations.
40 CFR § 261.31	Relevant and Appropriate	Chemical	EPA	Hazardous Waste from Nonspecific Sources	Enumerates solid wastes which are listed hazardous wastes from nonspecific sources.	Pilot Plant hazardous waste may be listed waste.
40 CFR § 265.13	Relevant and Appropriate	Action	EPA	General Waste Analysis	Requires that waste be analyzed before treatment, storage, or disposal.	During the removal action, the waste will need to be sampled and analyzed.
40 CFR § 265.14	Relevant and Appropriate	Action	EPA	Security	Requires security for the hazardous waste management facility.	Security measures need to be complied with at the TSD facility at the FEMP.
40 CFR §§ 265.70, .73, .74, .77	Relevant and Appropriate	Action	EPA	Recordkeeping and Reporting	Requires owners/operators of hazardous waste TSD facilities to keep operating records and waste reports.	Hazardous waste from Pilot Plant will be stored at FEMP TSD facility.

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Table 9-1. Regulatory requirements for the Pilot Plant sump removal action.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
40 CFR §§ 265.91 to 265.96	Relevant and Appropriate	Action	EPA	Releases from Solid Waste Management Units	Requires owners/operators of hazardous waste TSD facilities to conduct monitoring and response programs concerning releases from waste management units.	Hazardous waste from Pilot Plant will be stored at FEMP TSD facility.
40 CFR Part 265; Subpart G	Relevant and Appropriate	Action	EPA	Interim Status Closure Requirements	Establishes the interim status closure requirements for HWMUs.	Pilot Plant sump is an HWMU.
40 CFR § 265.171	Relevant and Appropriate	Action	EPA	Condition of Containers	Establishes standards for containers storing hazardous wastes.	Containers storing the sludge/ liquid may need to meet these requirements.
40 CFR § 265.172	Relevant and Appropriate	Action	EPA	Compatibility of Waste with Container	Requires that waste not react with or be otherwise incompatible with the container.	Containers storing the sludge/ liquid may need to meet these requirements.
40 CFR § 265.173	Relevant and Appropriate	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 sludge/ liquid may need to meet these requirements.
40 CFR § 265.174	Relevant and Appropriate	Action	EPA	Inspections	Requires weekly inspection of containers for leaks. Requires maintaining a record of the inspections.	Containers storing the sludge/ liquid may need to meet these requirements.
40 CFR § 265.175	Relevant and Appropriate	Action	EPA	Containment	Requires that storage areas have containment system.	Containers storing the sludge/liquid may need to meet these requirements.

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Table 9-1. Regulatory requirements for the Pilot Plant sump removal action.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
40 CFR § 265.176	Relevant and Appropriate	Location	EPA	Special Requirements for Ignitable or Reactive Waste	Requires that containers holding ignitable waste be located at least 15 feet from the property line.	Pilot Plant sludge/liquid may be ignitable.
40 CFR § 265.177	Relevant and Appropriate	Action	EPA	Special Requirements for Incompatible Wastes	Requires that incompatible wastes be stored separately.	Storage of sludge/liquid must meet this requirement.
40 CFR § 265.191	Relevant and Appropriate	Action	EPA	Assessment of Existing Tank System's Integrity	Provides requirements for assessing the integrity of tank systems which do not have secondary containment.	Hazardous waste from Pilot Plant may be stored in tanks.
40 CFR § 265.192	Relevant and Appropriate	Action	EPA	Design and Installation of New Tank Systems or Components	Provides design requirements for installation for new hazardous waste tank system and components.	Hazardous waste from Pilot Plant may be stored in tanks.
40 CFR § 265.193	Relevant and Appropriate	Action	EPA	Containment and Detection of Releases	Provides requirements for containment systems associated with hazardous waste storage tanks.	Hazardous waste from Pilot Plant may be stored in tanks.
40 CFR § 265.194	Relevant and Appropriate	Action	EPA	General Operating Requirements	Provides operating requirements for hazardous waste disposal facilities that store hazardous waste in tank systems.	Hazardous waste from Pilot Plant may be stored in tanks.
40 CFR § 265.195	Relevant and Appropriate	Action	EPA	Inspections	Requires owner/operator of hazardous waste disposal facility storing waste in tank systems to develop a schedule and procedures for inspecting overfill controls, tank and containment condition and tank pressure.	Hazardous waste from Pilot Plant may be stored in tanks.

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Table 9-1. Regulatory requirements for the Pilot Plant sump removal action.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
40 CFR § 265.196	Relevant and Appropriate	Action	EPA	Response to Leaks or Spills and Disposition	Provides requirements for owner/ operator of hazardous waste disposal facility storing hazardous waste in tank systems for responding to leaks, spills, or unfit equipment.	Hazardous waste from Pilot Plant may be stored in tanks.
40 CFR § 265.198	Relevant and Appropriate	Action	EPA	Special Requirements for Ignitable or Reactive Wastes	Provides storage requirements for ignitable or reactive wastes stored in tank systems at hazardous waste disposal facilities.	Hazardous waste from Pilot Plant may be stored in tanks.
40 CFR § 265.199	Relevant and Appropriate	Action	EPA	Special Requirements for Incompatible Wastes	Provides storage requirements for incompatible wastes stored in tank systems at hazardous waste facilities.	Hazardous waste from Pilot Plant may be stored in tanks.
40 CFR § 300.415	Applicable	Action	EPA	National Contingency Plan	Establishes the requirements for selecting an appropriate removal action and for complying with ARARs.	Pilot Plant removal action subject to this regulation and plan should comply with the requirements.
40 CFR Part 302	Relevant and Appropriate	Action	EPA	CERCLA Reportable Quantities	Provides notification requirements for the release of reportable quantities of hazardous substances.	The sump may be determined to have released hazardous substances in reportable quantities and therefore, the notification requirements will need to be met.
40 CFR Part 268	Relevant and Appropriate	Chemical	EPA	Land Disposal Restrictions	Provides concentration limits for hazardous constituents of concern which must be met prior to land disposal	The sludge/liquid may be land disposed.

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Table 9-1. Regulatory requirements for the Pilot Plant sump removal action.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
51 Fed. Reg. 24504 and 53 Fed. Reg. 37045	Applicable	Action	EPA	Management of Mixed Waste	Notice issued by EPA authorizes EPA and authorized states to manage hazardous component of mixed waste.	The sludge/liquid is a mixed waste.
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 5400.3	To Be Considered	Action	DOE	Hazardous and Radioactive Mixed Waste Program	Requires management of all hazardous and radioactive mixed wastes pursuant to RCRA.	Sump pump, drainage system and sludge/liquid may be mixed wastes subject to DOE requirements.
DOE Order 5400.5	To Be Considered	Chemical	DOE	Requirement for Radiation Protection of the Public and the Environment	Limit effective dose equivalent to the public and limit airborne radionuclides from DOE facilities.	Removal action will require compliance with radiation protection standards.
DOE Order 5480.11	To Be Considered	Chemical	DOE	Radiation Protection for Occupational Workers	Sets radiation exposure standards for occupational workers. Provides procedure for determining dose. Establishes DAC values for airborne radionuclide exposure and concentrations of radionuclides in drinking water in controlled areas.	Removal action will require compliance with radiation protection standards.

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Table 9-1. Regulatory requirements for the Pilot Plant sump removal action.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
DOE Order 5481.1B	To Be Considered	Action	DOE	Safety Analysis and Review Systems	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	Establish policies, requirements and guidelines for managing DOE solid low-level waste.	Sump pump and drainage system may be low-level waste subject to DOE requirements.
DOE Order 6430.1A	To Be Considered	Action	EPA	General Design Criteria	Eminates design criteria for storage facilities at DOE facilities	Radioactive waste from sump pump will need to be stored at an approved DOE storage facility.
OAC 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.	Pilot Plant removal action will require compliance with radiation standards.
OAC 3745-15-07(A)	Applicable	Action	OEPA	Air Pollution Nuisances Prohibited	Prohibits air pollution nuisances.	Air quality in Pilot Plant area cannot be deteriorated.
OAC 3745-17-05	Applicable	Chemical	OEPA	Nondegradation Policy	Degradation of air quality in any area.	Air quality in Pilot Plant area cannot be deteriorated.
OAC 3745-50-10(46)	Applicable	Action	OEPA	Hazardous Waste Management Unit	Defines hazardous waste management unit.	Pilot Plant is a hazardous waste management unit.

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Table 9-1. Regulatory requirements for the Pilot Plant sump removal action.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
OAC 3745-51-02	Applicable	Chemical	OEPA	Definition of Waste	Defines wastes.	Pilot Plant area contains wastes.
OAC 3745-51-03	Applicable	Chemical	OEPA	Definition of Hazardous Waste	Defines hazardous waste.	Pilot Plant area contains hazardous wastes.
OAC 3745-51-04	Applicable	Chemical	OEPA	Exclusions from Definition of Hazardous Waste	Exclusions from definitions of a waste.	Wastes in the Pilot Plant area are not excluded from being hazardous.
OAC 3745-51-07	Applicable	Action	OEPA	Residues of Hazardous Waste in Empty Containers	Defines empty container.	Sump pump and drainage system may be empty containers and therefore not subject to hazardous waste regulations.
OAC 3745-51-10	Applicable	Chemical	OEPA	Criteria for Identifying the Characteristics of Hazardous Waste	Defines characteristics of hazardous waste.	Pilot Plant area contains characteristic hazardous wastes.
OAC 3745-51-20	Applicable	Chemical	OEPA	Characteristic of Hazardous Waste - General	Defines hazardous waste based upon characteristics as defined in adjoining sections, biological toxicity, or presence of constituents in Appendix VIII.	Pilot Plant area contains characteristic hazardous wastes.
OAC 3745-51-21	Applicable	Chemical	OEPA	Characteristic of Ignitability	Defines hazardous waste based upon its ignitability.	Sludge/liquid may be an ignitable hazardous waste.
OAC 3745-51-24	Applicable	Chemical	OEPA	Characteristic of EP Toxicity	Defines hazardous waste based upon TCLP values.	Sludge/liquid contains constituents which meet the TCLP designation limits.

Table 9-1. Regulatory requirements for the Pilot Plant sump removal action.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
OAC 3745-51-31	Applicable	Chemical	OEPA	Hazardous Waste from Nonspecific Sources	Enumerates solid wastes which are listed wastes from nonspecific sources.	Pilot Plant wastes may be listed "F" wastes.
OAC 3745-52-11	Applicable	Action	OEPA	Hazardous Waste Determination	Any generator of waste must determine if that waste is a hazardous waste.	DOE is a generator of hazardous waste and must identify the hazardous waste contained in the Pilot Plant area.
OAC 3745-54-13	Applicable	Action	OEPA	Waste Analysis	Prior to any treatment, storage or disposal of hazardous wastes, a representative sample of the waste must be analyzed chemically and physically in accordance with a waste analysis plan.	During the removal action, the waste will need to be sampled in accordance with the waste analysis plan.
OAC 3745-54-14	Applicable	Action	OEPA	Security	Hazardous waste facility security.	Security measures will need to be complied with during the removal action.
OAC 3745-54-15	Applicable	Action	OEPA	General Inspection Requirements	Requires that TSD facilities be inspected.	Hazardous waste from Pilot Plant will be stored at FEMP TSD.
OAC 3745-54-16	Applicable	Action	OEPA	Personnel Training	Requires training of personnel in hazardous waste management.	Trained personnel must manage the hazardous waste extracted from the HMWU.
OAC 3745-54-17	Applicable	Action	OEPA	General Requirements for Ignitable or Incompatible Wastes.	Requires precautions be taken to prevent accidental ignition or reaction of ignitable, reactive or incompatible wastes.	During the removal action, workers must comply with standards if waste is determined to be ignitable.

Table 9-1. Regulatory requirements for the Pilot Plant sump removal action.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
OAC 3745-54-30 to 3745-54-35	Applicable	Action	OEPA	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.	Waste stored at TSD facility on site will need to comply with these requirements.
OAC 3745-54-50 to 3745-54-56	Applicable	Action	OEPA	Contingency Plans	Requires that TSD facilities have contingency plans designed to minimize hazards to human health and the environment.	Hazardous waste from Pilot Plant will be stored at FEMP TSD.
OAC 3745-66-70	Applicable	Action	OEPA	Use and Management of Containers	Establishes standards for storage of hazardous waste TSD facilities.	Storage of sludge/liquid must comply with these standards.
OAC 3745-66-71	Applicable	Action	OEPA	Condition of Containers	Establishes standards for containers storing hazardous wastes.	Containers storing the sludge/liquid must meet these requirements.
OAC 3745-66-72	Applicable	Action	OEPA	Compatibility of Waste with Container	Requires that waste not react with or be otherwise incompatible with the container.	Containers storing the sludge/liquid must meet these requirements.
OAC 3745-66-73	Applicable	Action	OEPA	Management of Containers	Requires that container holding waste remain closed, and be handled in a manner to prevent rupture or leaking.	Containers storing the sludge/liquid must meet these requirements.

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Table 9-1. Regulatory requirements for the Pilot Plant sump removal action.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
OAC 3745-66-74	Applicable	Action	OEPA	Inspections	Requires weekly inspection of containers for leaks. Requires maintaining a record of the inspections.	Containers storing the sludge/ liquid must meet these requirements.
OAC 3745-66-75	Applicable	Action	OEPA	Containment	Requires that storage areas have containment system.	Containers storing the sludge/ liquid must meet these requirements.
OAC 3745-66-76	Applicable	Location	OEPA	Special Requirements for Ignitable or Reactive Waste	Requires that containers holding ignitable waste be located at least 15 ft from the property line.	Pilot Plant sludge/liquid may be ignitable.
OAC 3745-66-77	Applicable	Action	OEPA	Special Requirements for Incompatible Wastes	Requires that incompatible wastes be stored separately.	Storage of sludge/liquid must meet this requirement.
OAC 3745-66-90 to 3745-66-95	Applicable	Action	OEPA	Tanks	Establishes requirements for storage of hazardous wastes in tanks and requirements for secondary containment, design, operation and inspection of tanks.	Hazardous waste from sump pump and drainage system may be stored in tanks.
OAC 3745-55-98	Applicable	Action	OEPA	Tanks, Special Requirements for Ignitable and Reactive Waste	Requires that ignitable waste be treated so that it is no longer ignitable or stored so as to prevent being ignited.	Hazardous waste from sump pump and drainage system may be stored in tanks.
OAC 3745-66-11	Applicable	Action	OEPA	Closure Performance Standards	Requires the closure of an interim status hazardous waste disposal facility.	Pilot Plant area must comply with the closure requirements because the Pilot Plant is a hazardous waste management unit.

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Table 9-1. Regulatory requirements for the Pilot Plant sump removal action.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
OAC 3745-66-12	Applicable	Action	OEPA	Closure Plan	Requires drafting of closure plan for hazardous waste management unit.	Pilot Plant is hazardous waste management unit.
OAC 3745-66-14	Applicable	Action	OEPA	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 Pilot Plant must be decontaminated prior to closure.
OAC 3745-71-02	Applicable	Chemical	OEPA	Ambient Air Quality Standards - Lead	Governs ambient air quality standards for lead.	Pilot Plant removal action may result in lead air emission which exceeds this standard.
OAC 3745-81-25A-0	Relevant and Appropriate	Chemical	OEP	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.
OERR-00-RR-017	To Be Considered	Action	EPA	Procedures for Evaluation of Response Action Alternatives and Remedy Selections	Procedures for evaluation of response action alternatives and remedy selection for state-led OERR sites.	Procedures may want to be considered in evaluating removal action.
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.
Guidance (May 28, 1991)	Applicable	Action	OEPA	Closure Plan Review Guidance	Provides description of process OEPA employs to determine closure.	Pilot Plant is subject to OEPA closure requirements.

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Table 9-1. Regulatory requirements for the Pilot Plant sump removal action.

Statute/ Regulation	ARAR Category	ARAR Type	Agency	Title	Requirement Summary	Application to Removal Action
42 USC § 2011 et seq.	Applicable	Action	DOE	Atomic Energy Act	Provides the framework for managing radioactive waste.	Pilot Plant removal action will require management of radioactive waste.
42 USC § 4901 et seq.	Relevant and Appropriate	Action		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 § 9601 et seq.	Applicable	Action		Comprehensive Environmental Response, Compensation and Liability Act	Provides the framework for conducting removal actions.	CERCLA § 106 requires that the removal action be performed.

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

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Attachment 1

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92-A

ATTACHMENT 1
REMOVAL SITE EVALUATION

PILOT PLANT SUMP
REMOVAL ACTION NO. 24 WORK PLAN
[ABANDONED SUMP WEST OF PILOT PLANT]

Fernald Environmental Management Project

July 1992

3828

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ACRONYMS AND ABBREVIATIONS

C.F.R.	Code of Federal Regulations
DOE	U.S. Department of Energy
EDE	effective dose equivalent
EPA	U.S. Environmental Protection Agency
FEMP	Fernald Environmental Management Project
FS	feasibility study
OU	Operable Unit
RI	remedial investigation
SS	stainless steel
TCLP	Toxicity Characteristic Leaching Procedure
TLV	threshold limit value

1.0 INTRODUCTION

The U.S. Department of Energy (DOE) letter DOE-667-92 titled "Proposed Phase III Removal Actions" and dated January 14, 1992, proposed the Pilot Plant Temporary Sump as a removal action. The purpose of this document is to evaluate the sump within the context of potential hazards to employees and the public, as well as the appropriateness of the proposed removal action.

The Pilot Plant is located in the southwest corner of the Fernald Environmental Management Project (FEMP) site (Figure 1-1, Grid No. 26). The temporary sump was in service from 1968 through 1970 to collect liquids from the Pilot Plant floor drain system while the main sump was undergoing refurbishment. It is located between the main sump and the southwest corner of the building (Figure 1-2). The temporary sump is a 10 ft long by 24 in. diameter piece of Schedule 10 stainless steel (SS) pipe with a SS plate welded over the lower end. An 8 in. entry line of SS is located at the pipe midpoint and may still be connected to the old floor drain system through Duriron pipes. The sump is set within a concrete apron at grade, as depicted in Figure 1-3.

The FEMP site personnel recently noted that the liquid level in the temporary sump was rising and falling. This fluctuation was reported to the regulatory authorities as a potential release to the environment. Analysis of samples revealed that the sump liquid is ignitable, has a pH of 3, and contains heavy metals in addition to uranium and thorium. The temporary sump was determined to be a hazardous waste management unit and is included in the Part A Permit application as Abandoned Sump West of Pilot Plant.

The scope of the sump removal action encompasses: 1) physical removal of the sump, including liquid contents and hardware components, 2) capping of the floor drain system drain line that is to be left in place, and 3) removal of contaminated soil (if applicable) from a zone surrounding the sump and inlet line. Contaminated soil that may exist beyond this zone (the 4 ft diameter, 11-ft deep vertical cylinder encompassing the sump, and 1 ft of soil below the inlet line), is excluded from this removal action and will be addressed in the final remediation of Operable Unit (OU)-5.

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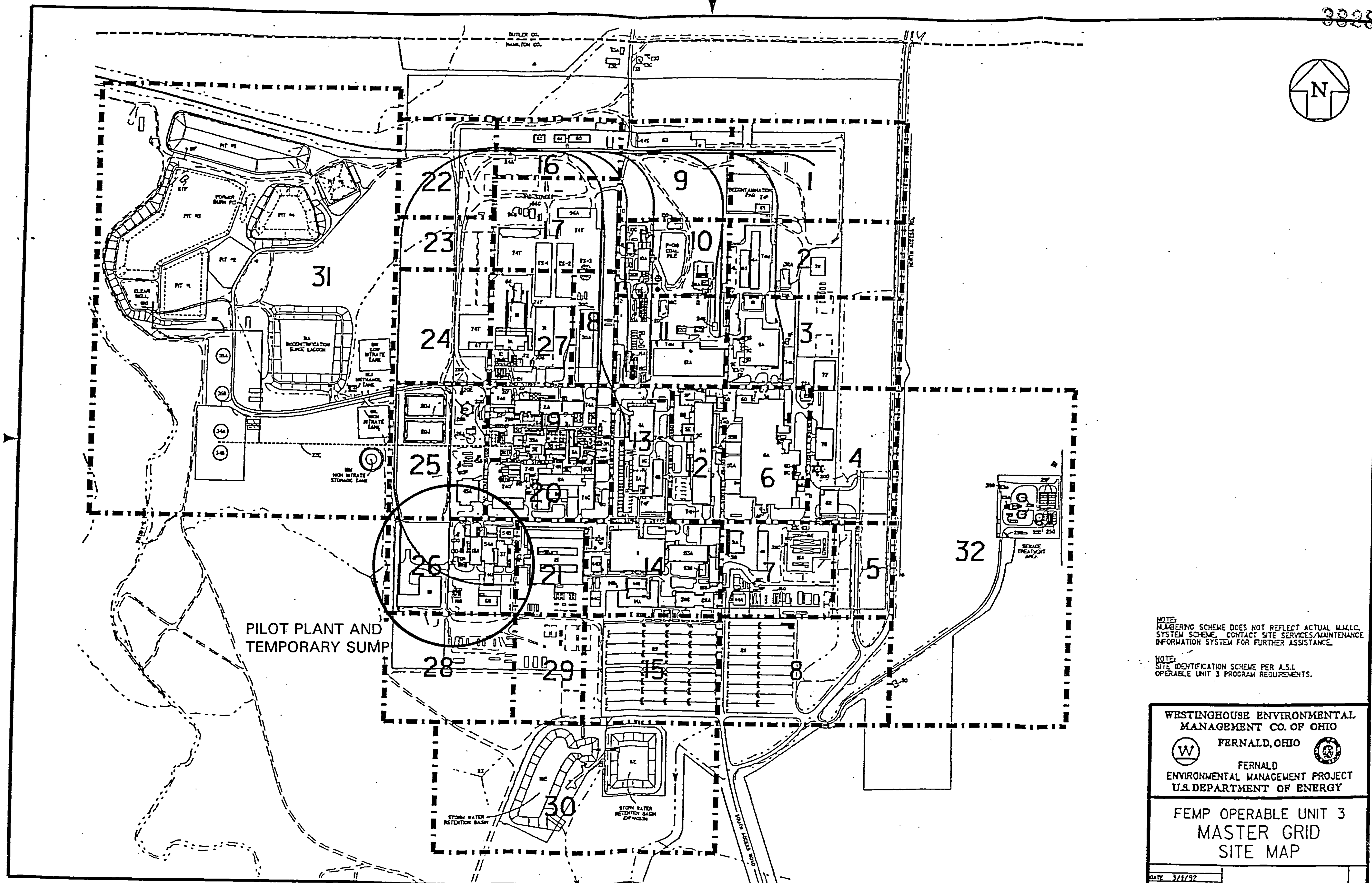

Figure 1-1. Master grid site map.

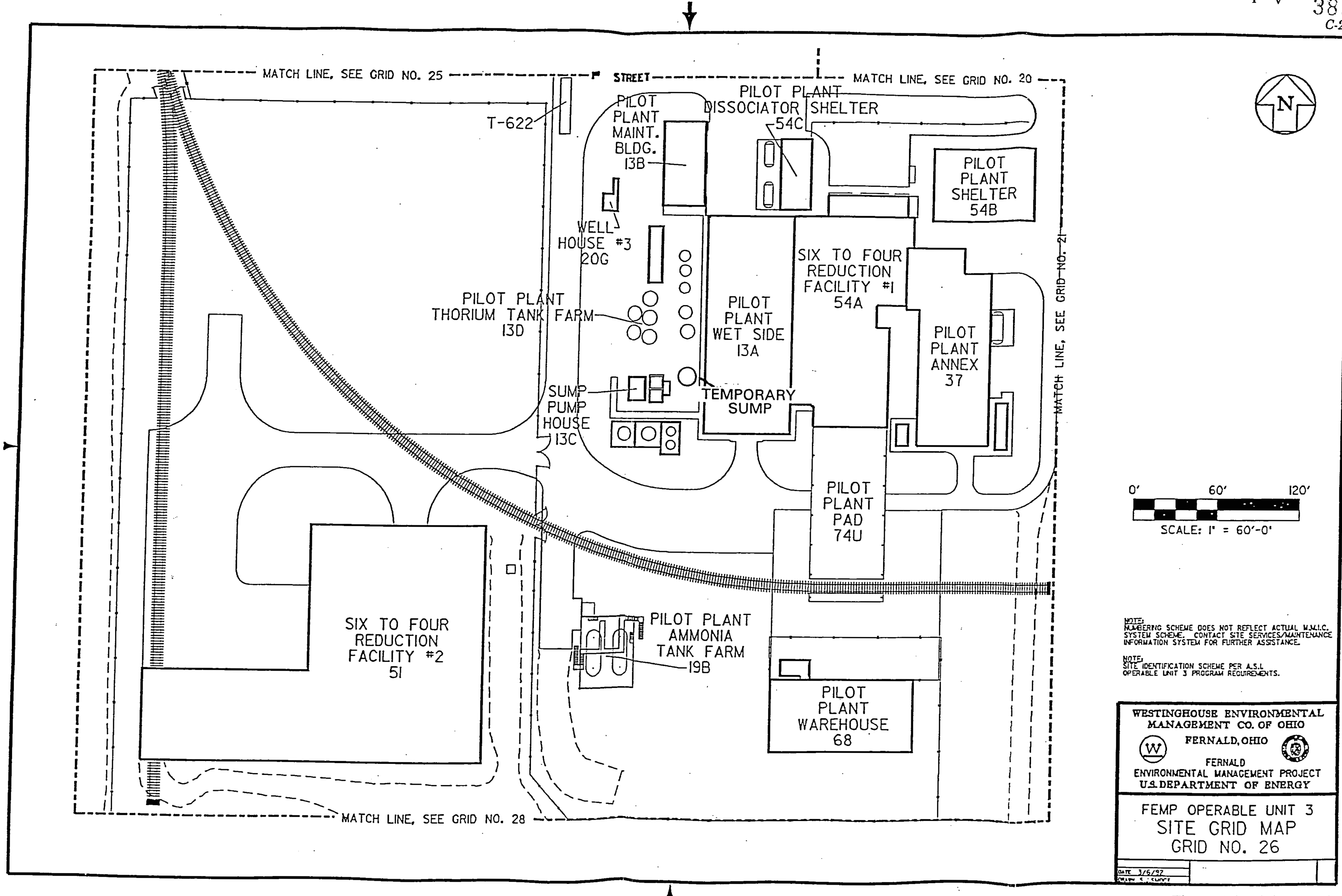

Figure 1-2. Grid no. 26.

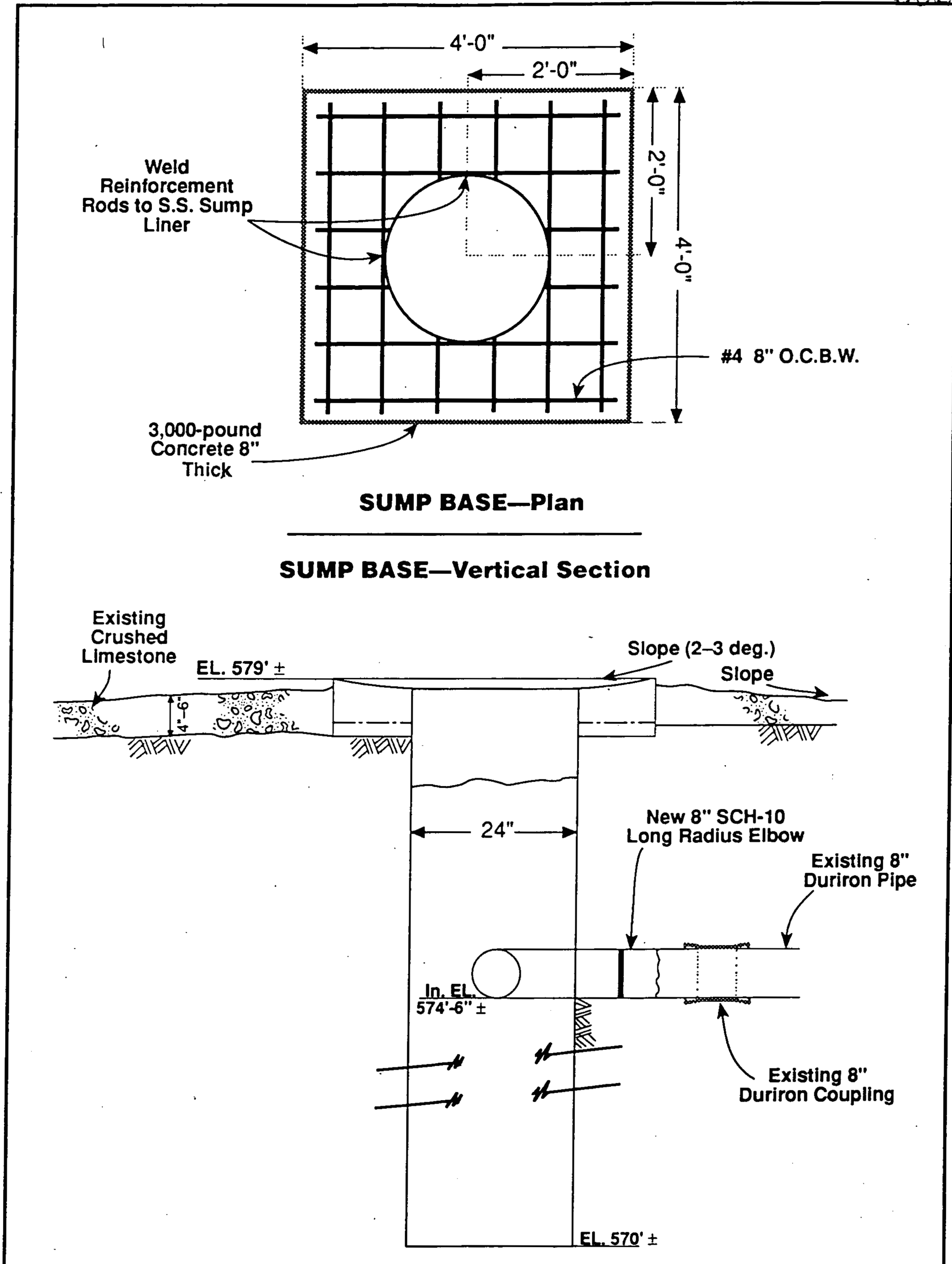

Figure 1-3. Pilot Plant Temporary Sump--plan and vertical cross section.

The bulk of the sump's liquid contents and sludge may be removed in a prior action as part of the ongoing Safe Shutdown activities (Removal Action 12). Early removal of the sump contents will significantly reduce the threat of release to the environment as well as provide valuable input to the removal action planning process.

2.0 SOURCE TERM

Samples have been obtained in connection with ongoing remedial investigation/feasibility study (RI/FS) activities as well as specific investigations of the sump contents. The analytical results from RI/FS samples do not indicate that contaminated materials are presently moving from the sump into the environment. Further, the analytical results from sump samples are consistent with the operations known to have occurred in the Pilot Plant.

2.1 SUMP CONTENTS DATA

The results from analyses of liquid samples collected from the sump are shown in Attachment 1. The two most recent grab samples of sump liquid (September 1991) were collected within the top three inches of the liquid. An earlier sample of the sludge present within the sump was also collected (January 1991). The liquid characteristics include ignitability (118 °F flash point), low pH (3), elevated uranium and thorium concentrations, and exceedance of the Toxicity Characteristic Leaching Procedure (TCLP) limit for lead. The primary hazardous aspect of the sludge is its high concentration of thorium, in excess of 55% (by weight). Although the majority of the sump's contents may be removed prior to the sump removal action, residual materials could remain in the sump, and additional liquids may drain into the sump from the main floor drain system.

2.2 SOIL SAMPLING DATA

Soil samples were collected in connection with installation of selected groundwater monitoring wells in the vicinity of the temporary sump (Figure 2-1). The available analytical results (Attachment 2) from the locations closest to the sump (1411, 1252, 1253) indicate the presence of radioactive and nonradioactive contaminants that are also found in the sump. Chemical data are available from 1411 and 1252, while radiological data are available from 1411 and 1253.

<u>Note</u>: The RSE was approved by the DOE in July 1992. Minor editorial corrections have been made to this page for clarification and consistency with the RAWP.

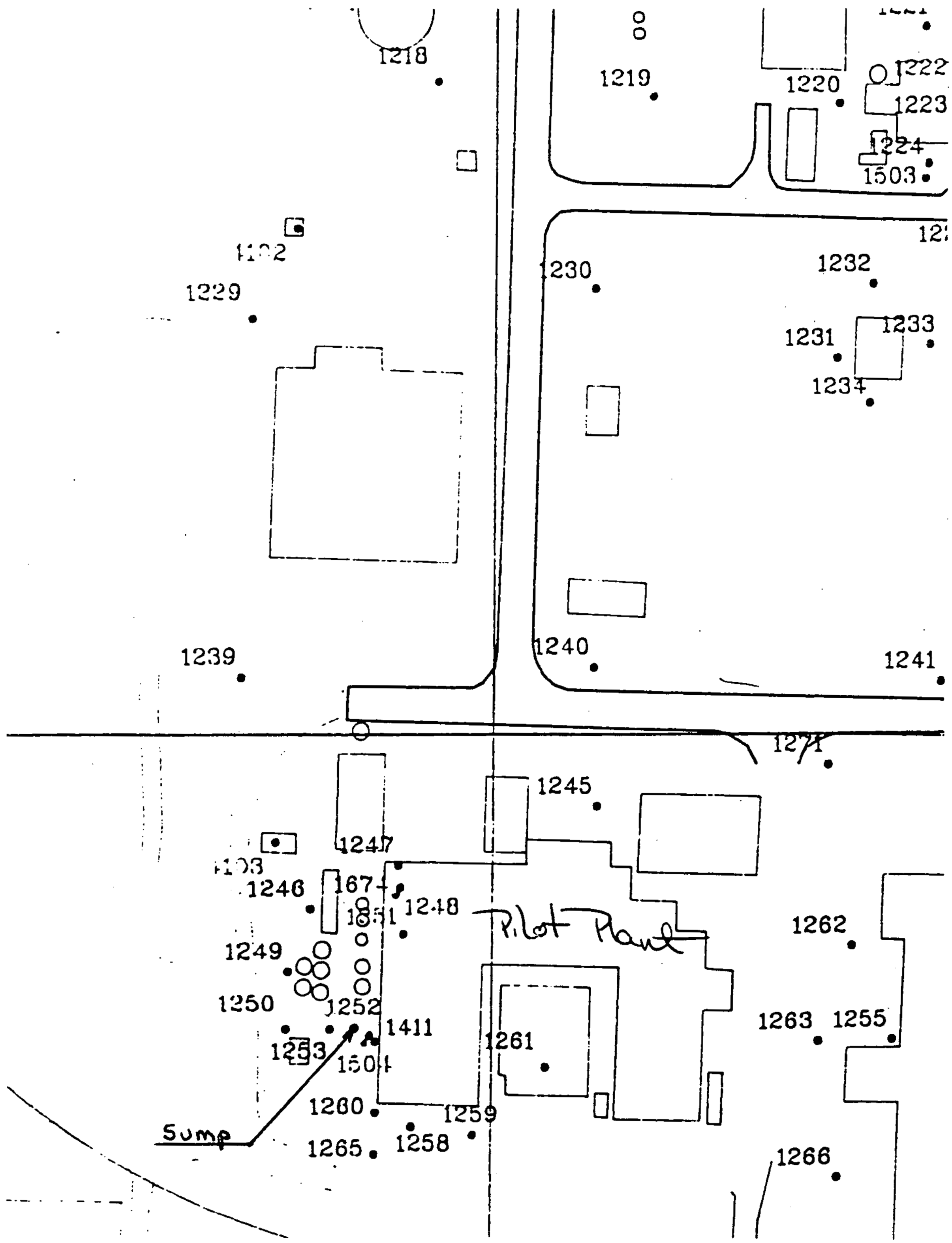

Figure 2-1. Monitoring well locations.

2.3 WATER SAMPLING DATA

Samples of perched water have been collected from three piezometers located near the temporary sump (1411, as well as 1246 and 1250). While these borings do not penetrate to groundwater, perched water is encountered approximately 11 to 12 ft below grade (elevation approximately 569 ft above mean sea level). The perched water monitoring data (Attachment 3) from these adjacent wells do not reveal elevated levels of the constituents found in the sump. The absence of contamination in these samples may be an indication that the sump is not currently leaking. However, the flow and mixing characteristics of the perched water are not well known, and the influence of sump leaks on perched water at the sampling locations cannot be accurately assessed.

2.4 PATHWAY ASSESSMENT

The contaminants found in the sump can reasonably be assumed to be soluble based on the low pH. Under this assumption, transport to groundwater could be a primary exposure pathway to man. The fact that perched water samples do not show contamination above detection limits could indicate that: 1) the contaminant solubility characteristics change on leaking from the sump, 2) a strong interaction between contaminants and the surrounding soils, 3) the monitoring wells are in the wrong location to detect the leak given the hydrogeology of the site, or 4) the sump is not presently leaking. It appears that either the third or fourth possibility is likely since the very mobile 1,1,1-Trichloroethane, found in the sump liquid, does not occur above its detection level in the sampling results. A conclusive determination regarding whether or not the sump is or has leaked cannot be made based on the existing data. However, the hazardous nature of the sump contents, the fact that the sump is open to the atmosphere, and the sump bottom is within 1 ft of the existing perched water, all combine to represent a significant threat to the human health and the environment.

Considering the flammable nature of the sump contents, there is also a potential for exposure to airborne contamination in the event of a fire. It is also reasonable to expect that such a fire would be easily controllable and of short duration (one hour or less). This pathway will be evaluated in Section 3.0 within the context of potential radiological and chemical exposures to on-site and off-site personnel.

Note: The RSE was approved by the DOE in July 1992. Minor editorial corrections have been made to this page for clarification and consistency with the RAWP.

3.0 EVALUATION OF THE MAGNITUDE OF THE POTENTIAL THREAT

The available data do not support a quantitative evaluation of the groundwater exposure pathway identified in Section 2.4. However, the sample analysis results for predominant contaminants can be compared to applicable regulatory requirements and criteria to provide a qualitative assessment of potential hazards associated with the sump. The predominant contaminants and relevant criteria are as follows:

- <u>Uranium and thorium</u>: The potential impacts from uranium and thorium contamination in the sump and surrounding areas will be assessed against the criteria found in DOE Order 5400.5, "Radiation Protection of the Public." Specifically, the uranium and thorium results from sample analyses will be compared with the concentration limits for these radionuclides in water.

- <u>Inorganics</u>: The potential impacts from the elevated lead concentration in the sump liquid is compared with the TCLP limits found in 40 C.F.R. 261.24.

- <u>Organics</u>: The specific organic constituents present in the sump liquid and sludge at detectable levels are compared with those considered hazardous substances according to 40 C.F.R. 261.32. The presence of these substances combined with the credible potential for release to the environment are considered to represent a potential threat of sufficient magnitude to warrant a removal action.

The results of the comparison are summarized in Table 3-1. It is readily apparent from these results that a major release to the environment has the potential to create contaminants in the soil or groundwater in excess of applicable limits.

To evaluate the potential significance of airborne contamination, experimentally developed factors that predict the release of contaminants from burning liquids, and the standard Gaussian dispersion equation were employed to model the release and transport of each contaminant in the event of a fire. These calculations are presented in Appendix A.

The calculated radiological exposure to the maximum individual is compared to the 10 mrem/yr radiological dose limit in 40 C.F.R. 61. For nonradiological contaminants, the applicable threshold limit value (TLV) is used as a point of comparison to assess the

Table 3-1. Comparison of measured sump concentrations with regulatory criteria.

Analyte	Criteria	Source	Measured Sump Concentrations[1/]
Uranium	6E-07 pCi/mL	DOE 5400.5, Chapter iii	490 pCi/mL
Thorium	5E-08 pCi/mL	DOE 5400.5, Chapter iii	830 pCi/mL
Lead	5 mg/L	40 C.F.R. 261.24	47 mg/L
Organics	Listed Chemical	40 C.F.R. 261.32	Carbon Tetrachloride Trichloroethane Xylene

1/ Based on data presented in Attachment 1. Specific activity of uranium 8.2E-7 Ci/g and thorium 1.09 E-7 Ci/g (Appendix A).

magnitude of the potential threat. The calculational results are summarized in Table 3-2, which shows that the conservatively calculated effective dose equivalent (EDE) resulting from the release of uranium and thorium during a fire is far below the allowable dose limit. However, the concentration of uranium has the potential to exceed the applicable TLV, and while no TLV has been established for thorium, thorium and uranium are both heavy metals.

Table 3-2. Calculated impacts from radiological and chemical exposure.

Contaminant	EDE (mrem)	40 C.F.R. 61 Dose Limit	Air Concentration (mg/m^3)	TLV (mg/m^3)
Uranium	0.02	10	5	0.2
Thorium	0.4	10	74.9	0.2[1/]
Lead	NA	NA	0.08	0.15

1/ The TLV for uranium is assigned to thorium for the purposes of this evaluation

Therefore, assuming that the nonradiological hazard presented by each is similar, it can be seen that the conservatively calculated thorium concentrations could also be a concern.

During surveillance of the temporary sump, the external exposure rate was estimated to be on the order of 0.8 mR/hr. Assuming that a hypothetical individual was near the sump 40-hr per week for a full year, the maximum external dose is calculated to be on the order of 1.7 rem.

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4.0 ASSESSMENT OF THE NEED FOR A REMOVAL ACTION

Consistent with Section 40 of the Code of Federal Regulations (C.F.R.), Part 300.410 of the National Contingency Plan, the DOE shall determine the appropriateness of a removal action. Of the eight factors to be considered in this determination, the following apply specifically to the Pilot Plant Temporary Sump:

40 C.F.R. 300.415

(b)(2)(i) - *Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants*;

(b)(2)(ii) - *Actual or potential contamination of drinking water supplies or sensitive ecosystems*;

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

(b)(2)(iv) - *High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface, that may migrate*;

(b)(2)(vi) - *Threat of fire or explosion*

The applicability of the five criteria is based on the assessment of construction and operating history of the Pilot Plant sump as well as the results of recent sampling and analysis efforts. In addition, the pathways identified in Section 2.4 represent credible routes of exposure to man. These two facts support the need for the removal action.

5.0 APPROPRIATENESS OF A RESPONSE

It is concluded on the basis of the foregoing evaluation that a response action is appropriate considering the hazardous nature of the Pilot Plant Temporary Sump contents and the potential for contaminant migration. A removal action is required to address the existing situation.

6.0 LITERATURE CITED

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APPENDIX A

Potential Radiological and Chemical Exposure from Contaminants Released to Air During a Postulated Fire

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Attachment 1 — Sump Contents Data
Attachment 2 — Subsurface Soil Data
Attachment 3 — Perched Water Data

1.0 INTRODUCTION

In Section 2.4 of the Removal Site Evaluation, the potential release of contaminants to air in the event of a sump fire was identified as an exposure pathway. The calculations to determine the potential magnitude of this threat are presented in this appendix. The intent of these calculations is to define conservative boundary conditions for a worst case fire scenario. To achieve this end, conservative assumptions were made to compensate for the lack of actual data necessary to perform definitive calculations. Key assumptions made for the calculations include the following:

1) The entire quantities of dissolved contaminants within the sump are available for release. This does not include the contaminants associated with the sludge.

2) The postulated fire has a duration of eight hours, in which time all available combustible material is consumed. Eight hours was selected as a bounding duration based on the expectation that the fire is likely to be extinguished in less than that time, and that it is unlikely that exposures would last longer than eight hours.

3) The receptor is located directly downwind at a distance of 100 m for the duration of the fire.

2.0 RELEASE TERM

The release term is the amount of material actually released by the hypothetical fire and is calculated as the product of total activity or mass available within the sump, and the release fraction, F:

$R_i = C_i \times F$ where:

R_i = Release term of species i, g
C_i = Total sump content of species i, g

F = Experimentally determined fractional release, unitless

The release fraction, 1.8E-03, which is the fraction of total activity released during the fire, was obtained from Schwendiman et al. (1968). The volume of the sump is equal to 8.9E+05 mL. The value of C for each contaminant, in grams, is calculated from the following equation:

$$C_i = V_i \times 8.9E{+}05$$

where V_i = Concentration of species i, g/mL

The above method yields the following total sump content quantities for the three predominant contaminants of interest:

Uranium	496 g
Thorium	6780 g
Lead	41.8 g

For the purpose of estimating radiological impacts, the mass content of radiological contaminants is converted to units of radioactivity. The uranium mass was converted to activity on the basis of the measured 1.16 wt% ^{235}U (98.83 wt% ^{238}U and 0.01 wt% ^{234}U). The thorium in the sump is assumed to be natural thorium (^{232}Th). The specific activity used for the calculations are:

Uranium	8.2 E-07 Ci/g
Thorium	1.09E-07 Ci/g

Based on the above equations and parameter values, the following release terms were calculated:

Uranium - $R_U = 0.7\ \mu Ci$
Thorium - $R_{Th} = 1.3\ \mu Ci$
Lead - $R_{Pb} = 0.075$ g

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3.0 ATMOSPHERIC DISPERSION

The airborne concentration of contaminants released by the hypothetical fire decreases with distance as a result of mixing within the atmosphere. The atmospheric dispersion coefficient (χ/Q) is used to calculate the ground level air concentration for the location 100 m directly downwind (on the plume centerline). The assumed meteorological conditions are moderately stable (pasquill class F) mixing conditions, and an average ground level wind speed of 0.5 m/sec.

The following equation is used to calculate the dispersion coefficient, χ/Q:

$$\chi/Q = 1 \div (\pi \sigma_y \sigma_z u), \text{ where}$$

σ_y = Lateral dispersion coefficient at 100 m
σ_z = Vertical dispersion coefficient at 100 m
u = Average wind speed, 0.5 m/sec
Q = Unit release rate (Ci(or g)/sec)

The χ/Q at 100 m was calculated to be 0.3185 sec/m^3.

4.0 INTAKE OF RADIONUCLIDES

The intake of radionuclides is determined from: 1) the air concentration of each radionuclide at the location of interest, 2) the duration of exposure, and 3) the respiration rate. This relationship can be expressed as:

Intake, $I_i = \chi \times B \times t$,

where χ = air concentration, μCi/m^3
B = respiration rate, m^3/sec
t = time of exposure
I_i = intake of radionuclide, i

The air concentration, χ, is calculated as the product of atmospheric dispersion factor, χ/Q, and the release rate, Q. Furthermore, Q is calculated as the quotient of the release term divided by the duration of release, T. Making these substitutions the intake equation becomes:

$$I_i = \chi/Q \times R_i \times B$$

The reference human breathing rate for light activity is 3.33E-04 m^3/sec (ICRP 23). Inserting this value, the release terms calculated previously, and the χ/Q of 0.3185 into the equation results in the following radiological intake:

Uranium = 7.4E-05 μCi
Thorium = 1.4E-04 μCi

5.0 IMPACTS ASSESSMENT

The impacts from exposure to uranium and thorium at the above levels are assessed by calculating the effective committed dose incurred from the intake described. The U.S. Environmental Protection Agency's (EPA) dose conversion factors are employed for this purpose (EPA 1988). The dose conversion factors for uranium and thorium are 6.88E-08 Sv/Bq and 7.38E-07 Sv/Bq, respectively. Multiplying the above intake values by the dose conversion factors and converting to the proper units yields an effective dose equivalent of 0.02 mrem for uranium and 0.4 mrem for thorium, for a total dose of 0.42 mrem.

For the purpose of this evaluation, the published Threshold Limit Value (TLV) will be used to assess the relative magnitude of chemical exposure to lead, uranium, and thorium will be evaluated. The TLV for uranium was used for thorium since a value for the latter has not been established. The validity of assigning the uranium TLV to thorium is supported by the fact that both are heavy metals and should behave similarly.

Since TLV's for metals are typically reported in units of concentration (i.e., ppm or mg/m^3) it is necessary to estimate the concentration of the three metals at the 100 m downwind location. The concentration of each metal at the 100 m downwind calculated as the product of the dispersion factor, χ/Q (sec/m^3), and the release term, R (g), divided by the release duration (8 hr x 3600 sec/hr). The results of the impacts assessment for metal fumes are summarized below:

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Metal	Concentration @ 100 M	TLV
Lead	0.08 mg/m^3	0.15 mg/m^3 1/
Uranium	5 mg/m^3	0.2 mg/m^3 2/
Thorium	74.9 mg/m^3	0.2 mg/m^3 3/

Notes: 1/ - OSHA PEL for lead is lower at 0.05 mg/m^3.
2/ - OSHA PEL for uranium is 0.2 mg/m^3 (insol.), and 0.05 mg/m^3 (sol.).

6.0 LITERATURE CITED

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EPA (U.S. Environmental Protection Agency). 1988. *Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion*. Federal Guidance Report No.11, EPA-520/1-88-020.

U.S. Department of Health Education and Welfare, Bureau of Radiological Health. 1970. *Radiological Health Handbook*.

ATTACHMENT 1
SUMP CONTENTS DATA

3828

4w
0t

Westinghouse Materials Co of Ohio
Analytical Chemistry Department
Results of Analyses

AnaLIS ID: 910913-157 Project: HWMU H005 Customer Sample ID: H005-1
Customer: HWMU Requisition Number:
Date Sampled: 13-SEP-1991 Date Sample Received: 13-SEP-1991
Sampled By: TS,DE Date Sample Completed:
Material Description: PILOT PLANT OUTDOOR SUMP Charge Number: WBA01

Activ. Number	Procedure No.	Analysis	Result	Units	Date Entered By	QA File Number	Date Completed
		Physical Description	SEE	COMMENTS	EPM-LAB		13-NOV-1991
300220	3002	Total U - BrPADAP AnL EPM	611	ppm	JJ STOECKEL	1	26-SEP-1991
303320	3033	pH - Electrode AnL EPM	3.0		JJ STOECKEL	1	26-SEP-1991
305920	3059	Total Th - Color. AnL	7.54	g/L	JJ STOECKEL	2	6-NOV-1991
306420	3064	Flash Pt. - Pensky Martens AnL	124	Deg. F	DL HARBULA	1	20-SEP-1991

***** Comments from the ENVIRONMENTAL & PROCESS MATERIALS LABORATORY for sample 910913-157 *****

hysical description :Brown liquid with about
1/4" of solids in the bottom.
U & flash point by L.Harbula
pH by J.Roberts

6w
30t

Westinghouse Materials Co of Ohio
Analytical Chemistry Department
Results of Analyses

AnaLIS ID: 910913-158 Project: HWMU H005 Customer Sample ID: H005-2
Customer: HWMU Requisition Number:
Date Sampled: 13-SEP-1991 Date Sample Received: 13-SEP-1991
Sampled By: TS,DE Date Sample Completed:
Material Description: PILOT PLANT OUTDOOR SUMP Charge Number: WBA01

Activ. Number	Procedure No.	Analysis	Result	Units	Data Entered By	QA File Number	Date Completed
		Physical Description	SEE	COMMENTS	EPM-LAB		13-NOV-1991
300220	3002	Total U - BrPADAP AnL EPM	577	ppm	JJ STOECKEL	1	26-SEP-1991
303320	3033	pH - Electrode AnL EPM	3.0		JJ STOECKEL	1	26-SEP-1991
305920	3059	Total Th - Color. AnL	7.62	g/L	JJ STOECKEL	2	6-NOV-1991
306420	3064	Flash Pt. - Pensky Martens AnL	118	Deg. F	DL HARBULA	1	20-SEP-1991

***** Comments from the ENVIRONMENTAL & PROCESS MATERIALS LABORATORY for sample 910913-158 *****

Physical description :Brown liquid with about 1/4 " of liquid in
the bottom.
U and flash point by L.Harbula
pH by J.Roberts

Westinghouse Materials Co. of Ohio
Analytical Chemistry Department
Results of Analyses

AnaLIS ID: 910913-158 Project: HWMU H005 Customer Sample ID: H005-2
Customer: HWMU Requisition Number:
Date Sampled: 13-SEP-1991 Date Sample Received: 13-SEP-1991
Sampled By: TG,DE Date Sample Completed:
Material Description: PILOT PLANT OUTDOOR SUMP Charge Number: WBA01

Activ. Number	Procedure No.	Analysis	Result	Units	Data Entered By	QA File Number	Date Completed
330044	330044	U-235 - ISO TMS	1.16	WT%(U)	HR CHILES	4015-91-M099	27-SEP-1991

***** Comments from the ENVIRONMENTAL & PROCESS MATERIALS LABORATORY for sample 910913-158 *****

Physical description :brown liquid with about 1/4 " of liquid in the bottom.
U and flash point by L.Harbula
pH by J.Roberts

Westinghouse Materials Co of Ohio
Analytical Chemistry Department
Results of Analyses

AnaLIS ID: 910111-010	Project: 0020 0001	Customer Sample ID:	S-5
Customer: PILOT PLT		Requisition Number:	
Date Sampled: 11-JAN-1991		Date Sample Received:	11-JAN-1991
Sampled By:		Date Sample Completed:	22-JAN-1991
Material Description: PILOT PLT SUMP PIT PP WEST 1 H2O		Charge Number:	SDB02

tiv. mber	Procedure No.	Analysis	Result	Units	Analyst	QA File Number	Date Completed
0102	7001	Ba-XRF	0.17	Rel. Wt. %	RN BOLIN	7001-91-002	[illegible]
	7001	Ca-XRF	0.12	Rel. Wt. %	RN BOLIN	7001-91-002	[illegible]
	7001	Cr-XRF	0.39	Rel. Wt. %	RN BOLIN	7001-91-002	22-JAN-1991
	7001	Cu-XRF	0.42	Rel. Wt. %	RN BOLIN	7001-91-002	22-JAN-1991
	7001	Fe-XRF	35.56	Rel. Wt. %	RN BOLIN	7001-91-002	22-JAN-1991
	7001	Mn-XRF	0.18	Rel. Wt. %	RN BOLIN	7001-91-002	22-JAN-1991
	7001	Ni-XRF	0.05	Rel. Wt. %	RN BOLIN	7001-91-002	22-JAN-1991
	7001	P-XRF	0.15	Rel. Wt. %	RN BOLIN	7001-91-002	22-JAN-1991
	7001	Pb-XRF	0.60	Rel. Wt. %	RN BOLIN	7001-91-002	22-JAN-1991
	7001	Si-XRF	1.06	Rel. Wt. %	RN BOLIN	7001-91-002	22-JAN-1991
	7001	Tc-XRF	0.08	Rel. Wt. %	RN BOLIN	7001-91-002	22-JAN-1991
	7001	Th-XRF	55.09	Rel. Wt. %	RN BOLIN	7001-91-002	22-JAN-1991
	7001	Ti-XRF	3.90	Rel. Wt. %	RN BOLIN	7001-91-002	22-JAN-1991
	7001	U-XRF	2.17	Rel. Wt. %	RN BOLIN	7001-91-002	22-JAN-19[illegible]
	7001	XRF Qual./Quant. Analysis	COMPLETE	Rel. Wt. %	RN BOLIN	7001-91-002	22-JAN-19[illegible]
	7001	Zn-XRF	0.06	Rel. Wt. %	RN BOLIN	7001-91-002	22-JAN-1991

WEMCO PO: 413910
Release No.: 826
Date: October 29, 1991

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ANALYTICAL RESULTS FOR SAMPLES

WEMCO ID:	910913-157	910913-158	910916-017
CNLSI NO.:	912295	912296	912298
Matrix:	Liquid	Liquid	Liquid
Preparation:	1	1	1
Units:	ppm	ppm	ppm
Volatile Organics:			
Trichlorofluoromethane	<20	<17	<2.0
1,1,2-Trichloro-1,2,2-Trifluoroethane	<20	<17	<2.0
Acetone	<50	<42	<5.0
Carbon Disulfide	<14	<12	<1.4
Methylene Chloride	<12	<10	<1.2
2-Butanone (MEK)	<30	<26	14
1,1,1-Trichloroethane	200	180	<2.4
Carbon Tetrachloride	30	27	2.6
Benzene	<10	<8.5	3.3
Trichloroethylene	<26	<22	<2.6
Methyl Isobutyl Ketone	<20	<17	<2.0
Toluene	<20	<17	3.9
Chlorobenzene	<22	<19	<2.2
1,1,2-Trichloroethane	<12	<10	<1.2
Tetrachloroethylene	<56	<48	6.9
Ethylbenzene	<10	<8.5	<1.0
m,p-Xylenes	<12	<10	<1.2
o-Xylene	21	17	<0.80
o-Dichlorobenzene	<28	<24	<2.8
2-Nitropropane	ND	ND	ND
Cyclohexanone	ND	ND	ND
Ethyl Acetate	ND	ND	ND
Ethyl Ether	ND	ND	ND
Pyridine	ND	ND	ND
Chlorinated Fluorocarbons	ND	ND	ND
Surrogates: (% Recovery)			
1,2-Dichloroethane-d4	97	89	90
Toluene-d8	91	100	98
Bromofluorobenzene	95	88	101

Preparation: 1 = No preparation
2 = Methanol extraction

ND = Not detected through a computer search of the Wiley/EPA mass spectral database
D = Surrogates diluted out of recovery range

WEMCO PO: 413910
Release No.: 826
Date: October 29, 1991

ANALYTICAL RESULTS FOR SAMPLES

WEMCO ID:	910913-157	910913-158	910916-018
CNLSI No.:	912295	912296	912297
Original Matrix:	Liquid	Liquid	Liquid
<u>Units:</u>	<u>ppm</u>	<u>ppm</u>	<u>ppm</u>

<u>Toxicity Characteristics Leaching Procedure</u>

Arsenic	<1.40	<1.40	0.74
Barium	25.9	26.4	1.19
Cadmium	0.62	0.64	0.48
Chromium	2.07	2.15	0.24
Lead	46.4	47.9	1.18
Mercury	0.051	0.056	1.03
Selenium	<0.60	<0.60	0.48
Silver	<0.04	<0.04	0.47

ATTACHMENT 2
SUBSURFACE SOIL DATA

SUBSURFACE SOIL RADIOLOGICAL DATA

Results in picocuries per gram (pCi/g).
Data presented by boring number, sample number, and depth in feet.
NA indicates not analyzed; a number preceded by a "less than" symbol indicates that the compound was not present above the detection limit of the analytical instrument.

RADIOLOGICAL PARAMETERS	1246 17981 0.0 - 0.5	1246 17982 0.5 - 1.0	1246 18002 10.5 - 11.0
Actinium 231	NA	NA	NA
Cesium 137	< 0.2	< 0.2	< 0.2
Lead 210	NA	NA	NA
Neptunium 237	< 0.6	< 0.6	< 0.6
Plutonium 210	NA	NA	NA
Plutonium 238	< 0.6	< 0.6	< 0.6
Plutonium 239/240	< 0.6	< 0.6	< 0.6
Protactium 234	NA	NA	NA
Radium 224	NA	NA	NA
Radium 226	1.5 ± 0.2	0.5 ± 0.1	1.1 ± 0.2
Radium 228	1.5 ± 0.3	< 0.6	1.2 ± 0.3
Ruthenium 106	< 1.1	< 1.0	< 1.2
Strontium 90	< 0.8	< 0.5	< 0.5
Technetium 99	< 0.9	< 0.9	< 0.9
Thorium 228	1.7 ± 0.3	0.6 ± 0.1	< 0.6
Thorium 230	8.0 ± 1.0	1.3 ± 0.2	1.7 ± 0.6
Thorium 232	1.3 ± 0.2	< 0.6	0.6 ± 0.3
Total Thorium **	NA	NA	5.4 ± 3.2
Uranium 234	222.0 ± 32.0	54.5 ± 7.4	255.0 ± 64.0
Uranium 235/236	16.0 ± 2.6	2.3 ± 0.5	17.3 ± 5.2
Uranium 238	238.0 ± 34.0	57.7 ± 7.8	267.0 ± 67.0
Total Uranium **	570.0 ± 58.0	140.0 ± 21.0	629.0 ± 66.0

* Data validation in progress.

** Results reported in ug/g

REPORT DATE : 24-NOV-91

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SUBSURFACE SOIL RADIOLOGICAL DATA

Results in picocuries per gram (pCi/g).
Data presented by boring number, sample number, and depth in feet.
NA indicates not analyzed; a number preceded by a "less than" symbol indicates that the compound was not present above the detection limit of the analytical instrument.

RADIOLOGICAL PARAMETERS	1250 18070 0.0 - 0.5	1250 18072 0.5 - 1.0	1250 18080 4.5 - 5.0	1250 18081 5.0 - 5.5
Actinium 231	NA	NA	NA	NA
Cesium 137	13.8 ± 1.9	< 0.2	NA	NA
Lead 210	NA	NA	NA	NA
Neptunium 237	< 0.6	< 0.6	NA	NA
Plutonium 210	NA	NA	NA	NA
Plutonium 238	19.8 ± 3.3	< 0.6	NA	NA
Plutonium 239/240	1.6 ± 0.3	< 0.6	NA	NA
Protactium 234	NA	NA	NA	NA
Radium 224	NA	NA	NA	NA
Radium 226	32.1 ± 2.1	7.3 ± 0.5	NA	NA
Radium 228	170.0 ± 14.0	23.9 ± 2.1	NA	NA
Ruthenium 106	< 3.2	< 1.5	NA	NA
Strontium 90	0.9 ± 0.4	1.0 ± 0.3	NA	NA
Technetium 99	< 0.9	< 0.9	NA	NA
Thorium 228	5.9 ± 2.2	NA	NA	NA
Thorium 230	1.6 ± 1.0	3.8 ± 0.6	NA	NA
Thorium 232	4.5 ± 1.8	2.7 ± 0.5	NA	NA
Total Thorium **	40.4 ± 16.3	23.9 ± 4.3	49.1 ± 12.0	11.6 ± 4.0
Uranium 234	92.2 ± 14.0	39.9 ± 5.5	NA	NA
Uranium 235/236	5.7 ± 1.2	1.6 ± 0.4	NA	NA
Uranium 238	60.4 ± 9.4	25.2 ± 3.6	NA	NA
Total Uranium **	76.3 ± 15.1	74.5 ± 1.3	55.2 ± 11.4	18.4 ± 4.1

* Data validation in progress.

** Results reported in ug/g

SUBSURFACE SOIL RADIOLOGICAL DATA

Results in picocuries per gram (pCi/g).
Data presented by boring number, sample number, and depth in feet.
NA indicates not analyzed; a number preceded by a "less than" symbol indicates that the compound was not present above the detection limit of the analytical instrument.

RADIOLOGICAL PARAMETERS	1250 52696 10.5 - 11.0	1250 52705 15.0 - 15.5
Actinium 231	NA	NA
Cesium 137	NA	NA
Lead 210	NA	NA
Neptunium 237	NA	NA
Plutonium 210	NA	NA
Plutonium 238	NA	NA
Plutonium 239/240	NA	NA
Protactium 234	NA	NA
Radium 224	NA	NA
Radium 226	NA	NA
Radium 228	NA	NA
Ruthenium 106	NA	NA
Strontium 90	NA	NA
Technetium 99	NA	NA
Thorium 228	NA	NA
Thorium 230	NA	NA
Thorium 232	NA	NA
Total Thorium **	5.5 ± 2.7	12.7 ± 4.1
Uranium 234	NA	NA
Uranium 235/236	NA	NA
Uranium 238	NA	NA
Total Uranium **	< 4.6	17.2 ± 4.5

* Data validation in progress.

** Results reported in ug/g

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REPORT DATE : 24-NOV-91

SUBSURFACE SOIL RADIOLOGICAL DATA

Results in picocuries per gram (pCi/g).
Data presented by boring number, sample number, and depth in feet.
NA indicates not analyzed; a number preceded by a "less than" symbol indicates that the compound was not present above the detection limit of the analytical instrument.

RADIOLOGICAL PARAMETERS	1253 18135 1.5 - 2.0	1253 18136 3.0 - 3.5	1253 18137 3.5 - 4.0	1253 18138 6.0 - 6.5
Actinium 231	NA	NA	NA	NA
Cesium 137	< 0.2	< 0.2	NA	NA
Lead 210	NA	NA	NA	NA
Neptunium 237	< 0.6	< 0.6	NA	NA
Plutonium 210	NA	NA	NA	NA
Plutonium 238	< 0.6	< 0.6	NA	NA
Plutonium 239/240	< 0.6	< 0.6	NA	NA
Protactium 234	NA	NA	NA	NA
Radium 224	NA	NA	NA	NA
Radium 226	2.0 ± 0.2	3.1 ± 0.3	NA	NA
Radium 228	< 0.5	1.0 ± 0.2	NA	NA
Ruthenium 106	< 1.0	< 1.0	NA	NA
Strontium 90	< 0.5	< 0.5	NA	NA
Technetium 99	< 1.0	1.2 ± 0.6	NA	NA
Thorium 228	0.8 ± 0.2	1.0 ± 0.2	NA	NA
Thorium 230	3.0 ± 0.5	4.6 ± 0.7	NA	NA
Thorium 232	< 0.6	< 0.6	NA	NA
Total Thorium **	4.4 ± 1.3	5.3 ± 1.5	5.7 ± 1.8	4.6 ± 2.1
Uranium 234	23.2 ± 3.1	21.6 ± 2.9	NA	NA
Uranium 235/236	3.5 ± 0.6	1.7 ± 0.4	NA	NA
Uranium 238	23.6 ± 3.2	19.3 ± 2.6	NA	NA
Total Uranium **	57.9 ± 9.4	41.5 ± 7.1	74.4 ± 11.8	65.9 ± 7.6

* Data validation in progress.

** Results reported in ug/g

SUBSURFACE SOIL RADIOLOGICAL DATA

Results in picocuries per gram (pCi/g).
Data presented by boring number, sample number, and depth in feet.
NA indicates not analyzed; a number preceded by a "less than" symbol indicates that the compound was not present above the detection limit of the analytical instrument.

RADIOLOGICAL PARAMETERS	1253 18144 10.5 - 11.0	1253 18150 15.0 - 15.5
Actinium 231	NA	NA
Cesium 137	NA	NA
Lead 210	NA	NA
Neptunium 237	NA	NA
Plutonium 210	NA	NA
Plutonium 238	NA	NA
Plutonium 239/240	NA	NA
Protactium 234	NA	NA
Radium 224	NA	NA
Radium 226	NA	NA
Radium 228	NA	NA
Ruthenium 106	NA	NA
Strontium 90	NA	NA
Technetium 99	NA	NA
Thorium 228	NA	NA
Thorium 230	NA	NA
Thorium 232	NA	NA
Total Thorium **	5.8 ± 2.0	6.2 ± 2.1
Uranium 234	NA	NA
Uranium 235/236	NA	NA
Uranium 238	NA	NA
Total Uranium **	33.5 ± 4.5	2.9 ± 2.1

* Data validation in progress.

** Results reported in ug/g

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SUBSURFACE SOIL RADIOLOGICAL DATA

Results in picocuries per gram (pCi/g).
Data presented by boring number, sample number, and depth in feet.
NA indicates not analyzed; a number preceded by a "less than" symbol indicates that the compound was not present above the detection limit of the analytical instrument.

RADIOLOGICAL PARAMETERS	1411 54997 10.5 - 11.0
Actinium 231	NA
Cesium 137	< 0.2
Lead 210	NA
Neptunium 237	< 0.6
Plutonium 210	NA
Plutonium 238	< 0.6
Plutonium 239/240	< 0.6
Protactium 234	NA
Radium 224	NA
Radium 226	0.5 ± 0.1
Radium 228	2.0 ± 0.3
Ruthenium 106	< 1.3
Strontium 90	< 0.5
Technetium 99	1.6 ± 0.4
Thorium 228	< 0.6
Thorium 230	1.0 ± 0.4
Thorium 232	< 0.6
Total Thorium **	3.6 ± 2.6
Uranium 234	86.1 ± 15.0
Uranium 235/236	8.8 ± 2.0
Uranium 238	76.7 ± 14.0
Total Uranium **	211.0 ± 24.0

* Data validation in progress.

** Results reported in ug/g

SUBSURFACE SOIL GENERAL CHEMICAL DATA
RI/FS DATA*
Results in parts per million (ppm)
Data presented by boring number, sample number, and depth in feet.
NA indicates not analyzed; a number preceded by a "less than" symbol indicates that the compound was not present above the detection limit of the analytical instrument.

CHEMICAL PARAMETERS	1250 18069 0.0 - 0.5	1250 18071 0.5 - 1.0
GENERAL CHEMISTRY		
Ammonia	NA	NA
Chloride	NA	NA
Fluoride	NA	NA
Hydrogen ion	NA	NA
Nitrate	NA	NA
Phenols	NA	NA
Phosphorus (black, white,	NA	NA
Phosphate as P	NA	NA
Sulfate	NA	NA
Total Kjeldahl Nitrogen	NA	NA
Total Organic Carbon	NA	NA
Total Organic Halides	NA	NA
Total Organic Nitrogen	NA	NA
METALS		
Aluminum	9.5600	9.5300
Antimony	< 0.0052 N	< 0.0062 N
Arsenic	6.3000 N	6.5000 N
Barium	0.0955	0.0888
Beryllium	0.0015	0.0017
Cadmium	0.0034 E	0.0045 E
Calcium	35.2000	115.0000
Chromium	0.0238 E	0.0234 E
Cobalt	0.0138	0.0165
Copper	0.0271	0.0223
Cyanide	< 0.2900	< 0.3000
Hexavalent Chromium	NA	NA
Iron	19.1000	18.1000
Lead	30.3000 *	15.9000 *
Magnesium	9.7400 *	26.0000 *
Manganese	0.8350	0.6140
Mercury	0.3400 N*	1.1000 N*
Molybdenum	< 0.0017	< 0.0020
Nickel	0.0398	0.0419
Potassium	999.0000	571.0000 B
Selenium	< 0.4200 WN	< 0.3900 EN
Silicon	NA	NA
Silver	0.0029	< 0.0021
Sodium	0.1500 B	0.2200 B
Thallium	< 0.4200	< 0.3900
Vanadium	0.0265 E	0.0269 E
Zinc	0.0608 E	0.0428 E

*Data validation in progress

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SUBSURFACE SOIL GENERAL CHEMICAL DATA
RI/FS DATA*
Results in parts per million (ppm)
Data presented by boring number, sample number, and depth in feet.
NA indicates not analyzed; a number preceded by a "less than" symbol indicates that the compound was not present above the detection limit of the analytical instrument.

CHEMICAL PARAMETERS	1411 54995 9.5 - 10.0	1411 54996 10.0 - 10.5
GENERAL CHEMISTRY		
Ammonia	NA	NA
Chloride	NA	NA
Fluoride	NA	NA
Hydrogen ion	NA	NA
Nitrate	NA	NA
Phenols	NA	NA
Phosphorus (black, white,	NA	NA
Phosphate as P	NA	NA
Sulfate	NA	NA
Total Kjeldahl Nitrogen	NA	NA
Total Organic Carbon	NA	NA
Total Organic Halides	NA	NA
Total Organic Nitrogen	NA	NA
METALS		
Aluminum	6680.0000	6760.0000
Antimony	< 6.2000 N	< 6.2000 N
Arsenic	2.2000 B*	3.7000 *
Barium	364.0000 N	3610.0000 N
Beryllium	0.9300 B	0.9900 B
Cadmium	4.5000	4.2000
Calcium	77100.0000 *	89400.0000 *
Chromium	21.2000 *	19.8000 *
Cobalt	9.9000 B	10.4000
Copper	12.4000 N*	11.1000 N*
Cyanide	< 0.3100	< 0.3300
Hexavalent Chromium	NA	NA
Iron	11100.0000	15300.0000
Lead	9.3000 *	16.9000 *
Magnesium	26600.0000	20000.0000
Manganese	473.0000 N*	487.0000 N*
Mercury	0.2400	0.2200
Molybdenum	< 2.1000	< 2.1000
Nickel	27.4000 *	25.9000 *
Potassium	1030.0000 B	953.0000 B
Selenium	< 0.4600 N	< 0.4100 N
Silicon	NA	NA
Silver	2.2000	< 2.1000
Sodium	1600.0000	1700.0000
Thallium	0.4600 B	0.3700 B
Vanadium	21.3000	21.8000
Zinc	209.0000 NE	213.0000 NE

*Data validation in progress

SUBSURFACE
HAZARDOUS SUBSTANCE RESULTS
RI/FS DATA

Results in parts per million (ppm).
Data presented by boring number, sample number, and depth in feet.
NA indicates not analyzed; a number preceeded by a "less than" symbol indicates that the compound was not present above the detection limit of the analytical instrument.

CHEMICAL PARAMETERS	1250 18069 0.0 - 0.5	1250 18071 0.5 - 1.0	1411 54995 9.5 - 10.0	1411 54996 10.0 - 10.5
PESTICIDES				
4,4'-DDD	< 0.019	< 0.019	< 0.100	< 0.110
4,4'-DDE	< 0.019	< 0.019	< 0.100	< 0.110
4,4'-DDT	< 0.019	< 0.019	< 0.100	< 0.110
Aldrin	< 0.009	< 0.009	< 0.051	< 0.054
Aroclor-1016	< 0.094	< 0.094	< 0.510	< 0.540
Aroclor-1221	< 0.094	< 0.094	< 0.510	< 0.540
Aroclor-1232	< 0.094	< 0.094	< 0.510	< 0.540
Aroclor-1242	< 0.094	< 0.094	< 0.510	< 0.540
Aroclor-1248	< 0.094	< 0.094	< 0.510	< 0.540
Aroclor-1254	0.120 J	< 0.190	< 1.000	< 1.100
Aroclor-1260	< 0.190	< 0.190	0.830 J	1.100
Dieldrin	< 0.019	< 0.019	< 0.100	< 0.110
Endosulfan II	< 0.019	< 0.019	< 0.100	< 0.110
Endosulfan sulfate	< 0.019	< 0.019	< 0.100	< 0.110
Endosulfan-I	< 0.009	< 0.009	< 0.051	< 0.054
Endrin	< 0.019	< 0.019	< 0.100	< 0.110
Endrin ketone	< 0.019	< 0.019	< 0.100	< 0.110
Heptachlor	< 0.009	< 0.009	< 0.051	< 0.054
Heptachlor epoxide	< 0.009	< 0.009	< 0.051	< 0.054
Methoxychlor	< 0.094	< 0.094	< 0.510	< 0.540
Toxaphene	< 0.190	< 0.190	< 1.000	< 1.100
alpha-BHC	< 0.009	< 0.009	< 0.051	< 0.054
alpha-Chlordane	< 0.094	< 0.094	< 0.510	< 0.540
beta-BHC	< 0.009	< 0.009	< 0.051	< 0.054
delta-BHC	< 0.009	< 0.009	< 0.051	< 0.054
gamma-BHC (Lindane)	< 0.009	< 0.009	< 0.051	< 0.054
gamma-Chlordane	< 0.094	< 0.094	< 0.510	< 0.540
SEMI-VOLATILE ORGANICS				
1,2,4-Trichlorobenzene	< 0.390	< 0.390	< 0.420	< 0.880
1,2-Dichlorobenzene	< 0.390	< 0.390	< 0.420	< 0.880
1,3-Dichlorobenzene	< 0.390	< 0.390	< 0.420	< 0.880
1,4-Dichlorobenzene	< 0.390	< 0.390	< 0.420	< 0.880
2,4,5-Trichlorophenol	< 1.900	< 1.900	< 2.000	< 4.300
2,4,6-Trichlorophenol	< 0.390	< 0.390	< 0.420	< 0.880
2,4-Dichlorophenol	< 0.390	< 0.390	< 0.420	< 0.880
2,4-Dimethylphenol	< 0.390	< 0.390	< 0.420	< 0.880
2,4-Dinitrophenol	< 1.900	< 1.900	< 2.000	< 4.300

*Data validation in progress

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SUBSURFACE SOIL
HAZARDOUS SUBSTANCE LIST RESULTS
RI/FS DATA*

Results in parts per million (ppm).
Data presented by boring number, sample number, and depth in feet.
NA indicates not analyzed; a number preceeded by a "less than" symbol indicates that the compound was not present above the detection limit of the analytical instrument.

CHEMICAL PARAMETERS	1250 18069 0.0 - 0.5	1250 18071 0.5 - 1.0	1411 54995 9.5 - 10.0	1411 54996 10.0 - 10.5
2,4-Dinitrotoluene	< 0.390	< 0.390	< 0.420	< 0.880
2,6-Dinitrotoluene	< 0.390	< 0.390	< 0.420	< 0.880
2-Chloronaphthalene	< 0.390	< 0.390	< 0.420	< 0.880
2-Chlorophenol	< 0.390	< 0.390	< 0.420	< 0.880
2-Methylnaphthalene	< 0.390	< 0.390	< 0.420	< 0.880
2-Methylphenol	< 0.390	< 0.390	< 0.420	< 0.880
2-Nitroaniline	< 1.900	< 1.900	< 2.000	< 4.300
2-Nitrophenol	< 0.390	< 0.390	< 0.420	< 0.880
3,3'-Dichlorobenzidine	< 0.770	< 0.780	< 0.840	< 1.800
3-Nitroaniline	< 1.900	< 1.900	< 2.000	< 4.300
4,6-Dinitro-2-methylphenol	< 1.900	< 1.900	< 2.000	< 4.300
4-Bromophenyl phenyl ether	< 0.390	< 0.390	< 0.420	< 0.880
4-Chloro-3-methylphenol	< 0.390	< 0.390	< 0.420	< 0.880
4-Chloroaniline	< 0.390	< 0.390	< 0.420	< 0.880
4-Chlorophenylphenyl ether	< 0.390	< 0.390	< 0.420	< 0.880
4-Methylphenol	< 0.390	< 0.390	< 0.420	< 0.880
4-Nitroaniline	< 1.900	< 1.900	< 2.000	< 4.300
4-Nitrophenol	< 1.900	< 1.900	< 2.000	< 4.300
Acenaphthene	< 0.390	< 0.390	< 0.420	< 0.880
Acenaphthylene	< 0.390	< 0.390	< 0.420	< 0.880
Anthracene	< 0.390	< 0.390	< 0.420	< 0.880
Benzo(a)anthracene	< 0.390	< 0.390	< 0.420	< 0.880
Benzo(a)pyrene	< 0.390	< 0.390	< 0.420	< 0.880
Benzo(b)fluoranthene	< 0.390	< 0.390	< 0.420	0.090 J
Benzo(g,h,i)perylene	< 0.390	< 0.390	< 0.420	< 0.880
Benzo(k)fluoranthene	< 0.390	< 0.390	< 0.420	< 0.880
Benzoic acid	< 1.900	< 1.900	< 2.000	< 4.300
Benzyl alcohol	< 0.390	< 0.390	< 0.420	< 0.880
Butyl benzyl phthalate	< 0.390	< 0.390	< 0.420	< 0.880
Chrysene	< 0.390	< 0.390	< 0.420	< 0.880
Di-n-butyl phthalate	< 0.390	< 0.390	1.400	1.400
Di-n-octyl phthalate	< 0.390	< 0.390	< 0.420	< 0.880
Dibenzo(a,h)anthracene	< 0.390	< 0.390	< 0.420	< 0.880
Dibenzofuran	< 0.390	< 0.390	< 0.420	< 0.880
Diethyl phthalate	< 0.390	< 0.390	< 0.420	< 0.880
Dimethyl phthalate	< 0.390	< 0.390	< 0.420	< 0.880
Fluoranthene	0.043 J	< 0.390	0.094 J	0.190 J
Fluorene	< 0.390	< 0.390	< 0.420	< 0.880
Hexachlorobenzene	< 0.390	< 0.390	< 0.420	< 0.880
Hexachlorobutadiene	< 0.390	< 0.390	< 0.420	< 0.880
Hexachlorocyclopentadiene	< 0.390	< 0.390	< 0.420	< 0.880
Hexachloroethane	< 0.390	< 0.390	< 0.420	< 0.880
Indeno(1,2,3-cd)pyrene	< 0.390	< 0.390	< 0.420	< 0.880
Isophorone	< 0.390	< 0.390	< 0.420	< 0.880

*Data validation in progress

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TABLE 4-8

CHEMICAL CONCENTRATIONS IN SOILS FROM THE PILOT PLANT AREA IN THE SOUTHWEST QUADRANT

Data presented by location, sample number, and sample depth.
NA indicates not available. For inorganic constituents, dashes indicate concentrations below background; for organic constituents, pesticides, and PCBs, dashes indicate no detection.

Constituents	Location Sample ID Depth (feet)	1250 18071 0.5-1.0	1250 18069 0.0-0.5	1252 52753 0.0-0.5	1252 52754 0.5-1.0	1260 18289 0.0-0.5	1260 18290 0.5-1.0	1411 54995 9.5-10.0	1411 54996 10.0-10.5
Inorganic constituents (mg/kg)									
Arsenic		--	--	7.4	--	--	--	--	--
Barium		--	--	--	--	--	--	--	3610
Beryllium		1.7	1.5	1.2	0.94	1.2	0.82	0.93	0.99
Cadmium		4.5	3.4	4.7	3	5.4	3.4	4.5	4.2
Calcium		115000	35200	86600	8440	181000	103000	77100	89400
Cobalt		16.5	13.8	13.9	14	13.3	--	9.9	10.4
Copper		22.3	27.1	--	25.3	28.9	--	--	--
Iron		--	--	--	--	27300	--	--	--
Lead		--	30.3	--	26.7	117	--	--	--
Magnesium		26000	9740	20200	4680	11400	20700	26600	20000
Manganese		--	835	--	--	--	--	--	--
Nickel		41.9	39.8	40.5	34.7	35.1	29.2	27.4	25.9
Silver		--	--	--	--	--	3.1	--	--
Thallium		--	--	--	0.34	0.33	0.26	0.46	0.37
Zinc		--	60.8	219	242	207	210	209	213
Organic constituents (ug/kg)									
Volatiles									
1,1-Dichloroethene		--	--	--	4	--	--	NA	--
1,1,2,2-Tetrachoroetane		--	--	--	--	--	--	NA	350
1,2-Dichloroethylene		2	--	--	--	--	--	NA	1600
2-Butanone		49	10	8	9	1	4	NA	2400
2-Propanone		--	9	--	12	6	6	NA	--
4-Methyl-2-pentanone		--	--	--	--	--	--	NA	330
Benzene		--	--	--	5	--	--	NA	--
Chlorobenzene		--	--	--	5	--	--	NA	--
Methylene chloride		10	7	20	20	20	19	NA	6700
Tetrachloroethene		--	--	1	--	2	--	NA	17000
Toluene		1	--	--	5	--	--	NA	31000
Trichloroethene		4	5	--	5	3	--	NA	2000
Semivolatiles									
Acenaphthene		--	--	1600	--	110	110	--	--
Anthracene		--	--	2800	60	170	290	--	--
Benzo(a)anthracene		--	--	5400	430	660	580	--	--
Benzo(a)pyrene		--	--	5100	320	470	520	--	--

TABLE 4-8 (Continued)

CHEMICAL CONCENTRATIONS IN SOILS FROM THE PILOT PLANT AREA IN THE SOUTHWEST QUADRANT

Data presented by location, sample number, and sample depth.
NA indicates not available. For inorganic constituents, dashes indicate concentrations below background; for organic constituents, pesticides, and PCBs, dashes indicate no detection.

Constituents	Location Sample ID Depth (feet)	1250 18071 0.5-1.0	1250 18069 0.0-0.5	1252 52753 0.0-0.5	1252 52754 0.5-1.0	1260 18289 0.0-0.5	1260 18290 0.5-1.0	1411 54995 9.5-10.0	1411 54996 10.0-10.5
Semivolatiles (Continued)									
Benzo(b)fluoranthene		--	--	4700	--	--	540	--	90
Benzo(g,h,i)perylene		--	--	3700	230	400	440	--	--
Benzo(k)fluoranthene		--	--	5000	550	730	510	--	--
bis(2-Ethylhexyl) phthalate		--	71	--	58	46	--	810	1100
Chrysene		--	--	7200	550	860	790	--	--
Dibenzofuran		--	--	640	--	55	72	--	--
Dibenzo(a,h)anthracene		--	--	1500	420	--	140	--	--
Di-n-butyl phthalate		--	--	--	--	--	46	1400	1400
Fluoranthene		--	43	10000	940	1500	1600	94	190
Fluorene		--	--	1700	44	130	160	--	--
Indeno(1,2,3-cd)pyrene		--	--	2900	160	280	330	--	--
Phenanthrene		--	--	8800	480	950	1300	140	240
Phenol		69	--	--	--	--	--	--	--
Pyrene		--	--	10000	860	1400	1300	83	150
Pesticides and PCBs (ug/kg)									
beta-BHC		--	--	220	--	--	46	--	--
PCB-1254		--	120	1000	170	200	--	--	--
PCB-1260		--	--	1000	270	340	--	830	1100

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ATTACHMENT 3
PERCHED WATER DATA

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GROUNDWATER HAZARDOUS SUBSTANCE LIST RESULTS
RI/FS DATA*
Results in parts per million (ppm).
Data presented by well number, sample number, and sample date.
NA indicates not analyzed; a number preceded by a "less than" symbol indicates that
the compound was not present above the detection limit of the analytical instrument.

CHEMICAL PARAMETERS	1246 45840 06-18-1990	1250 46837 06-18-1990	1411 46625 06-14-1990
PESTICIDES			
4,4'-DDD	< 0.000	< 0.000	< 0.000
4,4'-DDE	< 0.000	< 0.000	< 0.000
4,4'-DDT	< 0.000	< 0.000	< 0.000
Aldrin	< 0.000	< 0.000	< 0.000
Aroclor-1016	< 0.001	< 0.001	< 0.001
Aroclor-1221	< 0.001	< 0.001	< 0.001
Aroclor-1232	< 0.001	< 0.001	< 0.001
Aroclor-1242	< 0.001	< 0.001	< 0.001
Aroclor-1248	< 0.001	< 0.001	< 0.001
Aroclor-1254	< 0.001	< 0.001	< 0.001
Aroclor-1260	< 0.001	< 0.001	< 0.001
Dieldrin	< 0.000	< 0.000	< 0.000
Endosulfan II	< 0.000	< 0.000	< 0.000
Endosulfan sulfate	< 0.000	< 0.000	< 0.000
Endosulfan-I	< 0.000	< 0.000	< 0.000
Endrin	< 0.000	< 0.000	< 0.000
Endrin ketone	< 0.000	< 0.000	< 0.000
Heptachlor	< 0.000	< 0.000	< 0.000
Heptachlor epoxide	< 0.000	< 0.000	< 0.000
Methoxychlor	< 0.001	< 0.001	< 0.001
Toxaphene	< 0.001	< 0.001	< 0.001
alpha-BHC	< 0.000	< 0.000	< 0.000
alpha-Chlordane	< 0.001	< 0.001	< 0.001
beta-BHC	< 0.000	< 0.000	< 0.000
delta-BHC	< 0.000	< 0.000	< 0.000
gamma-BHC (Lindane)	< 0.000	< 0.000	< 0.000
gamma-Chlordane	< 0.001	< 0.001	< 0.001
SEMI-VOLATILE ORGANICS			
1,2,4-Trichlorobenzene	< 0.010	< 0.010	< 0.010
1,2-Dichlorobenzene	< 0.010	< 0.010	< 0.010
1,3-Dichlorobenzene	< 0.010	< 0.010	< 0.010
1,4-Dichlorobenzene	< 0.010	< 0.010	< 0.010
2,4,5-Trichlorophenol	< 0.050	< 0.050	< 0.050
2,4,6-Trichlorophenol	< 0.010	< 0.010	< 0.010
2,4-Dichlorophenol	< 0.010	< 0.010	< 0.010
2,4-Dimethylphenol	< 0.010	< 0.010	< 0.010
2,4-Dinitrophenol	< 0.050	< 0.050	< 0.050

*Data validation in progress

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GROUNDWATER HAZARDOUS SUBSTANCE LIST RESULTS

RI/FS DATA*

Results in parts per million (ppm).
Data presented by well number, sample number, and sample date.
NA indicates not analyzed; a number preceded by a "less than" symbol indicates that the compound was not present above the detection limit of the analytical instrument.

CHEMICAL PARAMETERS	1246 45840 06-18-1990	1250 46837 06-18-1990	1411 46625 06-14-1990
2,4-Dinitrotoluene	< 0.010	< 0.010	< 0.010
2,6-Dinitrotoluene	< 0.010	< 0.010	< 0.010
2-Chloronaphthalene	< 0.010	< 0.010	< 0.010
2-Chlorophenol	< 0.010	< 0.010	< 0.010
2-Methylnaphthalene	< 0.010	< 0.010	< 0.010
2-Methylphenol	< 0.010	< 0.010	< 0.010
2-Nitroaniline	< 0.050	< 0.050	< 0.050
2-Nitrophenol	< 0.010	< 0.010	< 0.010
3,3'-Dichlorobenzidine	< 0.020	< 0.020	< 0.020
3-Nitroaniline	< 0.050	< 0.050	< 0.050
4,6-Dinitro-2-methylphenol	< 0.050	< 0.050	< 0.050
4-Bromophenyl phenyl ether	< 0.010	< 0.010	< 0.010
4-Chloro-3-methylphenol	< 0.010	< 0.010	< 0.010
4-Chloroaniline	< 0.010	< 0.010	< 0.010
4-Chlorophenylphenyl ether	< 0.010	< 0.010	< 0.010
4-Methylphenol	< 0.010	< 0.010	< 0.010
4-Nitroaniline	< 0.050	< 0.050	< 0.050
4-Nitrophenol	< 0.050	< 0.050	< 0.050
Acenaphthene	< 0.010	< 0.010	< 0.010
Acenaphthylene	< 0.010	< 0.010	< 0.010
Anthracene	< 0.010	< 0.010	< 0.010
Benzo(a)anthracene	< 0.010	< 0.010	< 0.010
Benzo(a)pyrene	< 0.010	< 0.010	< 0.010
Benzo(b)fluoranthene	< 0.010	< 0.010	< 0.010
Benzo(g,h,i)perylene	< 0.010	< 0.010	< 0.010
Benzo(k)fluoranthene	< 0.010	< 0.010	< 0.010
Benzoic acid	< 0.050	< 0.050	< 0.050
Benzyl alcohol	< 0.010	< 0.010	< 0.010
Butyl benzyl phthalate	< 0.010	< 0.010	< 0.010
Chrysene	< 0.010	< 0.010	< 0.010
Di-n-butyl phthalate	< 0.010	< 0.010	< 0.010
Di-n-octyl phthalate	< 0.010	< 0.010	< 0.010
Dibenzo(a,h)anthracene	< 0.010	< 0.010	< 0.010
Dibenzofuran	< 0.010	< 0.010	< 0.010
Diethyl phthalate	< 0.010	< 0.010	< 0.010
Dimethyl phthalate	< 0.010	< 0.010	< 0.010
Fluoranthene	< 0.010	< 0.010	< 0.010
Fluorene	< 0.010	< 0.010	< 0.010
Hexachlorobenzene	< 0.010	< 0.010	< 0.010
Hexachlorobutadiene	< 0.010	< 0.010	< 0.010
Hexachlorocyclopentadiene	< 0.010	< 0.010	< 0.010
Hexachloroethane	< 0.010	< 0.010	< 0.010
Indeno(1,2,3-cd)pyrene	< 0.010	< 0.010	< 0.010
Isophorone	< 0.010	< 0.010	< 0.010

*Data validation in progress

GROUNDWATER HAZARDOUS SUBSTANCE LIST RESULTS
RI/FS DATA*
Results in parts per million (ppm).
Data presented by well number, sample number, and sample date.
NA indicates not analyzed; a number preceded by a "less than" symbol indicates that the compound was not present above the detection limit of the analytical instrument.

CHEMICAL PARAMETERS	1246 45840 06-18-1990	1250 46837 06-18-1990	1411 46625 06-14-1990
N-Nitroso-di-n-propylamine	< 0.010	< 0.010	< 0.010
N-Nitrosodiphenylamine	< 0.010	< 0.010	< 0.010
Naphthalene	< 0.010	< 0.010	< 0.010
Nitrobenzene	< 0.010	< 0.010	< 0.010
Pentachlorophenol	< 0.050	< 0.050	< 0.050
Phenanthrene	< 0.010	< 0.010	< 0.010
Phenol	0.001 J	< 0.010	< 0.010
Pyrene	< 0.010	< 0.010	< 0.010
bis(2-Chloroethoxy)methane	< 0.010	< 0.010	< 0.010
bis(2-Chloroethyl)ether	< 0.010	< 0.010	< 0.010
bis(2-Chloroisopropyl)ethe	< 0.010	NA	NA
bis(2-Ethylhexyl) phthalat	< 0.010	NA	NA
bis(2-Chloroisopropyl)ethe	NA	< 0.010	NA
bis(2-Ethylhexyl) phthalat	NA	< 0.010	NA
bis(2-Chloroisopropyl)ethe	NA	NA	< 0.010
bis(2-Ethylhexyl) phthalat	NA	NA	< 0.010
VOLATILE ORGANICS			
1,1,1-Trichloroethane	0.032	0.012	0.005
1,1,2,2-Tetrachloroethane	< 0.005	< 0.005	< 0.005
1,1,2-Trichloroethane	< 0.005	< 0.005	< 0.005
1,1-Dichloroethane	0.030	< 0.005	0.021
1,1-Dichloroethene	< 0.005	< 0.005	0.003 J
1,2-Dichloroethane	< 0.005	< 0.005	< 0.005
1,2-Dichloroethylene	0.012	0.002 J	0.550 E
1,2-Dichloropropane	< 0.005	< 0.005	< 0.005
2-Butanone	0.001 BJ	0.002 BJ	< 0.010
2-Hexanone	< 0.010	< 0.010	< 0.010
4-Methyl-2-pentanone	< 0.010	< 0.010	< 0.010
Acetone	0.003 BJ	0.002 BJ	< 0.010
Benzene	< 0.005	< 0.005	< 0.005
Bromodichloromethane	< 0.005	< 0.005	< 0.005
Bromoform	< 0.005	< 0.005	< 0.005
Bromomethane	< 0.010	< 0.010	< 0.010
Carbon Tetrachloride	< 0.005	< 0.005	< 0.005
Carbon disulfide	< 0.005	< 0.005	< 0.005
Chlorobenzene	< 0.005	< 0.005	< 0.005
Chloroethane	< 0.010	< 0.010	< 0.010
Chloroform	< 0.005	< 0.005	< 0.005
Chloromethane	< 0.010	< 0.010	< 0.010
Dibromochloromethane	< 0.005	< 0.005	< 0.005
Ethylbenzene	< 0.005	< 0.005	< 0.005

*Data validation in progress

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GROUNDWATER HAZARDOUS SUBSTANCE LIST RESULTS
RI/FS DATA*
Results in parts per million (ppm).
Data presented by well number, sample number, and sample date.
NA indicates not analyzed; a number preceded by a "less than" symbol indicates that the compound was not present above the detection limit of the analytical instrument.

CHEMICAL PARAMETERS	1246 45840 06-18-1990	1250 46837 06-18-1990	1411 46625 06-14-1990
Methylene chloride	0.004 BJ	< 0.005	0.003 BJ
Styrene	< 0.005	< 0.005	< 0.005
Tetrachlorethene	0.029	0.006	0.043
Toluene	< 0.005	< 0.005	0.001 BJ
Total xylenes	< 0.005	< 0.005	< 0.005
Trichloroethene	0.029	0.005	0.092
Vinyl Acetate	< 0.010	< 0.010	< 0.010
Vinyl chloride	< 0.010	< 0.010	0.007 J
cis-1,3-Dichloropropene	< 0.005	< 0.005	< 0.005
trans-1,3-Dichloropropene	< 0.005	< 0.005	< 0.005

*Data validation in progress

REPORT DATE: 11-NOV-91

GROUNDWATER GENERAL CHEMICAL DATA
RI/FS DATA*
Results in parts per million (ppm).
Data presented by well number, sample number, and sample date.
NA indicates not analyzed; a number preceded by a "less than" symbol indicates that
the compound was not present above the detection limit of the analytical instrument.

CHEMICAL PARAMETERS	1246 45840 06-18-1990
GENERAL CHEMISTRY	
Ammonia	NA
Chloride	NA
Fluoride	NA
Hydrogen ion	NA
Nitrate	NA
Phenols	NA
Phosphorus (black, white,	NA
Phosphate as P	NA
Sulfate	NA
Total Kjeldahl Nitrogen	NA
Total Organic Carbon	NA
Total Organic Halides	NA
Total Organic Nitrogen	NA
METALS	
Aluminum	0.0700 B
Antimony	< 0.0300
Arsenic	< 0.0020
Barium	0.0504 B
Beryllium	< 0.0020
Cadmium	0.0045 B
Calcium	145.0000
Chromium	0.0340
Cobalt	< 0.0100
Copper	< 0.0100
Cyanide	0.0058 B
Hexavalent Chromium	NA
Iron	0.0366 B
Lead	0.0020 B
Magnesium	36.7000
Manganese	0.1910
Mercury	< 0.0002
Molybdenum	NA
Nickel	< 0.0200
Potassium	0.4460 B
Selenium	< 0.0020 W
Silicon	NA
Silver	0.0197
Sodium	11.7000
Thallium	0.0022 BW
Vanadium	0.0135 B
Zinc	< 0.0050

Data validation in progress

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GROUNDWATER GENERAL CHEMICAL DATA
RI/FS DATA*
Results in parts per million (ppm).
Data presented by well number, sample number, and sample date.
NA indicates not analyzed; a number preceded by a "less than" symbol indicates that the compound was not present above the detection limit of the analytical instrument.

CHEMICAL PARAMETERS	1250 46837 06-18-1990
GENERAL CHEMISTRY	
Ammonia	NA
Chloride	NA
Fluoride	NA
Hydrogen ion	NA
Nitrate	NA
Phenols	NA
Phosphorus (black, white,	NA
Phosphate as P	NA
Sulfate	NA
Total Kjeldahl Nitrogen	NA
Total Organic Carbon	NA
Total Organic Halides	NA
Total Organic Nitrogen	NA
METALS	
Aluminum	0.0728 B
Antimony	< 0.0300
Arsenic	< 0.0020
Barium	0.0641 B
Beryllium	< 0.0020
Cadmium	0.0055
Calcium	154.0000
Chromium	0.0367
Cobalt	< 0.0100
Copper	0.0109 B
Cyanide	< 0.0020
Hexavalent Chromium	NA
Iron	0.0455 B
Lead	< 0.0020
Magnesium	38.5000
Manganese	0.0736
Mercury	0.0005
Molybdenum	NA
Nickel	< 0.0200
Potassium	1.8900 B
Selenium	0.0023 BW
Silicon	NA
Silver	0.0210
Sodium	12.5000
Thallium	< 0.0020
Vanadium	0.0143 B
Zinc	< 0.0050

*Data validation in progress

GROUNDWATER GENERAL CHEMICAL DATA
RI/FS DATA*
Results in parts per million (ppm).
Data presented by well number, sample number, and sample date.
NA indicates not analyzed; a number preceded by a "less than" symbol indicates that the compound was not present above the detection limit of the analytical instrument.

CHEMICAL PARAMETERS		1411 46625 06-14-1990
GENERAL CHEMISTRY		
Ammonia		NA
Chloride		NA
Fluoride		NA
Hydrogen ion		NA
Nitrate		NA
Phenols		NA
Phosphorus (black, white,		NA
Phosphate as P		NA
Sulfate		NA
Total Kjeldahl Nitrogen		NA
Total Organic Carbon		NA
Total Organic Halides		NA
Total Organic Nitrogen		NA
METALS		
Aluminum		0.1030 B
Antimony	<	0.0300
Arsenic		0.0027 BW
Barium		0.1640 B
Beryllium	<	0.0020
Cadmium		0.0040 B
Calcium		69.7000
Chromium		0.0367
Cobalt	<	0.0100
Copper	<	0.0100
Cyanide	<	0.0020
Hexavalent Chromium		NA
Iron		2.6500
Lead	<	0.0020 W*
Magnesium		16.4000
Manganese		1.7900
Mercury	<	0.0002
Molybdenum		0.0176
Nickel		0.0379 B
Potassium		0.9740 B
Selenium	<	0.0020 W
Silicon		NA
Silver		0.0172
Sodium		45.4000
Thallium	<	0.0020
Vanadium		0.0152 B
Zinc		0.0224

Data validation in progress

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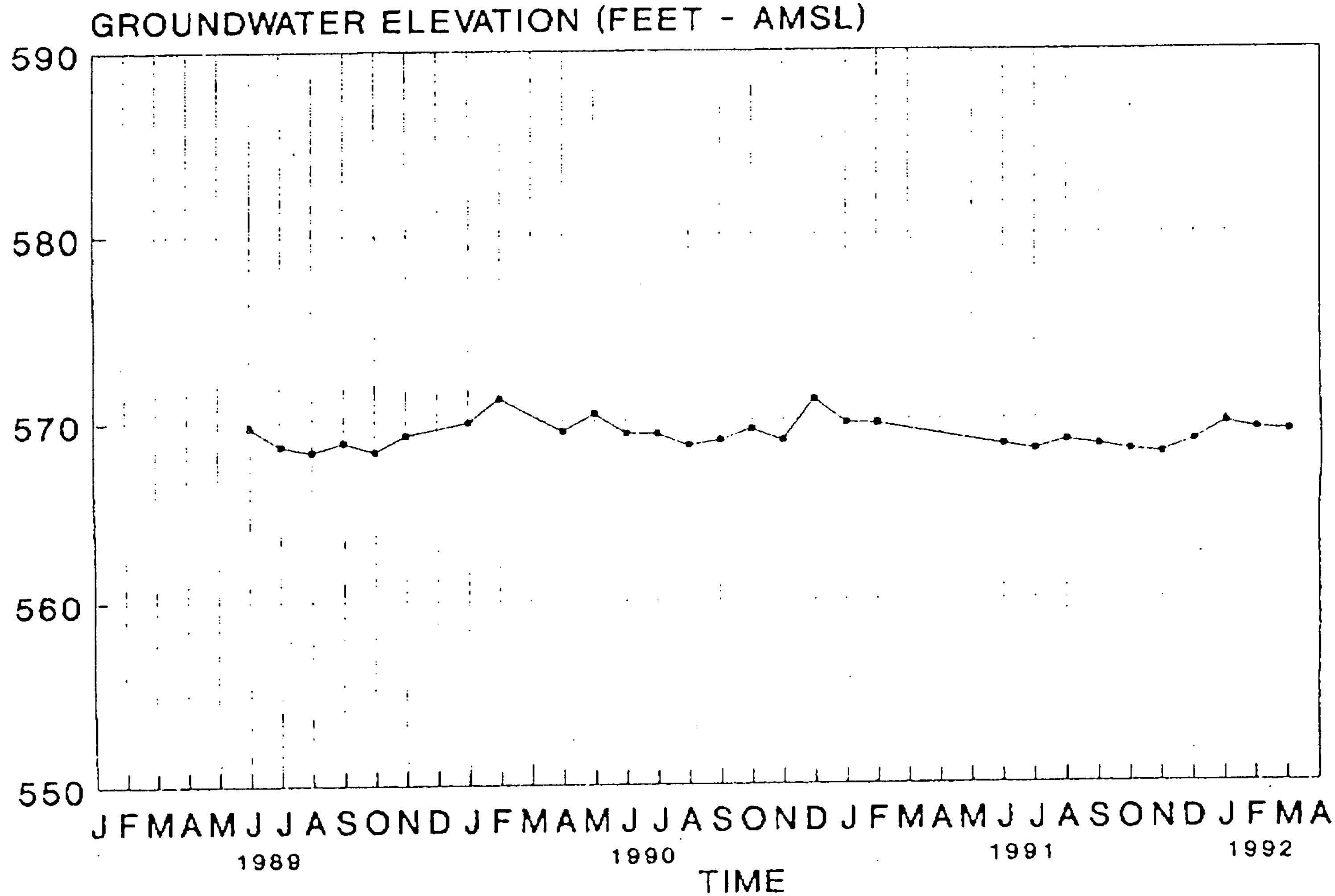
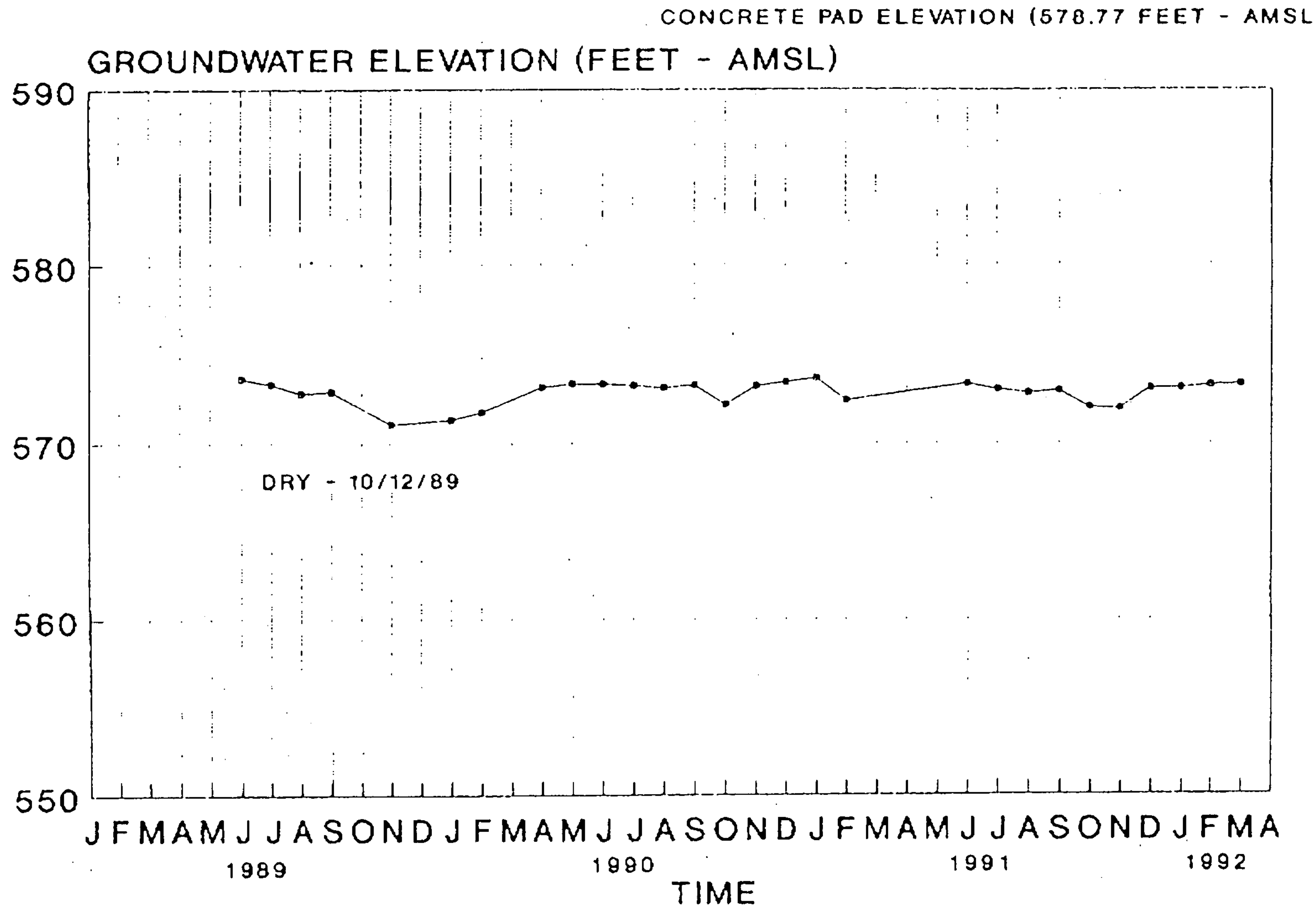
REPORT DATE : 11-NOV-91

HYDROGRAPH FOR MONITORING WELL 1246

CONCRETE PAD ELEVATION (678.90 FEET - AMSL)

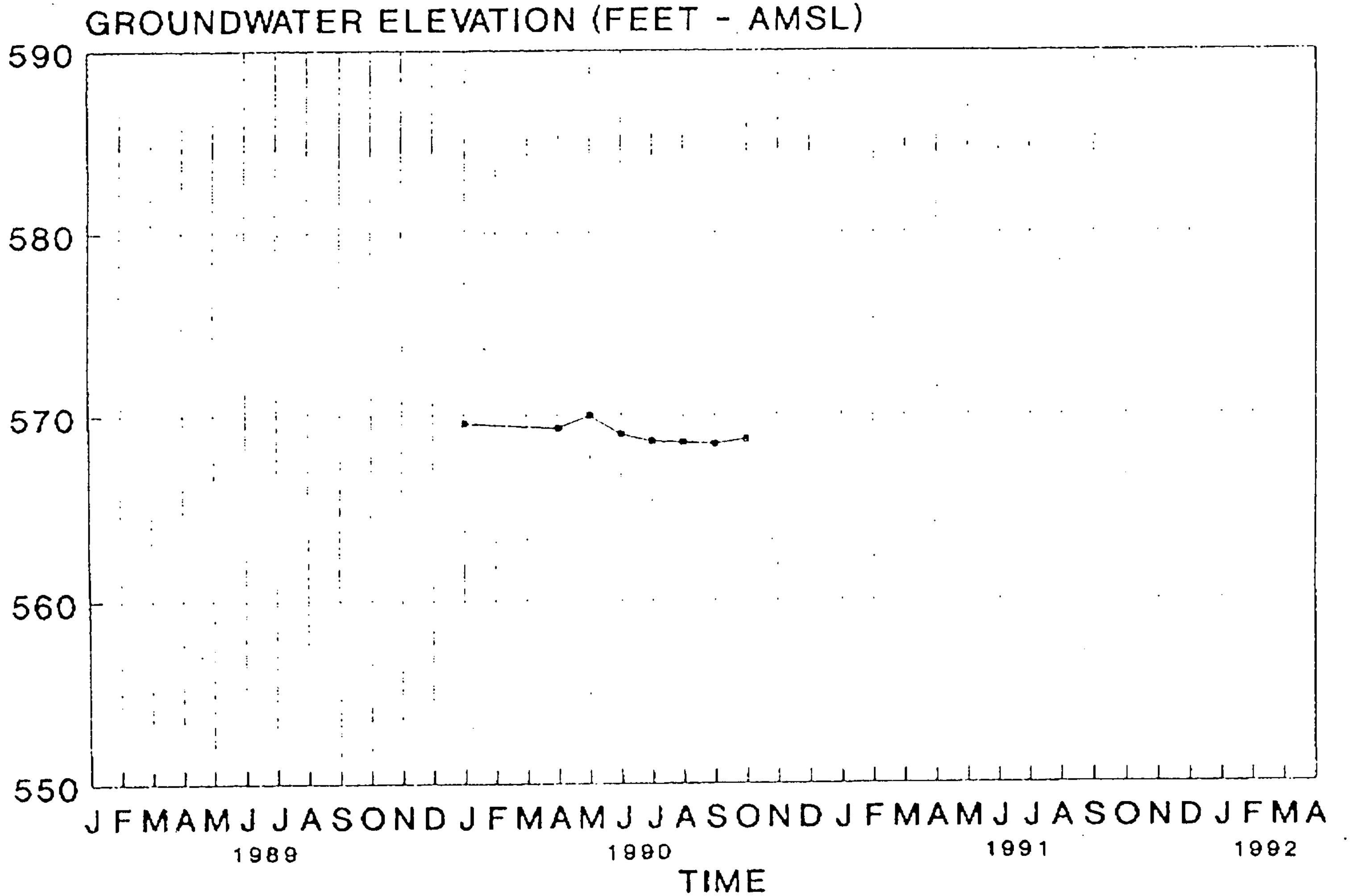


HYDROGRAPH FOR MONITORING WELL 1249



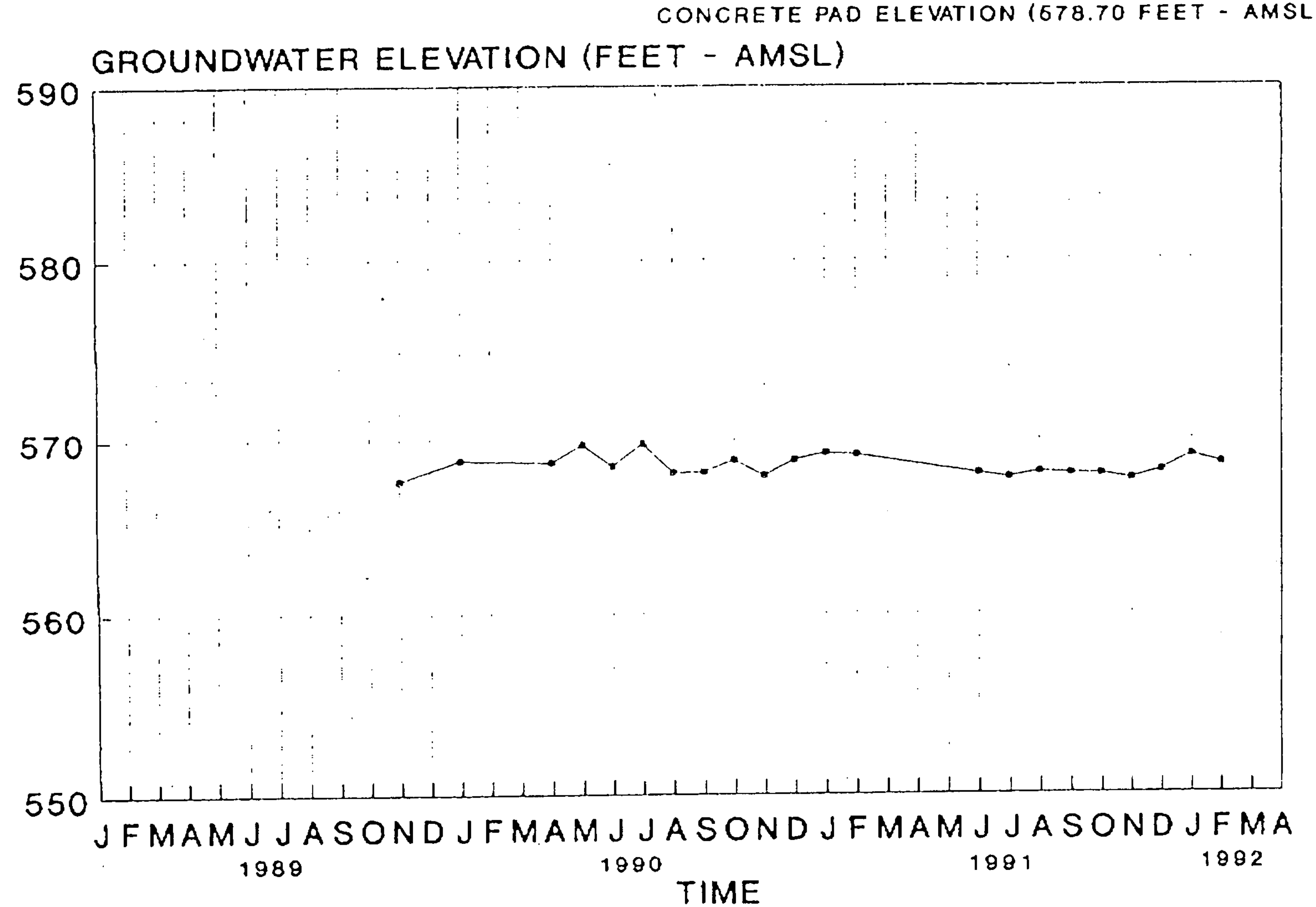
HYDROGRAPH FOR MONITORING WELL 1250

CONCRETE PAD ELEVATION (578.46 FEET - AMSL)



150

HYDROGRAPH FOR MONITORING WELL 1253



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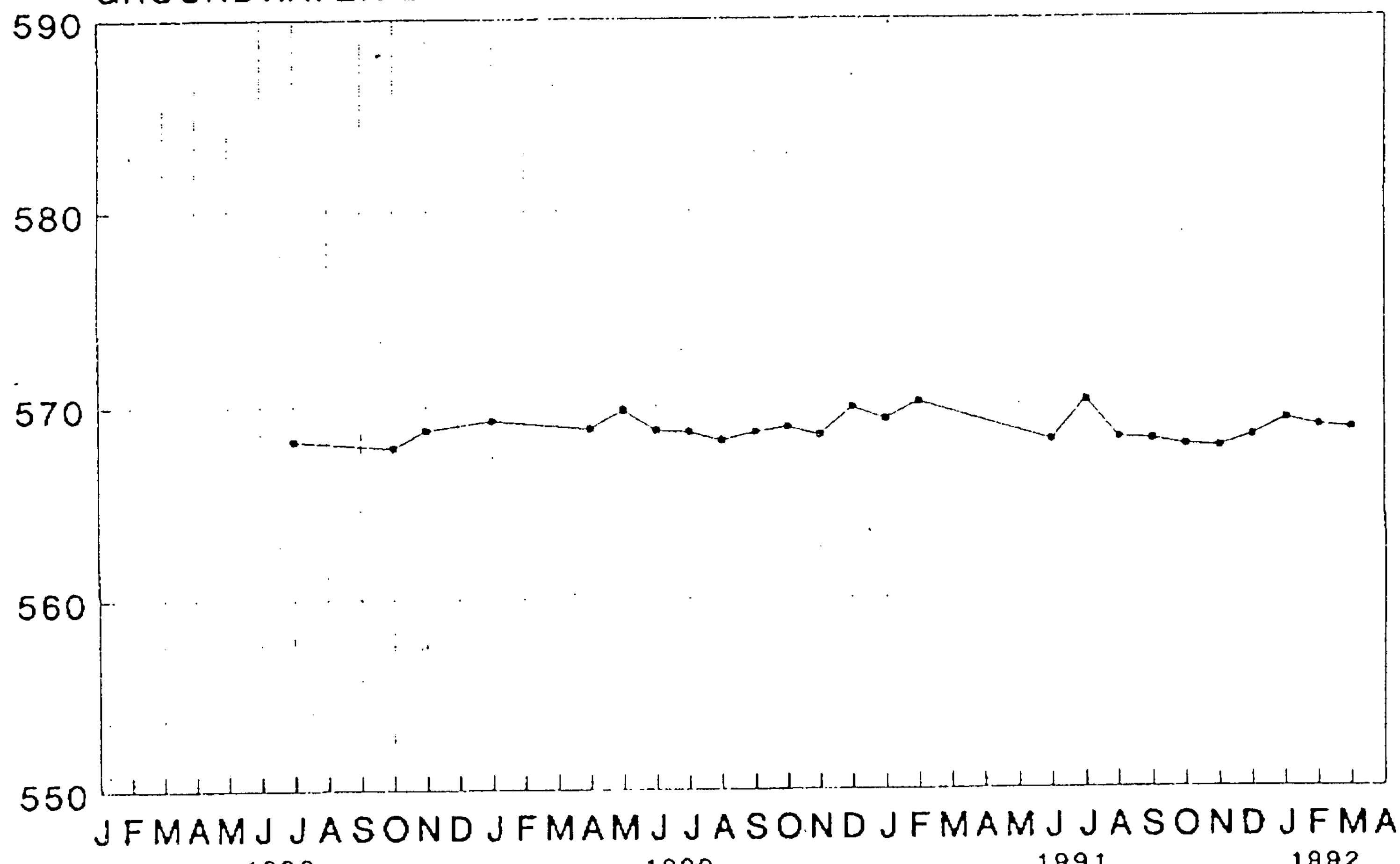
HYDROGRAPH FOR MONITORING WELL 1411

GROUND ELEVATION (578.30 FEET - AMSL)

GROUNDWATER ELEVATION (FEET - AMSL)



Attachment 2

ATTACHMENT 2
ANALYTICAL SUPPORT LEVELS

PILOT PLANT SUMP
REMOVAL ACTION NO. 24 WORK PLAN
[ABANDONED SUMP WEST OF PILOT PLANT]

Fernald Environmental Management Project

October 1992

within limits specified in the site NPDES permit. Contributing outfalls shall meet their own requirements to ensure that the final composite stream remains within limits.

Because of the population size served by the plant potable water system, monitoring for coliform bacteria and various other constituents defined by Safe Drinking Water Act shall be performed on a routine basis.

As part of the environmental restoration of FEMP, underground storage tanks are being removed and necessary remediation performed as required by the Ohio State Fire Marshall. Reports of findings and conclusions are provided to EPA and the state of Ohio.

2.3 PROJECT OBJECTIVES

2.3.1 Specific Objectives

Specific objectives of an environmental sampling and analysis project shall be specified in Project-Specific Plans (PSP). Examples of project objectives are included in Table 2-1 (Appendix A).

2.3.2 Intended Data Usages

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, evaluate the potential hazard to human health and the environment, evaluate remedial actions, choose and implement preferred remedial actions, and monitor plume migration and the effectiveness of remedial actions. Data partially fulfilling these requirements have been collected in previous and ongoing studies. Use of these data and identification and collection of additional data needs will fulfill the intent of the 1991 amended Consent Agreement and the stated site remediation objectives of DOE.

2.3.3 Data Quality Objectives

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

QA/QC requirements for ASLs are provided in Table 2-2 (Appendix A). End data users prescribe ASLs for data to develop DQOs as specified in Appendix C. Analytical methods for use for each ASL are defined in Attachment I. Data validation requirements are specified in Appendix D. Following are definitions of A through E levels of quality.

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 (ARAR), initial site characterization to locate areas for subsequent and more accurate analyses, field screening of samples to select those for fixed laboratory analysis, and engineering screening of alternatives (bench scale tests). These types of data include those generated on site through the use of Photo- or Flame- Ionization Detectors (PID or FID), pH, conductivity, alpha and beta-gamma friskers, or radiological wipe samples. Analogous to EPA DQO Level 1.

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

Example: Field screening for chemical gases in the well bore of ground-water monitoring wells using Photo-Ionization Detectors provides real time qualitative analysis for presence of volatile organic 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 in Attachment I shall be used. There are two sublevels available for specifying QA/QC, data reporting, and data validation requirements.

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

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

Methods may range from more sophisticated screening techniques to fully defined methods similar to ASL C or D for radiological and nonradiological parameters, but with reduced

QA/QC frequency and data reporting requirements for more rapid turnaround times. Also included in ASL B are standard methods (e.g., EPA 500-series drinking water methods with QA/QC requirements different than those specified for ASLs C and D) and conventional parameter analysis in support of regulatory requirements such as NPDES permit monitoring.

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

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

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

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

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

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

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

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

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

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

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

The useability of data is determined by DQO requirements. ASL A data are considered as "good" as level D data if in compliance with DQOs.

2.4 TARGET PARAMETERS

Attachment I contains analytical methods that are currently expected to be used. PSPs will cite existing methods in Attachment I or specify requirements for new methods needed for ASL E data to analyze for specified target parameters. Target parameter lists and quantitation limits for methods currently in the FLAMM are summarized in Table 2-3 (Appendix A).

Target parameters for each project shall be identified in PSPs. Criteria used to determine target parameters for source areas and each potential migration pathway shall include a waste inventory of processes contributing to the source; previous source area sampling results; sampling results of potentially upgradient sources; past monitoring data; indicator chemical determination based on mobility, toxicity, and persistence in the environment; and requirements of specific regulatory programs. Total uranium will generally be included as a target parameter for migration pathway sampling based on results of historical sampling.

Attachment 3

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ATTACHMENT 3
HEALTH AND SAFETY PLAN

PILOT PLANT SUMP
REMOVAL ACTION NO. 24 WORK PLAN
[ABANDONED SUMP WEST OF PILOT PLANT]

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ACRONYMS AND ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
AEDO	Assistant Emergency Duty Officer
ALARA	as low as reasonably achievable
ARAR	applicable or relevant and appropriate requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
C.F.R.	Code of Federal Regulations
CGI	combustible gas indicator
DED	Deputy Emergency Director
DOE	U.S. Department of Energy
EC	Emergency Chief
EDO	Emergency Duty Officer
EOC	Emergency Operations Center
EPA	U.S. Environmental Protection Agency
ERT	Emergency Response Team
FEMP	Fernald Environmental Management Project
FM	Factory Mutual
FMPC	Feed Materials Production Center
FS	feasibility study
G-M	Gieger-Mueller
HASP	Health and Safety Plan
HSM	Health and Safety Manager
HSO	Health and Safety Officer
IDLH	immediately dangerous to life and health
IRST	Industrial Radiological Safety & Training
LEL	lower exposure limit
MHSA	Mine Health and Safety Administration
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
NPL	National Priorities List
OSHA	Occupational Safety and Health Administration
PID	photoionization detector

ACRONYMS AND ABBREVIATIONS (continued)

PEL	permissible exposure limits
PPE	personal protective equipment
RI	remedial investigation
SCQ	Site-Wide CERCLA Quality Assurance Project Plan
SS	stainless steel
TCLP	Toxicity Characteristic Leaching Procedure
TLD	thermoluminescent dosimeter
TLV	Threshold Limit Value
TWA	time weighted average
UL	Underwriters Laboratory
WBGT	Wet Bulb Globe Temperature
WEMCO	Westinghouse Environmental Management Company of Ohio

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1.0 SCOPE OF WORK

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

This HASP is intended to provide guidance to the removal contractor and to meet FEMP site requirements. The contractor will be responsible for developing and implementing their own HASP.

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

1.1 TASKS

A detailed description of tasks can be found in the work plan Section 4.0. The tasks associated with this removal action include the following:

- Site preparation
- Sump pump-out/contents removal
- Removal of sump pump
- Drain line additional cleanout
- Remove concrete sump apron
- Excavation
- Cut/disconnect drain line
- Sump removal
- Drain line capping
- Decontamination
- Drain line internal inspection
- Backfill
- Waste management.

1.2 REGULATIONS AND GUIDELINES

All activities conducted during the Pilot Plant sump removal action at the Fernald Environmental Management Project (FEMP) shall be in compliance with the provisions and requirements of the following documents:

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

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

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

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

- USEPA, *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA*, Interim Final, (EPA/540/6-89/004, OSWER Directive 9355.3-01), October 1988

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

2.0 ORGANIZATION AND RESPONSIBILITIES

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

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

2.1 PROJECT MANAGER

The Project Manager is responsible for the overall operation of the Pilot Plant sump removal. The Project Manager will act as the contact person with the Westinghouse Environmental Management Company of Ohio (WEMCO).

2.2 REMOVAL SITE SUPERVISOR

The Removal Site Supervisor is responsible for the overall safe operation of personnel. The Removal Site Supervisor shall ensure that the Health and Safety Officer (HSO) is present during all activities indicated in Section 1.1. The Removal Site Supervisor will interact and coordinate the project and schedule with FEMP site organizations.

2.3 HEALTH AND SAFETY MANAGER

The Health and Safety Manager (HSM) is responsible to complete and oversee the implementation of the HASP. The HSM is responsible for selecting the HSO and overseeing that individual's site performance.

2.4 HEALTH AND SAFETY OFFICER

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

2.5 DIRECTORY OF RELEVANT CONTACT ORGANIZATIONS

Title	Location	Telephone
Westinghouse IRST	Bldg. 53	8453
Industrial Hygiene	Bldg. 53	6211
Radiological Safety	Bldg. 53	6919
Safety, Engineering & Fire Services	Bldg. 53	6802
Medical Services	Bldg. 53	6217
Emergency		6511
AEDO		6431

3.0 SITE HISTORY

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

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

The Pilot Plant sump is a temporary sump constructed for use during 1968 through 1970, the time the main sump was being refurnished. The temporary sump is a 9 ft long by 24 in. diameter piece of Schedule 10 stainless steel (SS) pipe with a SS plate welded over one end. At the mid-point in the pipe an 8 in. entry line of SS is in place which may still be connected to the old floor drain system through Duriron pipes. Duriron is a glass-like material impervious to acids. The sump is set in a concrete base at grade.

During the main sump refurbishment the old floor drain system, which ran the length of the west side of the Pilot Plant and consisted of 8 in. and 6 in. Duriron pipe, was covered over and abandoned in place. A new drainage system with grating covered catch drains was installed. It is believed that the temporary sump may still be connected to the old floor drain system which may account for the rising and falling liquid levels measured in the temporary sump. The Project Proposal dated April 1968 for the upgrade of the floor drains and sump speculates that the old floor drain system was badly deteriorated based on odors coming from the area under the floor. The actual condition of the old drainage system was not determined during the refurbishment.

Groundwater monitoring data for this area from close-by borings of 12 to 20 ft in depth were reviewed. One would anticipate that if a release occurred from the temporary sump, elevated levels of the same constituents would be found in the groundwater borings nearby and at the approximate depth of the sump. This is especially true for 1,1,1-Trichloroethane which is very mobile. The groundwater boring map and data sheet does not show elevated levels of the constituents found in the sump.

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4.0 HAZARD ASSESSMENT

This section has been prepared in accordance with Occupational Safety and Health Administration (OSHA) 29 C.F.R. 1910.120 and the Feed Materials Production Center (FMPC) Site Health and Safety Plan. Because of the uncertainty of chemical and radiological hazards present at the time of this draft, the hazard assessment may be revised based on up-to-date information during the progress of work. All work with materials shall employ the ALARA (as low as reasonably achievable) concept for either chemical or radiological contamination.

4.1 CHEMICAL HAZARDS

The chemical information presented in this HASP is based upon samples taken in September 1991 (WEMCO ID. 910913 -157 and -158 and 910913-158). Table 4-1 identifies the chemical and toxicological properties of the materials found in the sump.

Liquid within the sump is anticipated to be removed during the preremoval action pump-out. If additional liquid enters the sump after the preremoval action pump-out, then additional pumping shall be performed.

The sump removal action will take place once the liquid within the sump has been pumped out. With the liquid removed the majority of the chemical hazard will be eliminated. This hazard assessment is based on the chemical concentrations found in the liquid contents of the sump and is therefore a conservative estimate of the actual chemical hazard to workers.

Prior to commencing specific work tasks a FEMP Work Permit shall be completed in compliance with FMPC-OS&H-2939 "FMPC Work Permit."

The flash point of the liquid within the sump was found to be 118°F and the pH was 3.0. The liquid was brown in color with sedimentation present. The low pH is most likely due to nitric acid which was heavily used in the Pilot Plant.

The chemical analysis of the liquid included volatile organics and Toxicity Characteristic Leaching Procedure (TCLP) metals. The maximum values obtained in these samples were as follows:

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Table 4-1. Chemical and toxicological characteristics of Pilot Plant sump materials.

Compounds	CAS #	ACGIH TLV	OSHA PEL	Routes of Exposure	Toxic Properties	Target Organs	Chemical Properties
Carbon Tetrachloride	56-23-5	31 mg/m^3 Skin	12.6 mg/m^3	Inhalation Ingestion Absorbtion Skin/Eye Contact	CNS depression; nausa, vomitting; liver, kidney damage; skin irritation, suspect carcinogen	CNS, eyes, lungs, liver, kidneys, skin	Clear liquid with ether-like odor; BP: 170°F; VP: 91 mm
Lead	7439-92-1	0.1 mg/m^3	0.05 mg/m^3	Inhalation Ingestion Skin/Eye Contact	Lassitude; insomnia; pallor, eye grounds; anorexia, malnutrition, weight loss; constipation, abdominal pain; colic; anemia; gingival lead line; tremors, wrist drop	GI tract, CNS, kidneys, blood, gingival tissue	Appearance and properties vary
Mercury -alkyl compounds	NA	0.01 mg/m3 STEL: 0.03 mg/m^3	0.01 mg/m^3 STEL: 0.03 mg/m^3	Inhalation Ingestion Absorbtion Skin/Eye Contact	Paresthesia; ataxia, dysarthria; vision, hearing disturbance; spastic, jerky; dizziness; salavation; lacrimation; nausea, vomiting, diarrhea, constipation; skin burns; emotional distress	CNS, kidneys, eyes, skin	Appearance and odor vary depending on specific alkyl compound
Nitric Acid	7697-37-2	5.2 mg/m^3 STEL: 10 mg/m^3	5mg/m^3 STEL: 10 mg/m^3	Inhalation Ingestion Skin/Eye Contact	Irritate eyes, mucous membranes, skin; delayed pulmonary edema, pneumonitis, bronchitis, dental erosion	Eyes, resp. system, skin, teeth	Acrid odor, yellow-clear fuming liquid. BP: 181°F VP: 48 mm

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Table 4-1. Chemical and toxicological characteristics of Pilot Plant sump materials.

Compounds	CAS #	ACGIH TLV	OSHA PEL	Routes of Exposure	Toxic Properties	Target Organs	Chemical Properties
1,1,1-Trichloroethane	71-55-6	1910 mg/m^3 STEL: 2460 mg/m^3	1900 mg/m^3 STEL: 2450 mg/m^3	Inhalation Ingestion Absorbtion Skin/Eye Contact	Irritate nose, eyes; CNS depression; liver, kidney damage	CNS, eyes, nose, liver kidneyClear liquid with sweet chloroform-like odor BP: 74.1°C	
Xylene	1330-20-7	100 ppm	100 ppm	Inhalation Absorption Ingestion Skin/Eye Contact	Dizziness, excitement, drowsiness, incoordination; staggered gait; eye, nose, skin, throat; irritant; corneal vacuolization; anorexia, nausea, vomit, abdominal pain; dermatitis	CNS, eyes, GI tract, blood, liver, kidneys, skin	Liquid BP-281°F FP-81°F LEL-1.0%

BP	Boiling point (degrees Fahrenheit)
CAS	Chemical Abstract Service Registry
CNS	Central nervous system
FP	Freezing point
GI	Gastrointestinal
mg/m^3	Milligrams per cubic meter
PEL	Permissible Exposure Limit
ppm	Parts per million
TLV	Threshold Limit Value

Lead - 47.9 ppm
Mercury - 1.03 ppm
Carbon Tetrachloride - 30 ppm
1,1,1-Trichloroethane - 200 ppm
o-Xylene - 21 ppm

4.1.1 Lead

Lead may possibly be dissolved in the liquid or as a precipitate of the liquid. Lead may also be complexed in a compound which may alter the toxicity are consequently the primary route of exposure. The primary route of exposure for the material in the sump will be considered inhalation. Inhalation of particulates containing lead or mist containing lead as a complex compound may occur during the removal action.

Because of the short duration of this removal action only acute effects of lead exposure will be discussed. Only at high concentrations are acute effects seen, which are very unlikely during this removal action. Therefore the potential exposures to lead are unlikely.

Maintaining low dust concentration conditions is the best means of reducing exposure.

4.1.2 Mercury

The primary route of exposure of elemental mercury is skin absorption or inhalation of mercury vapors.

The acute effects include erosion of the respiratory/GI tracts, nausea, vomiting, bloody diarrhea, shock, headache, and metallic taste. Inhalation of high concentrations for short periods can cause pneumonitis, chest pain, dyspnea, coughing, stomatitis, gingivitis, and salivation.

Mercury vapor is not anticipated to be a problem primarily because elemental mercury is probably not present in the liquid or sludge. The mercury is most likely bound to particulate. The control of dust generation will control exposure to mercury contaminated particulates.

4.1.3 Carbon Tetrachloride

The primary route of exposure to carbon tetrachloride is by inhalation with secondary exposure by skin adsorption. Carbon tetrachloride is slightly soluble in water.

The acute effects of carbon tetrachloride include eye, nose, skin, and throat irritation; cough, dyspnea, cyanosis, cardiac arrhythmias, headaches, dizziness, mental confusion, nausea, vomiting, abdominal pain, and diarrhea. Carbon tetrachloride is considered a suspect carcinogen.

Carbon tetrachloride is volatile and can be expected to pose an inhalation problem. Detection of carbon tetrachloride can be made with real-time instrumentation such as a photoionization detector.

4.1.4 1,1,1-Trichloroethane

The primary route of exposure to 1,1,1-Trichloroethane is inhalation.

The acute health effects of include headache, lassitude, dermatitis, skin and eye irritation, cardiac arrhythmias, and depression of the central nervous system. 1,1,1-Trichloroethane has a relatively high permissible exposure limit of 350 ppm.

Trichloroethane can be monitored using real-time instruments, such as a photoionization detector. The usage of personal protective equipment will reduce exposure by skin adsorption or inhalation.

4.1.5 Xylene

The primary route of exposure to xylene is inhalation.

The acute health effects of xylene include dizziness; excitement; drowsiness; incoordination; staggering gait; irritation of eyes, nose, and throat; corneal vacuolization; anorexia; nausea; vomiting; abdominal pain; and dermatitis.

Control of exposures to xylene can be accomplished through proper use of personal protective equipment (PPE). In addition, real-time monitoring of xylene will be performed using a photoionization detector.

4.2 RADIATION HAZARDS

The primary radionuclides present in the sump are uranium and thorium. The available radiological data originated during a sampling survey in September 1991. A summary of the results include:

Dose Rate:0.8 mR/hr (at the top of the sump)
Alpha Activity:5100 pCi/L
Beta Activity:2900 pCi/L
Total U: 577 ppm
Total Th:7.62 g/L
U-235: 1.16 WT%(U)

The concentrations of radionuclides, including daughter products, assumed to be present in the sump liquid were determined as follows. It was assumed that the total thorium detected in the sump liquid is natural thorium (^{232}Th). The total uranium detected in the sump liquid is known to be enriched to 1.16 weight percent Uranium-235 and is calculated to be 98.83 weight percent Uranium-238 and 0.01 weight percent Uranium-234. It was conservatively assumed that the sump contents could have been generated up to 40 years ago and that there were no radioactive products, other than the uranium and thorium, present at that time. However, over the 40-year period, daughter products would have been generated. The RADDECAY computer code was used to determine the daughter radionuclides and equilibrium concentrations that could be present in the sump liquids today. Only those daughter radionuclides that are present at greater than one percent of the parent's activity are considered to be a radiation hazard. The concentrations of radionuclides assumed to be present in the sump liquid are presented in Table 4-2. The gamma radiation appears to be originating primarily from daughter products of Thorium-232. The Thorium-232 itself poses an alpha radiation hazard.

The removal of the sump liquid is expected to reduce the dose rate. Dose rate measurements will be made prior to beginning sump removal activities (WEMCO 1992).

The safety assessment for the sump removal activities should be reviewed for additional information. Control of these radionuclides shall be through engineering, administrative, and personal protective controls.

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Table 4-2. Concentrations of radionuclides in the sump liquid.

Radionuclide	Parent	Fraction of Parent Activity	Concentration in Sump (Ci/ml)
U-234			3.5E-10
U-235			1.4E-11
U-238			1.8E-10
Th-232			8.3E-10
Th-234	U-238	1.0E+00	1.8E-10
Pa-234m	U-238	1.0E+00	1.8E-10
Th-231	U-235	1.0E+00	1.4E-11
Ra-228	Th-232	9.9E-01	8.2E-10
Ac-228	Th-232	9.9E-01	8.2E-10
Th-228	Th-232	9.9E-01	8.2E-10
Ra-224	Th-232	9.9E-01	8.2E-10
Rn-220	Th-232	9.9E-01	8.2E-10
Po-216	Th-232	9.9E-01	8.2E-10
Pb-212	Th-232	9.9E-01	8.2E-10
Bi-212	Th-232	9.9E-01	8.2E-10
Tl-208	Th-232	3.5E-01	2.9E-10
Po-212	Th-232	6.3E-01	5.2E-10

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4.3 PHYSICAL HAZARDS

In addition to the chemical hazards previously described, a variety of physical hazards will be present similar to those associated with any large construction project. These physical hazards are due to poor housekeeping, motor vehicle operation, heavy equipment operation, the use of power and hand tools, handling and storage of fuels, and installation and use of electric power. These hazards are not unique and are generally familiar to most industrial workers. They will be covered in site-specific training and, if necessary, during daily safety briefings. Table 4-3 presents an overview of the hazards associated with the proposed activities.

4.3.1 Noise

Noise is a potential hazard associated with the operation of heavy equipment, power tools, pumps, and generators. Suspected high noise operations will be evaluated to determine if protective measures are warranted. Employees with 8 hr time weighted average (TWA) exposures exceeding 85 dBA will become part of a hearing conservation program. Noise levels above 85 dBA are expected only during the air hammering of the sump apron. Though exceedance of the 8 hr 85 dBA is not expected.

4.3.2 Fire or Explosion

The potential for a fire during the sump removal is moderate due the moderate flash point of the liquid found in the sump. Combustible gas monitoring will be conducted prior to removal actions, pipe cutting, or confined space entry. Ventilation of the sump will be conducted if necessary. During operations involving the sump liquids, a designated fire watch individual will be present adjacent to the Exclusion Zone. This individual will maintain radio contact with the FEMP Safety Engineering and Fire Services by having a radio adjacent to the Exclusion Zone during all Exclusion Zone operations. The designated individual will not have other operational responsibilities during the Exclusion Zone operations. Responses to either a fire or explosion are discussed in Section 12.0, Emergency Procedures.

4.4 HEAT/COLD STRESS

Heat stress is a significant hazard associated with the use of Level C protective equipment in hot weather environments. Local weather conditions encountered during late spring,

Table 4-3. Activity specific hazards.

Activity	Radiation	Chemical	Noise	Heat/Cold Stress	Physical
Site Preparation	Yes	No	No	No	Yes
Sump pump-out/contents removed	Yes	Yes	No	No	Yes
Removal of sump pump	Yes	Yes	No	Yes	Yes
Drain line additional cleanout	Yes	Yes	No	No	Yes
Remove concrete sump apron	Yes	Yes	Yes	Yes	Yes
Excavation	Yes	Yes	No	Yes	Yes
Cut/disconnect drain line	Yes	Yes	No	No	Yes
Sump removed	Yes	Yes	No	Yes	Yes
Drain line capping	No	No	No	No	Yes
Decontamination	Yes	Yes	No	Yes	Yes
Drain line internal inspection	Yes	No	No	No	Yes
Backfill	No	No	No	No	Yes

summer, and early fall are likely to produce conditions that will require restricted work schedules in order to protect employees. Heat stress will be monitored and the action levels described in Section 5.10 will be used to institute appropriate work/rest regimens. Potential hazards in cold environments can be direct (frostbite, hypothermia) or indirect (slick surfaces, brittle equipment, poor judgment and shortcuts). Winter conditions will require attention to proper clothing, equipment warm-up time, and freeze protection for vessels, piping, and walking/working surfaces. Additionally, training may be needed to instruct onsite workers on how to prevent cold injuries and provide information on dietary adjustments.

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

5.0 ACCIDENT PREVENTION

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5.1 RESPONSIBLE INDIVIDUALS

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

5.2 PERSONNEL RESTRICTIONS

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

- Horseplay of any kind will not be tolerated.

- The personal protective equipment specified by the HSO and this HASP shall be worn by all personnel.

- Eating, drinking, chewing tobacco or gum, smoking, and any other practice that may increase the possibility of hand-to-mouth contact is prohibited in the Exclusion and Contamination Reduction Zones.

- All lighters, matches, cigarettes and other forms of tobacco shall remain in the support zone.

- Individuals shall not be allowed to wear contact lenses while conducting onsite work operations in the Exclusion Zone or Contamination Reduction Zone.

- Individuals shall not be allowed to wear jewelry while conducting on-site work operations in the Exclusion or Contamination Reduction Zone.

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

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

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

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

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

5.3 FIRE PREVENTION AND PROTECTION

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

5.3.1 Fire Prevention

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

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

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

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

- Electrical lighting is the only means acceptable for artificial illumination where flammable liquids, vapors, fumes, dusts, or gases may be present. All electrical equipment and installations must be in accordance with the National Electrical Code for Hazardous Areas. Repairs on these items will be made only after they have been de-energized, and appropriate lock-out procedures are followed.

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

5.3.2 Fire Protection

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

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

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

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

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

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

5.4 CONTAMINATION AND EXPOSURE PREVENTION

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

- Being splashed with liquids during sampling or handling operations
- Contacting contaminated liquids, sludges, or solids
- Walking through contaminated liquids, sludges, or solids
- Contacting contaminated equipment or machinery
- Sitting or kneeling on the ground in the Exclusion Zone.

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

As much care as reasonably possible will be used to prevent contamination of small equipment. Sampling and monitoring instrumentation shall not be set on contaminated surfaces. Care will also be taken to minimize contamination of monitoring instrumentation. Such instrumentation may be bagged or placed in protective carriers.

5.5 HOUSEKEEPING

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

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

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

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

- Incompatible materials will be segregated.

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

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

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

5.6 SAFETY MEETINGS

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

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

5.7 ACCIDENT INVESTIGATION AND REPORTING

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

5.8 WORK/REST REGIMEN

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

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

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

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

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

* Impermeable clothing adds 10° to the measured WBGT.

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

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

5.9 BUDDY SYSTEM

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

5.10 OPERATION OF HEAVY EQUIPMENT

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

5.10.1 General Construction Safety Hazards

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

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

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

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

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

5.11 LOCK-OUT/TAG-OUT

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

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

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

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

4) Block mechanisms, if appropriate

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

5.12 CONFINED SPACE ENTRY

During the removal action, no confined space work is anticipated. If during the course of work it becomes necessary to enter a confined space, then the requirements of IH&S-IH-05, "Control of Entering and/or Work in a Confined Space" shall be followed.

5.13 EXCAVATION/TRENCHING

All excavation activities shall be in compliance with WEMCO IHS-S-11 Excavation Safety and 29 C.F.R. 1926 Subpart P. Prior to trenching or excavating, the proximity of utilities will be established. Trenches deeper than 4 ft shall be sloped or shored according to the type of soils and recommended practices if personnel are to enter. Trenches shall be equipped with ladders or proper exit means so that travel distance shall not exceed 25 ft to get out. Monitoring during excavation shall be conducted to determine the presence or absence of potentially explosive or toxic vapors.

The underground pipe will be cut at two locations in line with the Work Plan. Before torch cutting the interior of the pipe will be monitored for organic vapors and explosive limits. If the lower explosive limit (LEL) is greater than 0%, then the interior of the pipe shall be force ventilated in order to reduce the LEL to 0%. LEL monitoring shall be continued during the cutting operation.

5.14 HOISTING AND RIGGING

All hoisting and rigging operations shall be in compliance with WEMCO IH&S-S-10 Hoisting and Rigging and 27 C.F.R. 1926 Subpart N. Materials that are expected to be lifted include the sump pump and piping, sump housing, and the sump. Any above ground electrical lines within 12 ft (if less then 50 kV) of the cherry-picker shall be de-energized prior to the removal action. Appendix B contains WEMCO IH&S-S-10 Hoisting and Rigging.

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6.0 MONITORING

Monitoring shall be conducted for organic vapors, combustible gases, and radiation during all phases of the removal action. Monitoring shall be conducted on materials and personnel as detailed in Section 6.0 of the Removal Action Work Plan and as summarized in the following sections. All health and safety monitoring shall be performed in accordance with the applicable sections of the FEMP Site-Wide CERCLA Quality Assurance Project Plan (SCQ). The action levels are identified in Table 6-1.

6.1 AIR MONITORING FOR CHEMICALS

Air monitoring for organic vapors will be conducted before performance of activities in all work areas using a photoionization detector (PID) with a 11.7 eV lamp. The organic vapors of interest include xylene, trichloroethane, and carbon tetrachloride. The ionization potentials of trichloroethane and carbon tetrachloride require a lamp with an energy level of at least 11.4 eV.

The organic vapor action levels are based on 100% carbon tetrachloride vapor in the air. Carbon tetrachloride was chosen because its permissible exposure limit (PEL) is the lowest of the organic compounds identified. The relative response ratio for carbon tetrachloride is 0.9 for an 11.7 eV lamp (based on a HNU PI-101). The action level of 2.2 ppm would yield a 2 ppm carbon tetrachloride reading. The 2 ppm level is the 8-hour PEL for carbon tetrachloride.

A combustible gas indicator (CGI) shall be used to monitor combustible gas concentrations and oxygen levels in the working area. The CGI shall be used in the event of confined space entry (see Section 5.12), daily at the sump opening, and before any welding or cutting operations.

If total organic vapor levels in the worker breathing zone within the Exclusion Zone are detected for a period longer than one (1) minute at greater that 50 ppm, operations will be suspended until the cause of the elevated levels is determined.

If total organic vapor levels in the general worker breathing zone within the Exclusion Zone are detected at greater that 100 ppm for a period longer than one (1) minute, operations will be suspended until the cause of the elevated levels has been determined.

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Table 6-1. Action levels.

INSTRUMENT	RESPONSE	ACTION
LEVEL D EXCLUSION ZONES		
Alpha Probe	300 dpm/100 cm^2 total 20 dpm/100 cm^2 removable	Conduct additional surveys
Beta-Gamma Probe	5,000 dpm/100 cm^2 total 1,000 dpm/100 cm^2 removable	Conduct additional surveys
Combustible Gas Indicator	Greater than 0% LEL	No hot work; evaluate the situation; ventilate
	Greater than 1% LEL	Evacuate area
Total Organic Vapor Monitoring (PID)	Greater than 2.2 ppm above background	Upgrade to Level C; contact IRST
Oxygen	Less than 19.5%	Contact IRST Upgrade to Level B
	Greater than 23.5%	Remove/shut off ignition sources & investigate for cause of excursion
LEVEL C EXCLUSION ZONE		
Combustible Gas Indicator	Greater than 0% LEL	No hot work; evaluate the situation; ventilate
	Greater than 1% LEL	Evacuate area
Total Organic Vapor Monitoring (PID)	Greater than 50 ppm	Stop work–evaluate situation; take detector tube for carbon tetrachloride; contact IRST.
Oxygen	Greater than 100 ppm	Stop work–evaluate situation
	Less than 19.5%	Upgrade to Level B - supplied air. Contact IRST.
	Greater than 23.5%	Remove/shut off ignition sources & investigate for cause of excursion

Using real-time instrumentation (PID), initially a maximum of 1 ppm above background at the perimeter of Level C work zones before expansion of the exclusion zone is required. This may be re-evaluated when more information is available on contaminant generation concentrations.

The detected organic vapor levels are based upon the TLV of carbon tetrachloride, the most restrictive volatile organic identified in the sump. Personnel in the Exclusion Zone will have available, as a minimum, a full face respirator with organic/particulate cartridges. These respirators provide a protection factor of 50 for organic vapors.

The breathing zone atmosphere shall also be monitored every 15 to 30 minutes by an Industrial Hygienist for sustained levels of combustible gases and organic vapors. Monitoring will be continuous during critical operations including sump pump-out, concrete removal, drain line clean-out, cutting drain line, concrete removal, and decontamination. Personnel protection levels are:

- Above background to 2.2 ppm - Level D
- Above 2 ppm to 100 ppm - Level C
- Above 100 ppm to 20,000 ppm - Level B

If the combustible gas indicator readings within the Exclusion Zone exceed 0% of the lower explosive limit (LEL) for a period of one minute, no torch cutting activities will be initiated and any existing cutting activities will be suspended until the source of the elevated readings is determined and action is taken to reduce the levels below 0% of the LEL.

If the combustible gas indicator readings within the Exclusion Zone exceed 1% of the lower explosive limit (LEL) for a period of one (1) minute, activities will be suspended until the source of the elevated readings is determined and action is taken to reduce the levels below 1% of the LEL.

6.2 RADIATION

The objective of the monitoring program is to ensure that activities in the Exclusion Zone are performed with minimal risk of radiological exposure to personnel, in accordance with guidelines provided by the FEMP Industrial Hygiene and Safety Manual, FEMP and DOE Radiological Control Manuals, and DOE Order 5480.11.

The airborne radioactivity limit is based on the total thorium plus daughter equilibrium alpha activity associated with the Derived Air Concentration (DAC) for Th-232 (DOE 1988), the most restrictive radionuclide present within the sump. External dose rate and surface contamination limits are based on the lower threshold levels associated with high radiation and contamination areas and the presence of Th-232 (DOE 1992).

If the concentration of airborne particulate alpha activity exceeds 3E-12 μCi/ml within the Exclusion Zone, operations will be suspended and workers will promptly exit until the cause of the elevated levels has been determined.

If the external radiation dose rate within the Exclusion Zone exceeds 0.1 rem/hr for a period longer than one (1) minute, operations will be suspended and workers will promptly exit until the cause of the elevated levels has been determined.

If the level of removable contamination on Exclusion Zone working surfaces exceeds 20,000 dpm/100cm^2 alpha or 100,000 dpm/100 cm^2 beta/gamma, operations will be suspended and workers will promptly exit until the cause of the elevated levels has been determined.

During operations in the Exclusion Zone, the atmosphere will be continuously monitored using a properly calibrated and dual alarmed (audible and visual) CAM. The high alarm shall be set to 3E-12 μCi/ml. External dose rate and removable alpha and beta/gamma surface contamination levels will be measured every 30 minutes while work activites are in progress.

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

Location	Instrumentation
Exclusion Zone	1 Combustible Gas Indicator
	1 Organic Vapor Analyzer
	1 Dust Monitor
	1 Dose Rate Meter
	1 Alpha Survey Meter
	1 Beta/Gamma Survey Meter

	1 Beta/Gamma CAM (dual audible/visual alarm)
Exclusion Zone Exit Point	1 Alpha Survey Meter 1 Beta/Gamma Survey Meter

At least once per working day, the Health and Safety Officer shall verify that the minimum required instrumentation is operating in each specific area in which operations are being conducted. During routine surveillance, if the monitoring instrumentation is found to be inoperative, the operation shall be placed in a safe configuration until the instrument is repaired or a substitute can be provided.

Thermoluminescent dosimeter (TLD) badges shall be issued to all workers and visitors who enter the sump removal action Exclusion or Contamination Reduction Zone. The badges shall be issued in accordance with the FEMP Radiation Control Manual.

Internal radiation monitoring at the FEMP is routinely accomplished by performing *in vitro* and *in vivo* bioassay measurements. The FEMP Radiological Safety organization defines the internal radiation monitoring program for all workers at the FEMP. Internal radiation monitoring is required for all radiation workers exposed to surface or airborne radioactive contamination where the worker could receive 100 mrem annual effective dose equivalent from all occupational radionuclide intakes, or if any organ or tissue dose equivalent could exceed 5 rem annual dose equivalent. All workers required to enter the exclusion zone are required, at a minimum, to undergo baseline, annual, and termination *in vivo* examinations, and will participate in the routine uranium urinalysis program.

7.0 PERSONAL PROTECTIVE EQUIPMENT

7.1 INTRODUCTION

Various levels of personal protection will be provided to workers at the site. The selection of personal protective equipment requires an evaluation of site-specific contaminants and the concentrations and physical hazards that may be potentially encountered (See Section 4.0 for complete hazard assessment).

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

7.2 UPGRADE AND DOWNGRADE

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

The decision to upgrade the level of protection will be made by the HSO with approval of the IRST based upon the prevailing site conditions including exposure, contamination, meteorological conditions and the site operation involved. Industrial Hygiene will be notified in the event that a PID reading exceeds 25 ppm. For example, at PID readings of 50 ppm, airline respirators will be used unless specific monitoring (e.g., detector tubes) indicates that carbon tetrachloride is below 50 ppm. Levels greater than 100 ppm will require supplied air. The requirement to upgrade will be communicated to the Project Manager and involved employees.

A decision to downgrade from a level of protection published in this HASP as part of Table 6-1 is permitted, when in the professional judgment of the HSO, in consultation with the HSM, and approval of the IRST when site conditions warrant such a downgrade.

Table 7-1. Operation specific protection levels for the sump removal action.

Level D Operations

- Site Preparation
- Soil Sampling
- Cut Drain Line
- Remove Sump
- Backfill Area
- Drain Cleanout
- Drain Line Capping

Level D Modified Operations

- Clean Out Drain Line
- Excavate Soils
- Drain Inspection

Level C Operations

- Sump Pump-out
- Remove Concrete Apron
- Decontamination

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

The Removal Site Supervisor is required to be notified of the proposed change. Where the HSO has upgraded the level of protection due to prevailing site conditions, and site conditions return to the pre-upgrade state, the HSO is authorized to return to the previously published levels of protection upon notice to the Removal Site Supervisor.

7.3 LEVELS OF PROTECTION

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

The basis for the levels of protection are OSHA 1910.120 Appendix B. The majority of the work on site will be conducted in Level D protection. As identified in Section 4.0 Hazard Assessment, Level D protection provides sufficient protection against the dust borne metals, organic compounds and external radiation anticipated to be found during sump removal action activities.

Level C protection may provide the same level of skin protection as Level B, but will utilize a lower level of respiratory protection. Level C respiratory protection uses a full face air purifying respirator with canisters or cartridges. For this level of protection, it is necessary to recognize the contaminants prior to entry so as to provide the appropriate canister or cartridges specifically approved by National Institute for Occupational Safety and Health (NIOSH)/Mine Health and Safety Administration (MHSA) for those contaminants.

With each of these levels of protection there is a degree of variability or modification dependent on the specific tasks, specific chemicals, form and amount of chemicals present. For example, different tasks on the same site may require gloves of different materials, length, or thickness. Variations of a level of protection may be indicated by a qualifier, such as "Modified Level D."

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

Table 7-2. Initial personal protective equipment levels for the Pilot Plant sump removal action.

LEVEL OF PROTECTION	PERSONAL PROTECTIVE EQUIPMENT
D	Cotton Coveralls Neoprene (or equally-protective material) steel-toed boots Safety glasses Hard hat Gloves
D-MODIFIED	Cotton coveralls Chemical-resistant hooded coverall (tape legs and sleeves to boots and gloves) Inner surgical gloves Outer chemical resistant gloves (neoprene or equivalent) Neoprene steel-toed boots Hard hat Chemical splash goggles or safety glasses Nuke booties (optional)
C	Cotton inner coveralls Full facepiece, air purifying, OV/Acid/HEPA cartridge respirator Polycoated or Saranex hooded coverall (tape hood of coverall to respirator; tape legs and sleeves to boots and gloves) Inner surgical gloves Outer chemical resistant gloves (neoprene or equivalent) Neoprene steel-toed boots Nuke booties (optional) Hard hat

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7.3.1 Heavy Equipment Operators

All heavy equipment operators will be required to wear Level D protection.

7.4 PERSONAL PROTECTIVE EQUIPMENT FOR INSPECTORS AND VISITORS

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

8.0 SITE CONTROL

8.1 GENERAL ORGANIZATION

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

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

8.2 ILLUMINATION

All hazardous waste operation zones shall be illuminated to not less than the minimum illumination intensities as listed in the following chart:

General site area	5 footcandles
Excavation and waste areas, accessways, active storage areas, loading platforms, refueling and field maintenance areas.	3 footcandles

Sanitation facilities and equipment for work areas shall comply with the requirements stated in 29 C.F.R. 1910.120 (n).

8.3 COMMUNICATIONS

Communications are essential to all smoothly run operations. Personnel should be provided with the appropriate equipment to facilitate the transmission of information necessary to support work activities, report emergencies and receive emergency information. This does not require that each person be in possession of a transmitting or receiving device, but that such instruments be accessible to workers within the assigned work area. Information can be received by one person and given to other individuals by in-person communications.

9.0 DECONTAMINATION PROCEDURES

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

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

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

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

- Before departure from the decontamination area, all personnel must be "frisked" with radiation detectors to verify successful decontamination. All equipment must also be surveyed prior to removal from the area.

- In all cases of radiological contamination, Radiological Safety shall be notified to perform decontamination as per FMPC SP-P-35-017.

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

10.0 TRAINING

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

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

Categories of personnel include the following:

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

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

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

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

10.1 TRAINING REQUIREMENTS

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

Supervisors/Managers of

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

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10.1.1 Escorted Visitors

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

10.1.2 Unescorted Vistors

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

- Radiological Safety - 5 hours
- Safety Orientation - 1 hour
- Nuclear Safety - 1 hour

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

10.2 SITE SPECIFIC TRAINING

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

11.0 MEDICAL SURVEILLANCE

11.1 GENERAL

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

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

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

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

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

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

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

The objectives of the Medical Program are carried out by a team of eight individuals that include: two licensed physicians, one of whom is board certified in Preventive/ Occupational Medicine; two registered nurses; two technologists (x-ray and laboratory); and two clerk specialists.

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

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

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

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

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

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

12.0 EMERGENCY PROCEDURES

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

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

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

12.1 EMERGENCY ORGANIZATION FOR THE SUMP REMOVAL ACTION

12.1.1 Field Management

The shift Utility Engineer is the Assistant Emergency Duty Officer (AEDO) and provides management oversight and liaison with the Emergency Duty Officer (EDO) or the Deputy Emergency Director (DED) when the Emergency Operations Center (EOC) is activated.

12.1.2 Emergency Response Team

The Emergency Response Team (ERT) is responsible for event mitigation and damage control, spill and release control, firefighting, environmental monitoring, medical assistance, and rescue. The ERT is led by a Safety and Fire Inspector, who serves as the Emergency Chief (EC). The ERT is also supported by emergency responders who have expertise in specific areas such as radiological and chemical air sampling and monitoring.

12.1.3 Security Forces

The Administration Department (Safeguards and Security Section) is responsible for the overall security of the FEMP, response to security events, and support for operational emergencies. The Shift Security Organization consists of a Security Shift Lieutenant, a Communications Officer, and Security Inspectors.

12.1.4 Emergency Operations Center Staff

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

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

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

12.2 EMERGENCY COORDINATION

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

The AEDO has been designated as the primary on-site emergency coordinator. The AEDO has authority to initiate all necessary response actions, including activation of the EOC. The AEDO also has the authority to activate the FEMP Off-site Emergency Warning System at any time. Additional support may be summoned at any time by the AEDO through the Communications Center by activation of the EOC. All EOC staff members are supplied with personal pagers that can be activated by a group page. Off-duty Utility Engineers, Security Lieutenants, and Safety and Fire Inspectors may also be summoned in this manner.

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12.3 EMERGENCY RESPONSE PROCEDURES

The activities and hazards of the Pilot Plant Sump Removal Action have been evaluated to determine the potential emergencies to be anticipated. As a result, three categories of emergencies have been established. This list may be revised if on-site conditions or operations warrant. In the event of a revision or addition to the list, the Emergency Plan will be appropriately updated. The following lists the categories of emergencies.

Injury/Illness
Fire
Spills/Environmental Release

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

12.3.1 General Response Scheme

Action by the Person Discovering Emergency:

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

2) Take action to ensure own personal safety.

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

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

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

    a) Exact location

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

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

d) Emergency actions already taken.

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

Action by the Line Supervisor:

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

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

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

4) Alert personnel to move to safe rally point.

5) Shut down equipment if possible.

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

7) Notify AEDO if not already done.

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

Action by the AEDO:

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

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

- Ensures proper personal protective equipment for responders

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

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

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

1) Receives notification that an event has occurred

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

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

    a) Identifies the substance and its source

    b) Determines the extent and the amount of materials involved

4) Establishes the initial event classification

5) Directs the Communication Operator to conduct required notifications

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

7) Receives confirmation of warning system activation and required notifications from the Communications Operator

8) Authorizes the request for mutual aid

9) Directs evacuation or provides for sheltering if required

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

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

12) Notifies DED of significant actions after EOC activation

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

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

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

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

17) Preserves evidence and secures the scene

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

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

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

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

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

Action When Building or Area Is Not Directly Involved

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

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

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

3) Shut off gas and process liquids

4) Secure classified material or remove to a safe location

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

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

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

8) Assist the AEDO if called upon.

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

12.3.2 Injury/Illness

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

12.3.2.1 Emergency Decontamination. In the case of medical emergency, gross decontamination procedures will be implemented and the person transported to the nearest medical facility immediately. If a life threatening injury occurs and the injured person cannot undergo decontamination procedures without causing additional injuries, he or she should be transported in a body bag, plastic wrap, or wrapped in a blanket. The medical facility will be informed that the injured person is on the way, and has not been decontaminated. The medical facilities will be notified of the potential chemicals present and the exposure-prevention measures that can be employed during treatment. Decontamination measures for other emergencies will be based upon the toxicity of the contaminants on site and the immediacy of the emergency on hand.

12.3.3 Fire

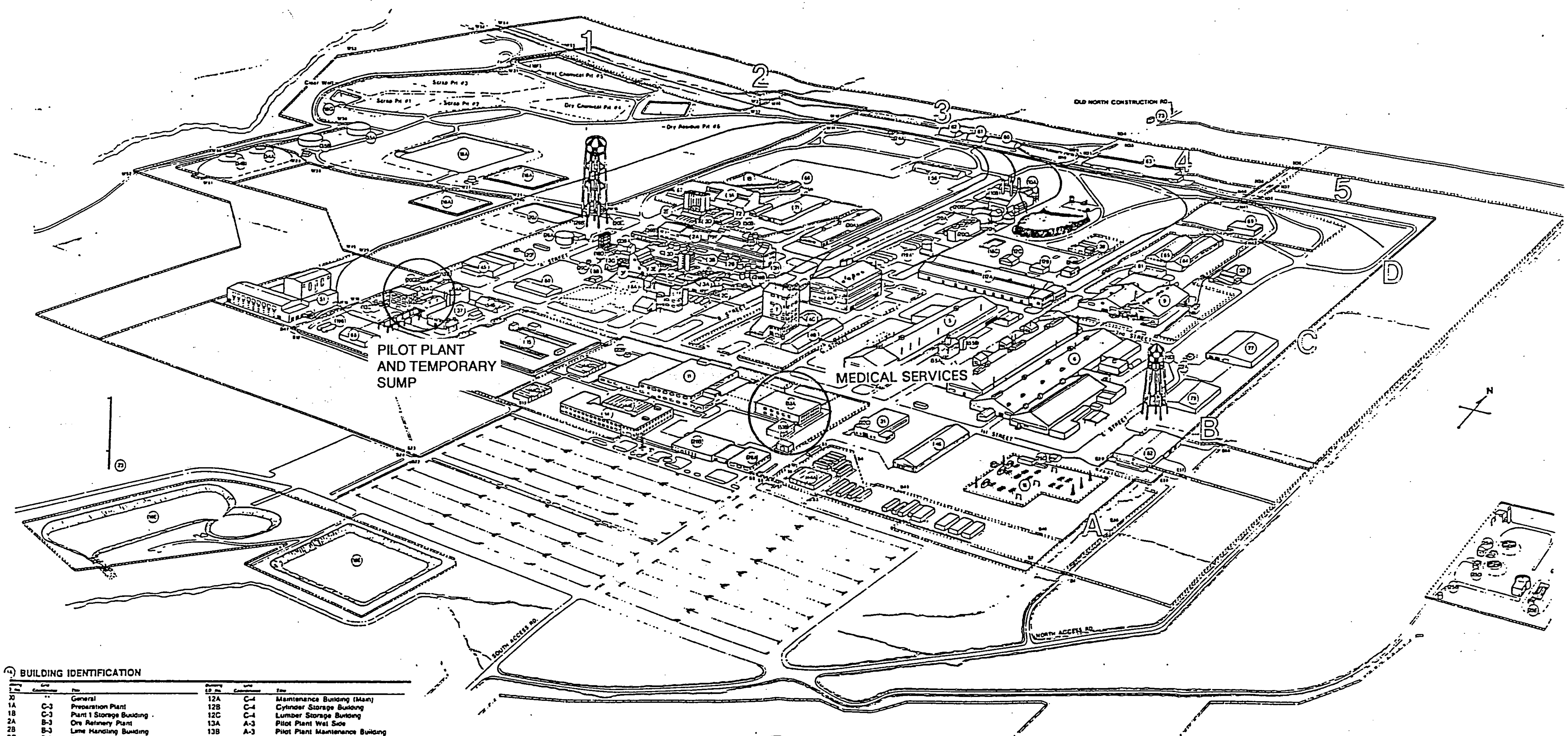
Fire extinguishers shall be available when removal work takes place. Whenever hot work such as torch cutting is performed a fire extinguisher shall be readily available. During operations involving the sump liquids, a designated fire watch individual will be present adjacent to the Exclusion Zone. This individual will maintain radio contact with the FEMP Safety Engineering and Fire Services by having a radio adjacent to the Exclusion Zone during all Exclusion Zone operations. The designated individual will not have other operational responsibilities during the Exclusion Zone operations. Personnel at the site shall not extinguish fires that are beyond the incipient stage. The AEDO shall be contacted when a fire occurs.

12.3.4 Hazardous Waste Spill or Waste Release

Remedial action (without implementing Contingency Plan)

Remedial action will be conducted for any minor releases of hazardous waste. Releases requiring minor remediation should normally not exceed the classification of NON-ROUTINE EVENT. Although NON-ROUTINE events do not constitute implementation

FMPC SITE



BUILDING IDENTIFICATION

30	**	General
1A	C-3	Preparation Plant
1B	C-3	Plant 1 Storage Building
2A	B-3	Ore Refinery Plant
2B	B-3	Lime Handling Building
2C	B-3	Bulk Lime Handling Building
2D	C-3	Metal Dissolver Building
2E	C-3	NFS Storage and Pump House
3A	B-3	Maintenance Building
3B	B-3	Ozone Building
3C	B-3	Control House
3D	B-3	NAR Towers
3E	B-3	Hot Raffinate Building
3F	B-3	Digestion Fume Recovery
3G	B-3	Refrigeration Building
3H	B-3	Refinery Sump
[illegible]	B-4	Green Salt Plant
8	B-4	Plant 4 Warehouse
4C	B-4	Plant 4 Maintenance Building
	B-4	Metals Production Plant
	B-5	Metals Fabricating Plant
	B-4	Plant 7
8A	B-3	Recovery Plant
8B	B-3	Maintenance Building
9	C-5	Special Products Plant
10A	D-4	Boiler Plant
10B	D-4	Boiler House Maintenance Building
11	A-4	Service Building
12A	C-4	Maintenance Building (Main)
12B	C-4	Cylinder Storage Building
12C	C-4	Lumber Storage Building
13A	A-3	Pilot Plant Wet Side
13B	A-3	Pilot Plant Maintenance Building
13C	A-3	Sump Pump House
14	A-4	Administration Building
15	A-3	Laboratories
16	A-5	Main Electrical Substation
18A	C-2	Surge Lagoon
18B	B-3	General Sump
18C	C-4	Coal Pile Runoff Basin
18D	B-3	Biodenitrification Towers
18E	*	Storm Water Retention Basin
18F	D-1	Pit 5 Sluice Gate
18G	C-1	Clearwell Pump House
19A	C-4	Metal Tank Farm
19B	A-3	Pilot Plant Ammonia Tank Farm
20A	C-4	Valve/Control Building
20B	D-4	Filter/Chemical Building
20C	C-4	Cooling Towers
20D	B-5	Elevated Storage Tank (Potable H_2O)
20E	B-3	Well House
20F	B-3	Well House
20G	A-3	Well House
20H	D-4	Process Water Storage Tank
20J	B-2	Lime Slurry Pits
22A	B-5	Gas Meter Building
22B	A-3	Storm Sewer Lift Station
22C	A-5	Truck Scale
23	*	Meteorological Tower
24A	D-3	Railroad Scale House
24B	C-4	Railroad Engine Building
25A	*	Chlorination House
25B	*	MH #175
25C	A-5	Sewage Lift Station Building
25D	*	U.V. Disinfection Building
25E	*	Digester Control House
26A	B-3	Pump House - H.P. Fire Protection
26B	B-3	Fire Protection Storage Tank
28A	A-4	Security Building
28B	A-4	Human Resources Building
30A	C-3	Chemical Warehouse
30B	C-3	Drum Storage Warehouse
31	A-5	Engine House - Garage
32	D-5	Magnesium Storage
34A	B-1	K-65 Storage Tank - North
34B	B-1	K-65 Storage Tank - South
35A	C-1	Metal Oxide Storage Tank - North
35B	B-1	Metal Oxide Storage Tank - South
37	A-3	Pilot Plant Annex
38	D-4	Propane Storage
39A	B-3	Incinerator Building
39B	B-3	Warehouse
39C	B-3	Incinerator Building Sprinkler Riser House
44A	A-5	Trailer Complex - 6-Plex - East
44B	A-3	Trailer Complex - 3-Plex
44C	A-3	Trailer Complex - 7-Plex - South
44D	A-3	Trailer Complex - 7-Plex - North
44E	A-4	Trailer Complex - 10-Plex
45	B-3	Building 45
46	A-5	Heavy Equipment Garage
51	A-2	UF_6 to UF_4 Reduction Facility II
53A	A-4	Health, Safety & Production Control Building
53B	A-4	In-Vivo Building
54A	A-3	UF_6 to UF_4 Reduction Facility I
54B	A-3	Warehouse/Weather Shelter
55A	B-4	Slag Recycling Plant
55B	B-4	Slag Recycling Pit/Elevator
56	D-3	CP Storage Warehouse
60	D-3	Quonset Number 1
61	D-3	Quonset Number 2
62	D-3	Quonset Number 3
63	D-4	KC-2 Warehouse
64	D-5	Plant 9 Warehouse
65	D-5	Plant 5 Warehouse
66	C-3	Drum Reconditioning Building
67	C-3	Plant 1 Storage Building
68	A-3	Pilot Plant Warehouse
69	D-5	Decontamination Building
71	C-3	General In-Process Storage Warehouse
72	C-3	Drum Storage Building
73	*	Fire Brigade Training Center Building
77	C-5	Finished Products Warehouse
78	*	New D&D Facility (On Hold)
79	B-5	Plant 6 Warehouse
80	B-3	Plant 8 Warehouse
81	C-5	Plant 9 Warehouse
82	B-5	Receiving & Incoming Materials Inspection Area

* Outside of Perimeter Security Fence

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Figure 12-1. Hospital Route.

of the Contingency Plan, they shall nevertheless be reported to the AEDO so that he/she can make the final determination of the category of the event.

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

Specific response to spills (when implementing Contingency Plan)

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

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

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

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

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

1) Respond promptly

2) Fight fire

3) Collect and contain released materials

4) Recover or isolate containers

5) Stop processes and operations where necessary

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

12.3.5 Post-Emergency Equipment Maintenance

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

Fire And Rescue

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

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

Personnel Decontamination Equipment

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

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

Medical

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

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

- Medical Services Laboratory.

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

Emergency Power System

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

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

Additional Emergency Equipment

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

13.0 RECORDKEEPING

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

13.1 LOGBOOKS

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

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

The log will be signed at the end of each day or work shift. All entries will be made in black ink. No pages will be removed from the log book with each plate numbered.

13.1.1 Daily Safety Log

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

- Names and job titles of all personnel in the work group
- Level of protection
- Health and safety monitoring equipment
- Weather conditions
- Work/rest schedule
- A description of the activities as they are occurring
- Any pertinent observations
- Sample number (if appropriate).

This document will be submitted daily to the Site Manager.

13.1.2 Air Monitoring Results Report

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

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

13.1.3 Daily Safety Briefing Log

This log will record the daily briefing safety briefings. It shall include an outline of the topics discussed and the names of personnel attending.

13.1.4 Instrument Calibration Log

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

- Instrument name
- Serial #
- Appropriate settings (span, gain, type of probe)
- Concentration of calibration gas (as appropriate)
- Instrument response
- Battery condition
- Brief description of any problems or malfunctions
- Initials of calibrator.

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13.2 RECORDS

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

13.2.1 Training Records

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

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

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

13.2.2 Medical Records

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

- Qualification statement for hazardous waste sitework
- Qualification for respirator use
- Respirator fit test results
- An emergency medical data sheet
- Results of worker exposure monitoring.

13.2.3 Personal Monitoring Records

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

13.3 REPORTS

The reports to be submitted during and after the sump removal action are described below.

13.3.1 Accident/Incident Reports

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

13.3.2 Weekly Safety Reports

A weekly safety report will be provided to the Project Manager and Project Health and Safety Officer on the following Monday of each week. Significant occurrences and violation of safety practices will be described. Actions taken to minimize potential hazards and any deficiencies will also be included. This report will be prepared and signed by the HSO.

13.3.3 Close Out Safety Report

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

- A description of significant events, exposures, accidents, illness and action taken to prevent their reoccurrence
- Documentation of final medical exams for all site personnel

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- Procedures for final decontamination of facilities and equipment

- A summary of all monitoring results including air, heat stress and meteorological

- A description of any state or federal inspections involving the health and safety of the site workers.

APPENDIX A

ACGIH TLVs for Heat Stress and Cold Stress

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ADOPTED
THRESHOLD LIMIT VALUES

AIRBORNE UPPER SONIC AND ULTRASONIC ACOUSTIC RADIATION

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

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

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

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

COLD STRESS

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

Introduction

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

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

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

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

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TABLE 1. Progressive Clinical Presentations of Hypothermia*

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

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

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

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

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

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

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

Evaluation and Control

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

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

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

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

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

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

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

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

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

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

Work–Warming Regimen

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

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

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

Notes for Table 3:

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

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

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

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

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

Special Workplace Recommendations

Special design requirements for refrigerator rooms include:

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

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

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

Workplace monitoring is required as follows:

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

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

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

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

Vascular Assessment

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

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

Sensorineural Assessment

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

Note: Separate staging is made for each hand.

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

HEAT STRESS

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

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

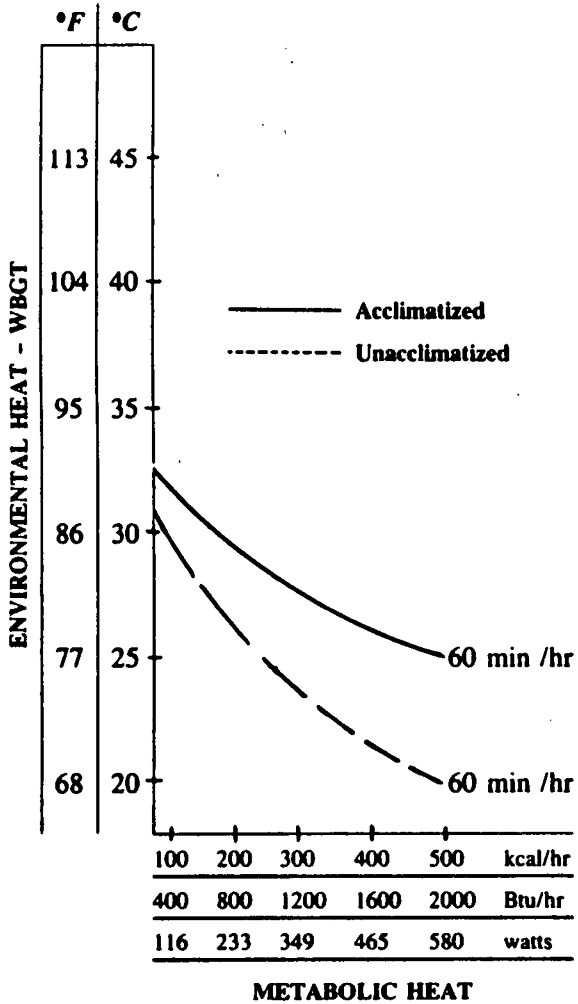
†Where there is a requirement for protection against other harmful substances in the work environment and additional personal protective clothing and equipment must be worn, a correction to the WBGT TLV values, as presented in Table 1 and Figure 1, must be applied. The values in Figure 1 are approximations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

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

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

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

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



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

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

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

where:

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

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

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

Evaluation and Control

I. *Measurement of the Environment*

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

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

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

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

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

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

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

II. *Work Load Categories*

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

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

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

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

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

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

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

III. *Work–Rest Regimen*

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

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

TABLE 2. Assessment of Work Load

Average values of metabolic rate during different activities.

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

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

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

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

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

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

where $WBGT_1$, $WBGT_2$ ... and $WBGT_n$ are calculated values of WBGT for the various work and rest areas occupied during total time periods; t_1, t_2 ... and t_n are the elapsed times in minutes spent in the corresponding areas which are determined by a time study. Where exposure to hot environmental conditions is continuous for several hours or the entire work day, the time-weighted averages should be calculated as an hourly time-weighted average, i.e., $t_1 + t_2 + \ldots t_n = 60$ minutes. Where the exposure is intermittent, the time-weighted averages should be calculated as two-hour time-weighted averages, i.e., $t_1 + t_2 + \ldots + t_n = 120$ minutes.

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

TABLE 3. Activity Examples

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

Sample Calculation

Assembly line work using a heavy hand tool.

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

IV. *Water and Salt Supplementation*

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

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

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

V. *Other Considerations*

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

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

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

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

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

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

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

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

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

sociated with temporary infertility in both females and males.

References

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

IONIZING RADIATION

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

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

APPENDIX B

IH&S-S-10 Hoisting and Rigging

Control No. 3828

Westinghouse Materials Company of Ohio

	INDUSTRIAL HYGIENE AND SAFETY MANUAL			Industrial Safety
	Title: CRANE, HOIST AND RIGGING PRACTICES			
IHS-S-10	Date: 3/20/89	Rev: 0		

1.0 PURPOSE

To outline basic safety practices that must be observed while operating cranes, hoists and mobile cranes at the FMPC. Following this SOP will ensure that WMCO operating practices comply with OSHA 1910.179 and the DOE Hoisting and Rigging Manual.

2.0 SCOPE

This procedure establishes the basic guidelines for the operation of cranes, overhead (underhung) hoists, mobile cranes, and associated rigging practices utilized at the FMPC.

3.0 DEFINITIONS

3.1 Crane - A movable or fixed hoisting mechanism that travels on an overhead fixed runway structure.

3.2 Overhead (Underhung) Hoist - A suspended machinery unit that is used for lifting or lowering a free suspended (unguided) load. For the purpose of this procedure, a crane will refer to a crane and an overhead (underhung) hoist.

3.3 Mobile Crane - Machinery unit that has a rotating superstructure and boom with a mechanism for over-the-road travel that can hoist and swing loads at various radii.

3.4 Rigging Devices - The associated equipment and operation of lifting and moving items with cranes, such as slings, shackles, and eyebolts.

4.0 RESPONSIBILITIES

4.1 Crane Operators - Shall adhere and comply with these requirements for the operation of cranes and safe rigging practices.

4.2 WMCO Management/Supervision - Instructs crane operators of these requirements of this procedure and ensures compliance with guidance contained in this procedure.

4.0 RESPONSIBILITIES (Continued)

4.3 Transportation - Shall maintain and operate mobile cranes in a safe condition as outlined by the manufacturer's instructions and this procedure.

4.4 WMCO Maintenance PM Crew and Industrial Mechanics - Shall maintain cranes in a safe operating condition and perform all required inspections.

4.5 Facility Owners/Designees - Shall operate cranes in a safe manner and cease to operate any crane with a deficiency that could jeopardize personnel or equipment.

4.6 Safety and Fire Services - Shall perform a quarterly audit of crane operations in accordance with this procedure.

4.7 WMCO Training - Shall develop, implement and administer a crane operator training and qualification program that includes safe rigging practices.

5.0 GENERAL

5.1 A crane or rigging device shall only be used for the operation that it was designed or intended.

5.2 All crane operators shall observe plant procedures and maintain the control of cranes and loads being lifted at all times.

5.3 Any crane involved in an accident or property damage incident shall be reported immediately to the assistant emergency duty officer.

5.4 Any crane or rigging that is not in a safe operating condition shall be removed from service immediately.

5.5 Only authorized personnel shall make repairs to cranes or rigging equipment.

5.6 Only trained and authorized personnel shall operate cranes.

5.7 Preventive and repair maintenance shall be in accordance with manufacturer recommendations and requirements.

6.0 PROCEDURE

6.1 Inspections of Cranes, Mobile Cranes and Rigging Devices

6.1.1 All cranes, mobile cranes, and rigging devices shall be inspected at the beginning of each shift for those shifts they are being used.

6.0 PROCEDURE (Continued)

6.1.2 Cranes and mobile cranes pre-shift/use inspection shall be completed and documented on form "FMPC Record of Daily Hoist Check", (Attachment A).

6.1.3 A thorough inspection of all crane running ropes shall be made at least once a month and documented on the form "FMPC Monthly Check Sheet, Ropes, Chains, Hooks, and Slings", (Attachment B).

6.1.4 The semi-annual or annual preventative maintenance inspection as determined by service use shall be completed and documented on the "FMPC Hoist Check Sheet", for fixed cranes and hoists, (Attachment C).

6.1.4.1 If the semi-annual or annual preventative maintenance inspection has not been completed within 30 days of the due date, the crane or hoist shall be downrated to 75% of its rated capacity.

6.1.4.2 If the semi-annual or annual preventative maintenance inspection has not been completed within 60 days of the due date, the crane or hoist shall be downrated to 50% of its rated capacity.

6.1.4.3 If the semi-annual or annual preventative maintenance inspection has not been completed within 90 days of the due date, the crane or hoist shall be taken out of service.

6.1.5 Mobile cranes shall be inspected annually by a public or private agency recognized by the U.S. Department of Labor.

6.1.6 Rigging devices shall be inspected for broken or cut parts, rust or corrosion, kinks, broken fittings, and other signs of damage or abuse.

6.2 Fixed Crane and Hoist Operations

6.2.1 Loads shall not be handled that exceed the crane or hoists' rated capacity except for required rated load tests.

6.2.2 Loads shall not be handled if chains or ropes are kinked or twisted or show other signs of deformity.

6.2.3 Only approved rigging devices or below the hook lifting devices shall be used to attach loads to the hook.

6.2.4 Only well secured and properly balanced loads shall be handled and moved.

6.0 PROCEDURE (Continued)

6.2.5 Crane and hoist hooks shall be centered over a load to prevent excessive swinging.

6.2.6 There shall be no sudden acceleration or deceleration of the crane or hoist when moving a load.

6.2.7 The load shall be clear and not contact any obstruction.

6.2.8 Cranes and hoists shall only be used to raise loads when centered over them.

6.2.8.1 Side pulling is prohibited unless approved by a representative of Safety and Fire Protection Engineering.

6.2.9 Bridge cranes and hoists shall not be used to carry or move personnel.

6.2.10 Loads shall not be lifted, carried, or suspended over personnel.

6.2.11 Upper limit switch shall not be used as an operating control.

6.2.12 Loads shall never be left suspended while unattended.

6.3 Mobile Crane Operations

6.3.1 A legible load rating chart shall be clearly visible to the operator while in the operating position and loads shall not be handled that exceed the rated capacity except for required load tests.

6.3.2 A load shall not be handled that exceeds its rated capacity except for required load tests.

6.3.3 Hoist ropes shall not be wrapped around the load.

6.3.4 Hoist ropes shall not be kinked or twisted when handling loads.

6.3.5 Only standard rigging practices or below-the-hook lifting devices shall be used to attach loads.

6.3.6 Loads shall only be handled when the crane is level and outriggers in place when necessary.

6.3.7 Only well secured and properly balanced loads shall be handled.

6.3.8 Hooks shall be centered over loads to prevent excessive swinging.

6.0 PROCEDURE (Continued)

6.3.9 There shall be no sudden acceleration or deceleration of the crane or hoist when moving a load.

6.3.10 The load shall be clear and not contact any obstructions.

6.3.11 There shall be no sudden acceleration or deceleration of the crane or hoist when moving a load.

6.3.12 Side loading of boom shall be limited to freely suspended loads.

6.3.13 Cranes shall not be used for dragging loads sideways.

6.3.14 The use of a manbasket to carry personnel shall only be used under the written approval of the transportation supervisor.

6.3.14.1 Safety and Fire Protection Engineering shall be contacted verbally prior to use of a manbasket for personnel; at least 24 hours notice should be given.

6.3.15 Loads shall never be lifted, carried or suspended over personnel.

6.3.16 The area around the counterweight swing radius shall be barricaded.

6.3.17 Outriggers shall be used in accordance with the crane manufacturer's guidelines.

6.3.17.1 Wood blocks used to support outriggers shall be of sufficient width and length to prevent shifting or toppling under load, be strong enough to prevent crushing and free from defects.

6.3.18 The operator shall not be permitted to leave the operating position with a suspended load.

6.3.19 All overhead electrical distribution and transmission lines shall be considered energized unless indicated by the Utility Engineer and clearly grounded.

6.0 PROCEDURE (Continued)

6.3.19.1 Except where electrical distribution and transmission lines have been de-energized and clearly grounded at point of work, the following minimum safe working distance shall be maintained from any part of the crane or loads.

50kV or less - 10 feet
over 50kV to 200kV - 15 feet
over 200kV to 350kV - 20 feet
over 350kV to 500kV - 25 feet
over 500kV to 750kV - 35 feet

6.3.19.2 If the crane is in transit with no load and the boom is lowered, all equipment shall be a minimum of 4 feet from energized electrical lines for voltages less than 50kV, and 10 feet for voltages over 50kV up to 345kV and 16 feet for voltages up to 750kV.

6.3.19.3 A watchperson shall be designated and observe the clearance and give timely warning if operator has visual difficulty in determining and maintaining the desired clearance listed in 6.3.19.3.

6.3.20 The operator(s) shall exercise extreme care when in transit with a crane.

6.3.20.1 The boom shall be carried in line with the direction of travel.

6.3.20.2 The superstructure shall be secured against rotation except when making turns to avoid obstructions.

6.3.20.3 The hook shall be secured.

6.3.20.4 The boom shall be kept as low as possible.

6.3.21 Two blocking is prohibited.

6.4 Rigging Practices

6.4.1 ANSI standard hand signals shall be used with mobile crane operations (Attachment D).

6.4.2 Rigging devices shall not be used in a manner that exceeds their rated capacity or lift angle at anytime.

6.4.3 Rigging devices shall not be spliced together.

6.4.4 Loads shall be blocked and the pulling of slings from a resting load prohibited.

6.0 PROCEDURE (Continued)

6.4.5 The raising and lowering of loads attached with rigging devices shall be done slowly to remove all slack and determine stability of load and to avoid unnecessary stress to crane ropes and slings.

6.4.6 Rated load capacities shall be labeled on all rigging devices.

6.4.7 Knotted rigging devices shall not be used.

6.4.8 Each end of the rigging devices shall be firmly secured to prevent slipping through the hook.

6.4.9 Rigging devices shall be protected against weather, incompatible chemicals and high temperatures.

6.4.10 Rigging devices shall be stored properly and in designated areas.

6.4.11 Rigging devices shall be protected from sharp objects and corners.

6.4.12 Damaged rigging devices shall be removed from service and discarded.

6.4.13 Hands and fingers shall be kept from between the rigging devices and the load.

6.4.14 Rigging devices shall have suitable characteristics to the environment being used in.

6.4.15 Rigging devices shall be identified as to capacity.

6.4.16 All personnel shall be kept clear of loads during lifting and while loads are suspended.

7.0 APPLICABLE DOCUMENTS

7.1 29 CFR 1910.179, "Overhead and Gantry Cranes"

7.2 DOE Hoist and Rigging Manual

8.0 FORMS USED

8.1 "Record of Daily Hoist Check Sheet", FMPC-OS&H-2423

8.2 "Monthly Check Sheet Ropes, Chains, Hooks, and Slings", FMPC-PRO-2445

8.3 "Hoist Check Sheet", FMPC-PRO-2163

9.0 ATTACHMENTS

9.1 Attachment A, "Record of Daily Hoist Check Sheet"

9.2 Attachment B, "Monthly Check Sheet Ropes, Chains, Hooks, and Slings"

9.3 Attachment C, "Hoist Check Sheet"

9.4 Attachment D, "Standard Hand Signals Used With Mobile Crane Operations"

ISH-S-10	Date: 03-20-89	Rev: 0

ATTACHMENT ONE

FMPC

OPERATIONS SAFETY & HEALTH DEPARTMENT - FIRE & SAFETY SUBSECTION

RECORD OF DAILY HOIST CHECK

INSTRUCTIONS:

1. When starting a new hoist check sheet at the beginning of a month, record the hoist's use and location (Plant or building and area)
2. Make a daily check of the hoist's parts and record an OK for satisfactory or an NG (Not Good) for unsatisfactory in the appropriate columns as follows:
   (1) Operate hoist to see if limit switch(es) are in operating order.
   (2) Examine hoist cables to see if there are broken wires. Six or more in one rope lay are too many and would require the entry of an "NG".
   (3) Inspect hook and lifting device(s) to see if they are cracked or damaged.
   (4) Check the operation of the safety latch.
   (5) Record any appropriate remarks, particularly if hoist has an unsatisfactory condition.
   (6) Date, record clock number, and initial the entry.

Notify foreman immediately of any condition which makes hoist unsafe. Return to Operations Safety & Health after sheet has been completed.

FMPC-OS&H-2423 (REV 4/7/88)

HOIST USAGE AND NUMBER	HOIST LOCATION.

DATE	LIMIT SWITCHES	HOIST CABLES	HOOK	LIFTING DEVICES	SAFETY LATCH	SHIFT INITIALS 1	2	3	REMARKS

NO.	DISTRIBUTION OF COPIES
1	Fire & Safety Subsection (RECORD COPY)
2	Supervisor

DATE.

LAST PMP: ______________ NEXT SCHEDULED PMP: ______________

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ATTACHMENT TWO

FMPC

MAINTENANCE SECTION

MECH PMP-15B

MONTHLY CHECK SHEET
ROPES, CHAINS, HOOKS, AND SLINGS

Equipment Name & Location: ______________________

Equipment I.D.: ______________ Inspected by (Clock No.): ______________ Date: ______________

(√) OK Adjustment made; (O) Needs further attention, see Remarks; (NA) Not applicable.

ITEM	(√)	REMARKS	ITEM	(√)	REMARKS
Wire Rope Cable			**Wire Rope Slings**		
Corroded or broken wires at end of connections			Capacity identification		
Corroded, cracked, bent, worn or improperly applied end connections			End connections for excessive wear		
Severe kinking, crushing, cutting or unstranding			Wire wear		
Broken wire & degree of distribution[1]			Broken wires[10]		
Worn outside wires[2]			Kinking or crushing		
Reduction of rope diameter[3]			Reduction of rope diameter		
Welded Link Chain			Heat damage		
Clean free of rust			Corrosion		
Gouges & nicks			**Chain Slings**		
Distorted links			Distortion links interfering with proper fuction		
Cracked or broken links			Excessive wear or twist[11]		
Lubrication			Deformed attachments (see limits on hooks above)		
Stretching[4]			**Metal Mesh Slings**		
Twist			Capacity identification		
Corrosion			Sling edge		
Roller Link Chain			Reduction in wire diameter (limit 25%)		
Elongation under load (450 lbs.)[5]			Corrosion (limit 15%)		
Twist[6]			Handle distortion (limit 10%)		
Side bow[7]			**Nat. and Syn. Rope Slings**		
Pins			Capacity identification		
Rollers			Wear		
Link plates			Broken or cut fibers		
Corrosion			Burns or charring		
Gouges & nicks			Rusting		
Clean			Hardware distortion		
Lubrication					
Hooks					
Cracks					
Deformation[8]					
Twist[9]					
Safety latches					

References:

[1] See Table 1 (in one rope lay).

[2] Limit - outside wear in excess 33%.

[3] Limit - 1/64" to 5/16" & 1/32" to 1/2" & 3/64" from 9/16" to 3/4".

[4] 1 1/2% elongation (notify foreman).

[5] 1/4" in 12".

[6] Excess of 15 degrees in five feet.

[7] Limit 1/4" in five feet.

[8] See Table 2, not more than 15%.

[9] Not more than 10 degrees.

[10] See Table 5, not more than 6 in one rope lay or 3 broken wires in one strand in one rope lay.

[11] See Table 2.

Signed & Dated Production Daily Hoist Check Sheet ☐ Yes

Approved for Continued Service ☐ Yes; ☐ No.

COMMENTS:

HOURS ______________
EACH MAN

FMPC-PRO-[illegible] (REV. [illegible])

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ISH-S-10	Date: 03-20-89	Rev: 0

ATTACHMENT THREE

FMPC
MAINTENANCE SECTION

MECH PMP - 15A1

HOIST CHECK SHEET

Equipment Name & Location: ______________________

Equipment I. D.: ______________ Inspected by (Clock No.): ______________ Date: ______________

(√) OK; (X) Adjustment made; (O) Needs further attention, see Remarks.

ITEM		REMARKS
MECHANICAL:		
Visual Check of Wire Rope		
Twisting, wear, kinking, corrosion, broken wires, broken strands, crushing		
Reduction of rope diameter		
Cracked, bent, or worn end connections		
Chains Roller & Link		
Distorted or worn links		
Corrosion, cracks		
Reduction of Pitch		
Cracked, bent, or worn end connections		
Hooks		
Corrosion, cracks		
Load block & sheaves		
Safety latches		
Throat opening		
Drums(Wire Rope)		
Flanges & groves		
Sprocket & teeth		
Shaft & bearings		
Brush & switches		
Suspensions		
Bent, cracked, or corroded structural members		
Rivets, nuts, bolts		
Worn or cracked pins, sheaves, wheels, rollers, railstops, track surface		

ITEM		REMARKS
ELECTRICAL:		
Pendant Hoist		
Box		
Chain Suspension		
Button Assembly		
Wiring		
Insulators		
Connections		
Fasteners		
Trolley		
Cable Reel		
Collectors		
Buss Bars		
Shoes or Rollers		
Conduit rigid, flexible		
Wiring & Connections		
Fasteners, supports		
Insulators		
Hoist		
Hoisting		
Wiring		
Gears, bearings		
Pins, screws, keys		
Limit switches		
Magnetic brake		
Lubrication		
Gear case		
Grease fittings		
Wheels		
Wire rope		

Approved for Continued Service ☐ Yes; ☐ No.

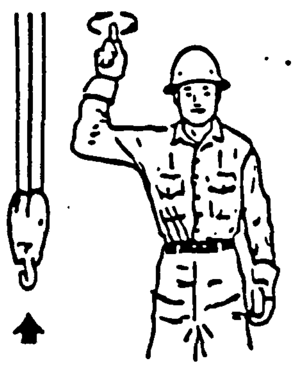
Signed & Dated Production Daily Hoist Check Sheet ☐ Yes

COMMENTS:

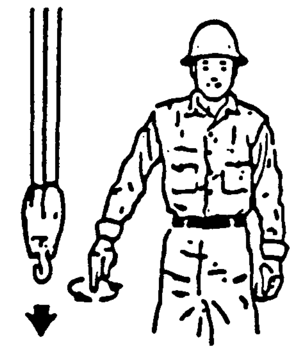
HOURS ______________
EACH MAN

FMPC-PRO-3153(REV. 4/22/86)

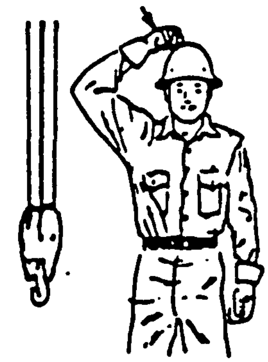
ATTACHMENT FOUR



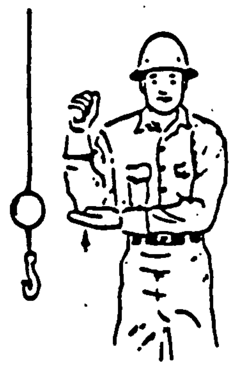
HOIST. With forearm vertical, forefinger pointing up, move hand in small horizontal circles.



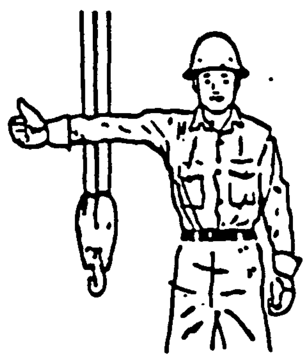
LOWER. With arm extended downward, forefinger pointing down, move hand in small horizontal circles.



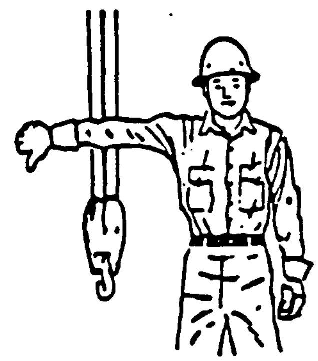
USE MAIN HOIST. Tap fist on head; then use regular signals.



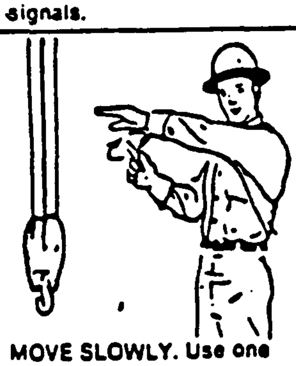
USE WHIPLINE (Auxiliary Hoist). Tap elbow with one hand, then use regular signals.



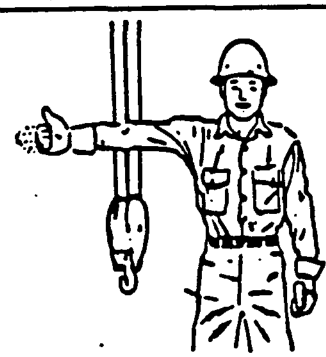
RAISE BOOM. Arm extended, fingers closed, thumb pointing upward.



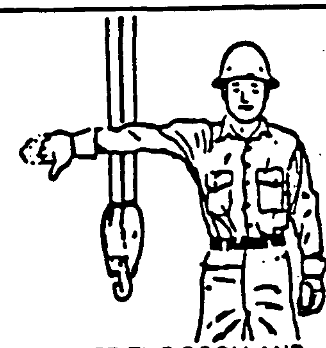
LOWER BOOM. Arm extended fingers closed, thumb pointing downward.



MOVE SLOWLY. Use one hand to give any motion signal and place other hand motionless in front of hand giving the motion signal. (Hoist slowly shown as example.)

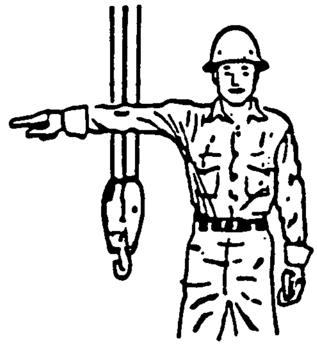


RAISE THE BOOM AND LOWER THE LOAD. With arm extended, thumb pointing up, flex fingers in and out as long as load movement is desired.

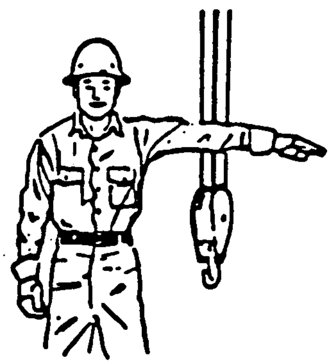


LOWER THE BOOM AND RAISE THE LOAD. With arm extended, thumb pointing down, flex fingers in and out as long as load movement is desired.

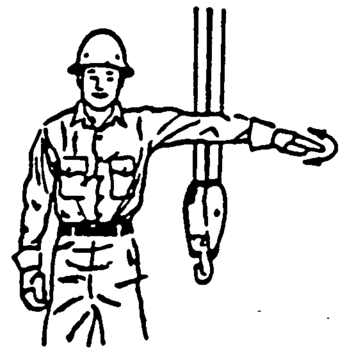
ATTACHMENT FOUR (Page 2)



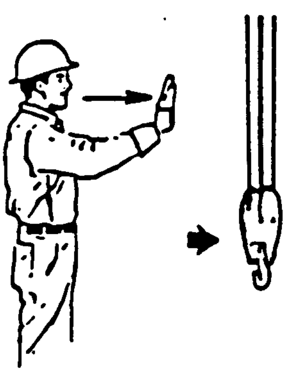
SWING. Arm extended point with finger in direction of swing of boom.



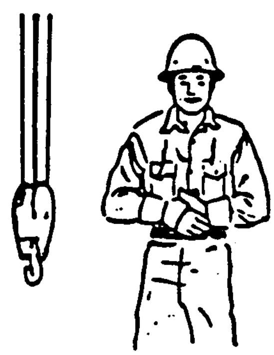
STOP. Arm extended, palm down, hold position rigidly.



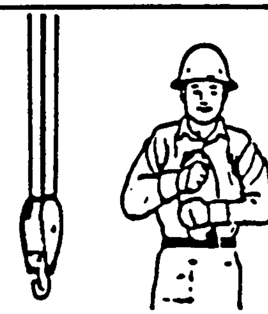
EMERGENCY STOP. Arm extended, palm down, move hand rapidly right and left.



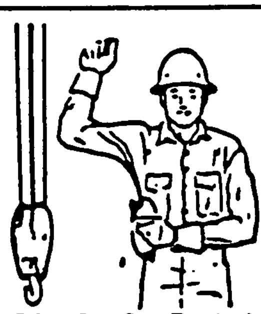
TRAVEL. Arm extended forward, hand open and slightly raised, make pushing motion in direction of travel.



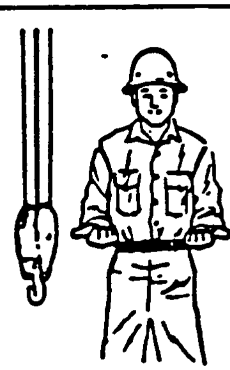
DOG EVERYTHING. Clasp hands in front of body.



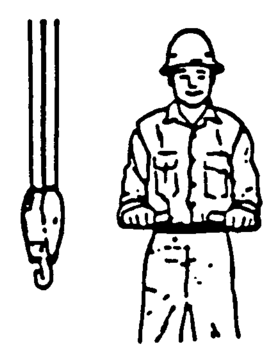
TRAVEL (Both Tracks). Use both fists in front of body, making a circular motion about each other, indicating direction of travel; forward or backward. (For land cranes only.)



TRAVEL. (One Track). Lock the track on side indicated by raised fist. Travel opposite track in direction indicated by circular motion of other fist, rotated vertically in front of body. (For land cranes only).



EXTEND BOOM (Telescoping Booms). Both fists in front of body with thumbs pointing outward.



RETRACT BOOM (Telescoping Booms). Both fists in front of body with thumbs pointing toward each other.

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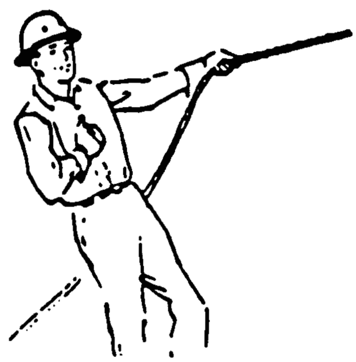
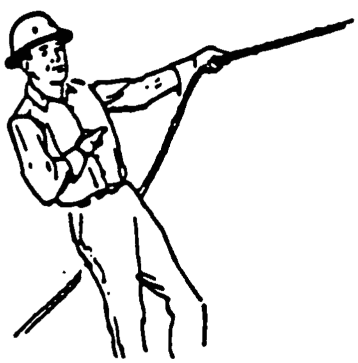
ATTACHMENT FOUR (Page 3)



EXTEND BOOM (Telescoping Boom). One Hand Signal. One fist in front of chest with thumb tapping chest.



RETRACT BOOM (Telescoping Boom). One Hand Signal. One fist in front of chest, thumb pointing outward and heel of fist tapping chest.

ISSUE AND REVISION RECORD

DATE OF CHANGE	REVISION NUMBER	AFFECTED PAGES	REASON FOR CHANGE
	0		Original issue of the procedure

Attachment 4

ATTACHMENT 4
QUALITY ASSURANCE PROJECT PLAN

PILOT PLANT SUMP
REMOVAL ACTION NO. 24 WORK PLAN
[ABANDONED SUMP WEST OF PILOT PLANT]

Fernald Environmental Management Project

October 1992

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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
EPA	U.S. Environmental Protection Agency
FEMP	Federal Environmental Management Project
OEPA	Ohio Environmental Protection Agency
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
SAP	Sampling and Analysis Plan
SCQ	Site-Wide CERCLA Quality Assurance Project Plan

1.0 INTRODUCTION

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

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

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

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

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

2.0 PILOT PLANT SUMP REMOVAL ACTION HISTORY

The FEMP site personnel had noted recently that the level of liquid was rising and falling in the temporary sump, which was installed for service from 1968 through 1970 to serve the Pilot Plant floor drain system while the main sump was being refurbished. This was subsequently reported to regulatory authorities as a potential release to the environment. The liquid in the sump is ignitable, has pH of 3, contains heavy metals, and radioactive thorium and uranium. The sump was determined to be a hazardous waste management unit and is included in the Part A Permit application as the Abandoned Sump West of Pilot Plant.

To reduce the threat to human health and safety, and lower the risk of damage to the environment, sources of contamination must be minimized to the maximum extent possible. In order to accomplish this, the sump and its contents must be removed, along with as much of the liquid content of the drainage system as possible under the Pilot Plant, and the line leading from the plant to the sump capped. Determining the actual current configuration of the drainage system under the plant is required to properly plan for the most effective removal. The actions associated with removal of the sump are described in Section 4.0 of the work plan.

3.0 APPLICABLE SCQ REQUIREMENTS FOR THE PILOT PLANT SUMP REMOVAL ACTION

The Pilot Plant Temporary Sump 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 characterization and documentation of the drain system and actual removal of the sump and its contents. Pertinent sections which shall govern the Pilot Plant sump removal action are as follows:

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

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

3.1 PROJECT DESCRIPTION

The FEMP project description is as defined in Section 2 of the SCQ. In addition, Section 2.0 of this Quality Assurance Project Plan defines this project. Project objectives and schedule are stated in the Removal Action Work Plan Sections 1.0, 2.2, and 3.2.

3.2 PROJECT ORGANIZATION AND RESPONSIBILITY

The project description is as defined in Section 3 of the SCQ. The Pilot Plant sump removal action organization and responsibilities are included in Section 3.1 of the Removal Action Work Plan.

3.3 QUALITY ASSURANCE OBJECTIVES

The removal action quality assurance objectives are found in Section 4 of the SCQ. Specifically, the removal task will address controls on planning, implementation, and assessment of removal action activities with emphasis on training, records administration, document control, sampling, chain of custody, instrument calibration and preventive maintenance, corrective actions, DQO, data accuracy, precision, completeness, representativeness and comparability, and surveillance/audits. The data generated shall be of known quality and in compliance with the selected data quality objectives. Additional sampling and analysis objectives are defined in Section 6.1 of the Sampling and Analysis Plan (SAP). All personnel working on this task shall be trained in accordance with Subsection 4.4.1 of the SCQ as defined in Section 3.3 of the work plan. Records administration will be in accordance with Subsection 4.4.2 of the SCQ. Document control shall be in accordance with Subsection 4.4.3.

3.4 FIELD ACTIVITIES

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

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

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

3.5 SAMPLING REQUIREMENTS

Sampling requirements on the Pilot Plant Temporary Sump removal action shall be performed in accordance with Section 6 and Appendix K of the SCQ. These requirements shall be referenced in the Task SAP along with the task specific sampling procedures required to meet the removal action data needs. Section 6.0 of the Removal Action Work Plan contains the SAP which includes:

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

3.6 SAMPLE CUSTODY

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

3.7 CALIBRATION PROCEDURES AND FREQUENCY

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

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

3.8 ANALYTICAL PROCEDURES

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

3.9 INTERNAL QUALITY CONTROL CHECKS AND FREQUENCY

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

3.10 DATA REDUCTION, VALIDATION AND REPORTING

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

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3.11 PERFORMANCE AND SYSTEM AUDITS

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

3.12 PREVENTIVE MAINTENANCE

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

3.13 CORRECTIVE ACTIONS

Corrective actions will be in accordance with SCQ Section 15.

3.14 QUALITY ASSURANCE REPORTS TO MANAGEMENT

Project reports will be in accordance with SCQ Section 16.

4.0 REFERENCES

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

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

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Attachment 5

264-A

ATTACHMENT 5
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

PILOT PLANT SUMP
REMOVAL ACTION NO. 24 WORK PLAN
[ABANDONED SUMP WEST OF PILOT PLANT]

Fernald Environmental Management Project

October 1992

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ACRONYMS AND ABBREVIATIONS

AEA	Atomic Energy Act
ALARA	as low as reasonably achievable
ARAR	applicable or relevant and appropriate requirement
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
EDE	effective dose equivalent
EPA	U.S. Environmental Protection Agency
Fed. Reg.	Federal Register
FEMP	Fernald Environmental Management Project
FMPC	Feed Materials Production Center
HWMU	hazardous waste management unit
LDR	land disposal restriction
NAAQS	National Ambient Air Quality Standards
NCP	National Oil and Hazardous Substance Pollution Contingency Plan
NESHAP	National Emission Standards for Hazardous Air Pollutants
NRC	Nuclear Regulatory Commission
NSPS	New Source Performance Standards
O.A.C.	Ohio Administrative Code
OEPA	Ohio Environmental Protection Agency
O.R.C.	Ohio Revised Code
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
PACD	Proposed Amended Consent Decree

ACRONYMS AND ABBREVIATIONS (continued)

RCRA	Resource Conservation and Recovery Act
RPP	radiation protection program
SARA	Superfund Amendments and Reauthorization Act
TBC	To-Be-Considered
TCLP	Toxicity Characteristic Leaching Procedure
TSD	treatment, storage, or disposal
U.S.C.	U.S. Code

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1.0 INTRODUCTION

The removal of the Pilot Plant Temporary Sump is required under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) section 106 (42 U.S.C. [U.S. Code] § 9600 et seq., as amended by the Superfund Amendments and Reauthorization Act of 1986 [SARA]). Section 106 requires that a response action occur when there is imminent or substantial endangerment to the public health, welfare or environment because of an actual or threatened release of a hazardous substance. The removal action is also the subject of a Consent Agreement (the Agreement) between the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Energy (DOE). The Agreement, most recently amended in April 1991, establishes the framework for the Fernald Environmental Management Project (FEMP) environmental investigation and cleanup.

The closure of the Pilot Plant Temporary Sump 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 and from the Feed Materials Production Center (FMPC). The Proposed Amended Consent Decree (PACD) is currently being negotiated to reflect DOE's updated Consent Agreement with EPA. The latest PACD Draft 6 is dated December 4, 1990.

Pursuant to Section II, Paragraph 3.12 of the Consent Decree, DOE submitted a compliance schedule that identifies projected activities for newly identified hazardous waste management units (HWMUs). The Pilot Plant sump has been identified as an HWMU and is included in DOE's Resource Conservation and Recovery Act (RCRA) compliance schedule. The RCRA compliance schedule requires that Closure Plan Information and Data (CPID) be submitted for each HWMU identified in the RCRA Compliance Schedule. The CPID must identify the applicable or relevant and appropriate requirements (ARARs) for RCRA closure which will ultimately be evaluated during final remediation.

Removal of the sump is an interim action required to define the source of contamination, remove as much as possible for source control, determine the extent of the system, and attempt to determine if a release to the environment has occurred. It is not the intention to close this unit at this time. CPID will be submitted to OEPA on or before May 5, 1994, the original date provided OEPA in the Compliance Schedule. Removal of the sump is necessary to determine if the sump is still physically connected to the abandoned and covered drain system under the Pilot Plant. Should this be the case, the boundaries of the current unit may require redefinition. Additionally, removal of the sump may be necessary from a physical standpoint to allow proper and complete exploration of the inlet drain line and more effective removal of contamination from the system. Final remediation will be addressed in the Records of Decision for OU-3 and OU-5.

The scope of the Pilot Plant sump removal action is to reduce an immediate threat to human health and the environment. The criteria in Removal Action No. 17 Work Plan will be employed to determine the degree of remediation. Clean-up levels will not be identified in the ARARs for the Pilot Plant sump removal action. Final cleanup levels and corrective action will be identified in the OU-5 CERCLA Record of Decision.

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

The EPA defines "applicable" requirements as:

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

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

> cleanup standards, standards of control and other substantive environmental protection requirements, criteria or limitations promulgated under federal or

state law that while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance at a CERCLA site, addresses problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site (OSWER Directive 9234.1-01, August 8, 1988).

"To-be-Considered" documents (TBCs) should also be examined for a removal action. TBCs are nonpromulgated federal- or state-issued advisories or guidance which are not legally binding and thus, are 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. DOE Orders enumerate the authority granted to the DOE under the Atomic Energy Act (AEA) and play an important role at DOE facilities. Because these Orders are not promulgated, they are considered TBCs. The DOE Orders, however, are legally enforceable against DOE contractors and subcontractors.

This section identifies the ARARs required for the Pilot Plant sump removal action. Specific requirements pertaining to removal of the equipment and foundation, remediation of contaminated soils and groundwater, 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 the state standard is more stringent then the federal requirement (40 C.F.R. § 300.400[g][4]).

The specific types of ARARs evaluated for the Pilot Plant removal action 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 sump removal action, contaminant-specific ARARs address chemical and/or radionuclide contamination of the sump sludge/liquids, soil, groundwater, air, and equipment. The contaminant-specific ARARs evaluated for the sump 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 occur in specific locations. The location-specific ARARs identified for the sump 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 sump removal action are discussed in Section 5.0.

2.0 CONTAMINANT-SPECIFIC REQUIREMENTS

Contaminant-specific requirements are concentration limits for hazardous and radioactive substances which are established based upon their presence in various environmental media. The contaminant-specific ARARs pertinent to the sump removal action are summarized below.

2.1 FEDERAL REQUIREMENTS

The federal contaminant-specific requirements are enumerated in federal statutes and regulations, the United States Code (U.S.C.) and the Code of Federal Regulations (C.F.R.), respectively.

2.1.1 Resource Conservation and Recovery Act

The RCRA (42 U.S.C. § 6901 et seq.) requires that generators identify hazardous wastes and comply with standards for the transportation and management of hazardous waste at facilities which treat, store or dispose of hazardous waste. These standards are enumerated in regulations promulgated by the EPA (40 C.F.R. Parts 260, 262, 264, 268). Subtitle C, Hazardous Waste Management, mandates the creation of cradle-to-grave management and a permitting system for hazardous wastes. The RCRA defines hazardous waste as "solid waste" which because of its quantity, concentration, or physical, chemical or infectious characteristics may cause or significantly contribute to an increase in mortality or serious illness, or may pose a substantial hazard to human health or the environment when improperly managed (RCRA § 1004[5], 42 U.S.C. § 6903[5]). The OEPA was authorized to implement RCRA in the state of Ohio (RCRA § 3006, 42 U.S.C. § 1693). This authorization enables the OEPA and EPA to jointly regulate hazardous waste in the state of Ohio.

The RCRA is applicable or relevant and appropriate to the Pilot Plant removal action. Pursuant to the RCRA requirements, the EPA has promulgated regulations that identify and list hazardous wastes (40 C.F.R. Part 261). These implementing regulations categorize "hazardous wastes" in two different ways: by formal listing or by exhibiting a characteristic (40 C.F.R. § 261.3). These standards are contaminant-specific ARARs applicable or relevant and appropriate to the sump 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, then the waste must be managed as a RCRA hazardous waste. The liquid contained in the sump, and possibly the drainage pipe system, is a characteristic waste. The liquid has exceeded the TCLP concentration limits (40 C.F.R. § 261.24). In addition, the sludge/liquid may be an ignitable waste if the waste: 1) contains less than 24% alcohol by volume and 2) has a flash point less than 60°C (140°F) (40 C.F.R. § 261.21).

In addition to being a characteristic waste, the sludge/liquid contained in the sump pump and drainage system is a listed "F" waste, Nos. F002 and F003 (FEMP Material Evaluation Form No. 1229, November 1991). Wastes are listed as "F" wastes because they exhibit one or more characteristics of a hazardous waste, or the wastes contain specific components known to be toxic or otherwise hazardous at levels of regulatory concern. 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.

The EPA has also promulgated land disposal restriction regulations (LDRs) that establish concentration limits for the hazardous constituents of wastes (40 C.F.R. Part 268). The EPA has promulgated two sets of limits for LDRs: constituent concentrations in the waste extract (CCWE), which uses the TCLP test procedure to obtain a leached sample of the waste, and constituent concentrations in waste (CCW), which examines the total contaminant concentration in the waste. The LDRs are numerical values that designate whether a waste can be prohibited from land disposal. If the waste fails to meet the LDR concentration values, then the waste cannot be land disposed. The LDR values are technology-based standards established by EPA. Although these standards are not within the scope of the sump removal action, these standards will apply to the sump waste later when it is permanently disposed.

Table 2-1 enumerates the TCLP and LDR values for the constituents of concern at the Pilot Plant.

2.1.2 Clean Air Act

The Clean Air Act establishes a nationwide program for the control of hazardous air pollutants and other emissions. The EPA has been delegated the authority to establish

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

	RCRA TCLP Designation Limits in mg/L	RCRA Land Ban Limits		RCRA Corrective Action Levels (Proposed)[1/]	
		CCW in mg/kg	Nonwastewater CCWE in mg/l	Air in $\mu g/m^3$	Soil in mg/kg
Acetone	—	—	0.59[5/]	—	8,000
Arsenic	5	—	5.0	0.00007	0.80
Barium	100[2/]	—	100	—	4,000
Benzene	0.5[2/]	3.7[7/]	—	—	—
Cadmium	1.0	—	1.0	0.0006	40
Carbon Disulfide	—	—	4.81[5/]	—	8,000
Carbon Tetrachloride	0.5[4/]	—	0.96[5/]	0.03	5.0
Chlorinated Fluorcarbons	—	—	—	—	—
Chlorobenzene	100	—	0.05[5]	20	2,000
Chromium	5.0	—	5.0	0.00009	400
Cyclohexanone	—	—	0.75[5/]	—	—
Dichlorobenzene[3/]	7.5[4/]	—	0.65[5/,6/]	—	—
Ethyl Acetate	—	—	0.75[5/]	—	—
Ethyl Ether	—	—	0.05[5/]	—	—
Ethylbenzene	—	—	0.053[5/]	—	8,000
Lead	5.0[2/]	—	5.0	—	—
Mercury	0.2[2/]	—	0.20 (low-level)	—	20
Methyl Ethyl/Ketone	200	—	0.05[5/]	300	4,000
Methyl Isobutyl Ketone	—	—	0.33[5/]	70	4,000
Methylene Chloride	—	—	0.96[5/]	0.3	90
1,1,1-Trichloroethane	—	—	0.41[5/]	1,000	7,000
1,1,2-Trichloro-1,2,2-Trifluoroethane	—	—	0.96[5/]	—	—
1,1,2-Trichloroethane	—	7.6[7/]	—	0.6	100
Pyridine	—	—	0.33[5/]	—	80
Selenium	1.0	—	5.7	—	—
Silver	5.0	—	5.0	—	200
Tetrachloroethylene	0.7	—	0.079	1	10
Toluene	—	—	0.33[5/]	7,000	20,000
Trichloroethylene	0.7[4/]	—	0.091[5/]	—	60
Trichlorofluoromethane	0.5[4/]	—	0.96[5/]	—	—
2-Nitropropane	—	—	—	—	—
Xylene	—	—	0.15[5/]	1,000	200,000

CCWE = Constituent Concentration in Waste Extract, 40 C.F.R. § 268.41
RCRA = Resource Conservation and Recovery Act
TCLP = Toxicity Characteristic Leaching Procedure, 40 C.F.R. § 260.24
mg/L = milligrams per liter
mg/kg = milligrams per kilogram
$\mu g/m^3$ = micrograms per cubic meter
1/ RCRA Correction Action Levels are proposed standards and therefore are TBCs (40 C.F.R. Part 264, Subpart S); 55 Fed. Reg. 30798, July 27, 1990.
2/ Sample tested from sump exceeded the TCLP value for this contaminant.
3/ TCLP limit for 0-Dichlorobenzene.
4/ The analytical results provided for these chemicals may exceed the TCLP value. However, the concentration limit was below the instrument's detection limits. Further analysis is required to determine if the TCLP value has been exceeded.
5/ CCWE established because waste is an "F" listed waste.
6/ CCWE limit established for 1,2-Dichlorobenzene.
7/ CCW limit established because waste is an "F" listed waste.

National Ambient Air Quality Standards (NAAQS), National Emission Standards for Hazardous Air Pollutants (NESHAP), and New Source Performance Standards (NSPS)(40 C.F.R. Parts 50, 60, 61). No NSPS or NAAQS are applicable to the sump removal action because the removal action will not require air emissions from major stationary sources.

Under NESHAP, the EPA has established emission standards according to specific types of sources which emit particular types of pollutants. The DOE facilities that emit radionuclides are specifically regulated under 40 C.F.R. Part 61, Subpart H. The NESHAP sets the radionuclide emission standards for DOE facilities based upon each facility. Under 40 C.F.R. Part 60, Subpart H, the EPA has established the effective dose equivalent (EDE) for DOE facilities at 10 millirem/year (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 sump 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 establishes standards for the protection of persons against radiation in restricted and unrestricted areas (56 Fed. Reg. [Federal Register] 23360, May 21, 1991). The regulations require NRC-licensed facilities to establish a radiation protection plan that combines meeting the enumerated dose standards with maintaining radiation exposures as low as reasonably achievable (ALARA) to provide the greatest degree of protection from radiation.

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 I provides requirements for labeling of containers which store radioactive waste. If a radioactive substance stored in a container exceeds specified radioactive concentration limits, then the container must be labeled. These concentration limits are enumerated in Appendix C and Appendix B, Table 3 of the regulations. The sump sludge/liquid exceeds the concentration limits for Uranium-232 and Thorium-232, and therefore should be stored as specified in the NRC regulations.

2.1.4 Occupational Safety and Health Administration Standards

The Occupational Safety and Health Administration (OSHA) regulations enumerate standards in 29 C.F.R. Part 1910, Subpart Z for occupational exposure to toxic and hazardous air contaminants. Tables Z-1-A and Z-2 in the regulations specify eight-hour time-weighted averages and short-term exposure limits for hundreds of toxic and hazardous air contaminants. It is anticipated that the removal action, under anticipated operating conditions, will not exceed any of the air contaminant concentrations specified in this regulation.

2.2 STATE OF OHIO REQUIREMENTS

State contaminant-specific requirements are enumerated in statutes and regulations, the Ohio Revised Code (O.R.C.) and the Ohio Administrative Code (O.A.C.), respectively.

2.2.1 State Hazardous Waste Management Regulations

The EPA has authorized the OEPA to implement RCRA in the state of Ohio. As part of this authorization, the OEPA has developed a state-specific hazardous waste management program (O.A.C. 3745-50 et seq.). These regulations are applicable to the sump removal action. Generally, the state hazardous waste regulations parallel the federal regulations. The state definition of "hazardous waste" incorporates the EPA definition (O.A.C. 3745-51-10). Under the Ohio regulations, a waste is hazardous if it is specifically listed or if the waste exhibits characteristic properties of reactivity, ignitability, corrosivity or toxicity (O.A.C. 3745-51-20).

The sludge/liquid contained in the sump exhibits the characteristic of ignitability under the Ohio and EPA regulations if it: 1) contains less than 24% alcohol by volume, and 2) has a flash point less than 60°C (140°F) (O.A.C. 3745-51-21[A][1], 40 C.F.R. § 260.21). The sludge/liquid also contains contaminants which exceed the TCLP limits under the Ohio and federal regulations. The Ohio regulations incorporate some of the TCLP values found in the federal regulations which are enumerated in Table 2-1 (O.A.C. 3745-51-24, Table 1). In addition, the OEPA regulations enumerate listed wastes (O.A.C. 3745-51-31). Because the sump waste is an "F" listed waste, these regulations apply.

2.2.2 Air Quality

The Ohio Department of Health (Department of Health) has promulgated a nondegradation policy for air quality that requires air quality to be maintained for areas achieving primary and secondary air quality standards. The regulations are not source-specific and require that no deterioration of air quality occur (O.A.C. 3745-17-05). The Ohio regulations require that total suspended particulates not exceed 150 $\mu g/m^3$, 24-hour average concentrations and 50 $\mu g/m^3$, annual arithmetic mean (O.A.C. 1745-17-02). This nondegradation policy is applicable to the removal activities, however it is anticipated that the activities will comply with this standard.

The OEPA requires that lead air emissions not exceed a maximum arithmetic mean of 1.5 $\mu g/m^3$ during any calendar quarter (O.A.C. 3745-71). This regulation is applicable to the removal action because the sludge/liquid contains high concentrations of lead. However, it is anticipated that the 1.5 $\mu g/m^3$ standard will not be exceeded.

2.2.3 Radiation Protection

The Department of Health established rules for the protection of workers and the general public from overexposure to radiation (O.A.C. 3701-38). Because federal facilities subject to the AEA are exempt, these regulations are relevant and appropriate to the sump removal action. The radiation protection rules are similar to NRC's regulations (prior to promulgation of NRC's new rules in May 1991) protecting workers and the general public from radiation exposure.

The Department of Health requires that occupational workers in restricted areas not receive a dose in excess of the following values: 18 ¾ rem/quarter to the hands and forearms or feet and ankles; 1 ¼ rem/quarter to the whole body, head and trunk, organ or lens of the eye; and 7 ½ rem/quarter to the skin (O.A.C. 3701-38-11). The regulations also enumerate derived air concentration (DAC) values for radioactive material in restricted areas (O.A.C. 3701-38-13[d]). Finally, the Ohio regulations require that exposure to radiation in unrestricted areas shall not exceed a dose of 2 mrem/hr or 100 mrem/7 consecutive days. Exceedances of these levels may be granted if radiation exposure will not exceed a dose to the whole body of 0.5 rem/yr (O.A.C. 3701-38-15).

3.0 LOCATION-SPECIFIC REQUIREMENTS

Location-specific ARARs are restrictions on the concentration levels of hazardous substances or the conduct of activities solely because the substance or activities occur in specific locations. Some examples of special locations include floodplains, wetlands, historic places and sensitive ecosystems or habitats. The sump hazardous waste management unit is not located in any of the aforementioned specified areas.

3.1 O.A.C. 3745-66-76—SPECIAL REQUIREMENTS FOR IGNITABLE OR REACTIVE WASTES

The OEPA has established special requirements for location of containers which store ignitable or reactive wastes. Because the sludge/liquid may be an ignitable waste, this regulation is relevant and appropriate. The regulation requires that containers holding ignitable waste be located at least 50 ft from the facility's property line.

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 removal action outlined in Sections 2.2 and 4.1 of the work plan.

4.1 FEDERAL REQUIREMENTS

4.1.1 Comprehensive Environmental Response, Compensation, and Liability Act

The CERCLA and the EPA regulations implementing CERCLA under the NCP, 40 C.F.R. Part 300, require the selection of an appropriate removal action. Generally, a removal action is taken to abate, prevent, minimize, stabilize, mitigate or eliminate the release or threat of release of hazardous constituents. The removal action must to the extent practicable attain all ARARs under federal and state environmental laws. For removal actions, however, the urgency of the situation and the scope of the removal action dictate the extent with which ARARs must be complied. 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 sump activities:

- Fences, warning signs, or other security or site control precautions—necessary where humans or animals may have access.

- Capping of contaminated soils or sludges—necessary to reduce migration of hazardous substances or pollutants into soil, groundwater or air.

- Use of chemical treatment to retard the spread of released contaminants—necessary where use of chemical treatment will reduce the spread of the released contaminants.

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

- Removal of bulk containers that contain hazardous substances—necessary to reduce likelihood of spillage, exposure to humans and the environment and fire or explosion.

- Containment, treatment, disposal or incineration of hazardous materials—necessary to reduce likelihood of exposure to humans or the environment. (40 C.F.R. § 300.414[d]).

The planned sump removal 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, require that when a reportable quantity of a hazardous substance is released into the environment, the DOE must notify the National Resource Center. The reportable quantities for hazardous substances are enumerated in 40 C.F.R. §§ 302.4 and 302.5. Notification requirements are enumerated in 40 C.F.R. § 302.6. After removing the sump, the DOE plans to determine if the sump has released hazardous substances into the environment. If hazardous substances have been released in reportable quantities specified in the regulations, the DOE will need to notify the National Resource Center.

4.1.2 Atomic Energy Act

The AEA (42 U.S.C. § 2011 et seq.) establishes the framework for the federal government to control atomic energy and source, special nuclear and by-product materials. The sump sludge/liquid is probably source material under the AEA because the sludge/liquid contains uranium and thorium in concentration greater than .05%. The radioactive component of the sludge/liquid must be managed according to the requirements of the AEA.

4.1.3 Resource Conservation and Recovery Act

The RCRA and EPA regulations implementing RCRA enumerate numerous action-specific requirements that may be ARARs for the sump removal action. Under RCRA, the EPA and its authorized states have the authority to regulate the hazardous component of a mixed waste management stream. Although RCRA § 1004(27) excludes "source, special nuclear and by-product material" from RCRA management, the EPA has concluded that RCRA § 1004(2) excludes only the radioactive portion of the mixed waste from RCRA management.[1/] Therefore, the hazardous components of the sump sludge/liquid and any other mixed waste at the sump are subject to the RCRA hazardous waste management regulations. The RCRA is relevant and appropriate to the sump removal action.

The sump and drainage pipe will not be subject to the RCRA disposal requirements if these items are determined to be "empty." A container is "empty" under 40 C.F.R. § 261.7 if the following criteria are met:

a) All wastes have been removed that can be removed using the practices commonly employed to remove materials from that type of container, e.g., pouring, pumping and aspirating; and

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1 51 Fed. Reg. 24504, July 3, 1986;
53 Fed. Reg. 37045, September 23, 1988.

b) No more than 2.5 cm (1 in.) of residue remain on the bottom of the container; or

c) (i) No more than 3% by weight of the total capacity of the container remains in the container if the container is less than or equal to 100 gallons; or

(ii) No more than 0.3% by weight of the total capacity of the container remains in the container if the container is greater than 100 gallons in size (O.A.C. 3745-51-07[B][1]).

If the sump and drainage pipe meet the definition of "empty," then these items will not need to be managed as a hazardous waste.

The treatment, storage and disposal (TSD) facility requirements should be considered in planning the storage of the sump hazardous waste and closure of the HWMU. Although final treatment and disposal of the hazardous waste is not within the scope of this project[2/], the TSD requirements for storage and closure should be considered. In addition, because the sump and its equipment will be decontaminated prior to transport and the contaminated sludge will be treated and stored on site, the RCRA transportation regulations will not be applicable to the sump removal action. Other general TSD requirements and storage standards are relevant and appropriate to the storage of the hazardous wastes present in the sump.

The TSD regulations for interim status facilities in 40 C.F.R. Part 265 are relevant and appropriate to the management of hazardous components of waste from the sump. The interim status rules are relevant and appropriate because the FEMP TSD facilities have applied for RCRA Part A and Part B permits. Subpart B requires that a TSD facility analyze the waste before treatment, storage or disposal. In addition, TSD facilities must provide adequate security, inspections, personnel training and take special precautions for ignitable wastes and incompatible wastes. Subpart E enumerates record keeping requirements for all hazardous wastes stored, treated or disposed at the TSD facility. Subpart F specifies requirements for conducting groundwater monitoring for releases of solid waste from the management units.

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2 The requirements for final disposal and treatment are set forth at 40 C.F.R. Part 264, Subparts K, L, M, N, O, W, and X, and 40 C.F.R. Part 268.

Subpart G enumerates the interim status closure requirements for hazardous waste management units. The Pilot Plant sump has been identified as an HWMU in the DOE Consent Decree with OEPA. The RCRA closure requirements are relevant and appropriate to the closure of the sump. The regulations require that an HWMU be closed in a manner which minimizes the need for further maintenance and controls, minimizes or eliminates that threat to human health and the environment. (40 C.F.R. § 265.111). The regulations also require that all contaminated equipment, structures and soils be properly disposed of or decontaminated prior to closure (40 C.F.R. § 265.114). The CPID is included in the work plan to address the RCRA requirements.

Because the sludge/liquid from the sump will be stored in a container to await treatment and permanent disposal, the EPA regulations in 40 C.F.R. Part 265, Subpart I, are relevant and appropriate to the removal action. The EPA 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. The regulations also require that containers be inspected weekly and that the storage area have a secondary containment system that is designed to contain leaks and spills, is sloped to facilitate drainage, has sufficient capacity to contain 10% of the volume of containers, and prevents run-on into the containment system. Finally, the regulations require that ignitable waste be located at least 50 ft from the property line.

Subpart J enumerates standards for storing hazardous waste in tanks at TSD facilities (40 C.F.R. § 265.191 to 265.199). These standards are relevant and appropriate if the hazardous waste from the sump will be stored in a tank.

In addition to TSD requirements, the RCRA regulations also enumerate analytic methods for determining whether a waste is hazardous. The appendices to 40 C.F.R. Part 261 specify methods for conducting sampling and analysis to determine TCLP exceedances. These methods are relevant and appropriate to performing sampling and analysis during the removal action.

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

The EPA has established LDRs for certain listed and characteristic wastes. The sump sludge/liquid is prohibited from land disposal because it is a mixed waste which is ignitable, it exceeds the CCWE values for lead and mercury and is a listed "F" waste. 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 sludge/liquid or any other mixed waste from the sump is subject to this one-year requirement.

The one-year storage requirement may be avoided based upon EPA'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 EPA 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 EPA grants this extension, the DOE will want to ensure that the LDR variance covers mixed waste stored on site at the FEMP TSD facilities.

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 sump removal action. The NRC regulations require that personnel in restricted areas be monitored when they are likely to receive a dose in excess of 10% of the NRC standard (10 C.F.R. § 20.1502). Second, the regulations require that caution signs, labels, signals and controls be provided in radiological areas and on radioactive-contaminated containers (10 C.F.R. § 20.1601). Labels are not required if containers hold materials in quantities less than the limits listed in Appendix C or Table 3 of Appendix B of the regulations (10 C.F.R. § 20.1605). The radioactive concentration of the sump sludge/liquid for thorium and uranium exceeds the concentration requirements in the NRC regulations. Therefore, the containers should be labeled as radioactive waste. In addition, the sump, drainage pipe, and pump foundation which are also radioactively contaminated should be labeled and stored as radioactive wastes. Even if the waste does not exceed the concentration values in the NRC regulations, it is good management practice to label any materials that have been potentially contaminated. Subpart K specifies the requirements for disposal of radioactive waste.

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.

Under 10 C.F.R. Part 61, the NRC specifies standards for the design of low-level radioactive waste disposal facilities. The regulations require that radioactive waste 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 wastes from the sump.

4.1.6 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 sump 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.

The requirements of 29 C.F.R. Part 1926 applicable to the sump 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 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 treatment and storage of hazardous and radioactive wastes, and the closure requirements for the sump.

4.2.1 Ohio Hazardous Waste Management Regulations

The state of Ohio Hazard Waste Management Regulations are applicable to the sump removal 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 regulations are applicable to the sump removal action. Although final treatment and disposal of the hazardous waste is not within the scope of the removal action, the TSD requirements for storage of the hazardous waste are applicable. The sludge/liquid is a hazardous waste because it has failed the TCLP test. The sump's equipment and drainage pipe once treated, however, will probably not be a hazardous waste. The residues of hazardous waste that remain in the sump are not subject to the hazardous waste regulations if the sump pump is "empty" (O.A.C. 3745-51-07[1]). If the sump meets this definition of "empty," then it will not need to be managed as a hazardous waste.

Because the sump sludge/liquid is a hazardous waste, the waste must be managed in accordance with the Ohio TSD requirements. The FEMP TSD facility where the sump pump waste will be stored is an interim status facility which has applied for RCRA Part A and Part B permits. The interim status TSD facility standards are specified in O.A.C. 3745-65. Before storage, the sludge/liquid will need to be analyzed to determine that it is a 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. If the waste is determined to be ignitable, then special requirements for ignitable waste must be met. The ignitable waste must be separated and protected from sources of ignition: open flames, smoking, cutting, welding, hot surfaces, frictional heat, sparks, spontaneous ignition, and radiant heat (O.A.C. 3745-65-17[A]). The FEMP TSD facility must also comply with security, inspection, and personnel training requirements (O.A.C. 3745-65-14, -15, and -16).

The FEMP TSD facility must also comply with operational standards that require proper design, construction and maintenance of the facility; proper equipment and communication devices; proper testing and maintenance of equipment; adequate aisle space; and preparation of contingency plans (O.A.C. 3745-65-30 to 3745-65-56).

The 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 sump hazardous wastes.

The containers holding the waste 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 3745-66-75). Finally, if the sludge/liquid is determined to be ignitable, the container storing the waste must be located at least 15 m from the facility's property line (O.A.C. 3745-66-76).

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. If the sludge/liquid from the sump is stored in a tank system, these regulations will apply.

Finally, the Ohio Hazardous Waste Management Regulations enumerate requirements for the closure of hazardous waste management units. The sump area is a "hazardous waste management unit" because the sump, its equipment pad, and underlying soil are "a contiguous area of land on or in which hazardous waste is placed." (O.A.C. 3745-50-10[46]) The sump was identified as a HWMU in the RCRA Part A and Part B permits and as such must comply with the substantive requirements of "Closure Requirements for Interim Status Facilities," O.A.C. 3745-66. The sump must be closed to minimize the need for further maintenance and to control and eliminate the escape of hazardous waste in protecting human health and the environment (O.A.C. 3745-66-11). The regulations require that a written closure plan be drafted. The closure plan must identify the following steps to achieve partial or final closure:

- Describe how the hazardous waste management unit will be closed

- Describe how final closure will be conducted and identify the operation that will remain unclosed during the active life of the facility

- Provide an estimate of the hazardous wastes to be stored on site and describe the methods to be employed during closure to treat, store, and dispose of the hazardous wastes

- Describe the steps needed to remove or decontaminate all hazardous waste and contaminated systems, components, structures and soils (e.g., procedures for cleaning equipment, methods for sampling and analysis of soil, and criteria for determining the extent of decontamination necessary to close the facility)

- Describe other activities necessary to ensure closure complies with closure performance standards (e.g., groundwater monitoring, leachate collection and run-off control)

- Provide a schedule for closure of each hazardous waste management unit (O.A.C. 3745-66-12).

The CPID included in the work plan will be submitted to OEPA and EPA in lieu of the written Closure Plan under these regulations. The closure regulations require that all contaminated equipment structures and soil be properly disposed or decontaminated before closure (O.A.C. 3745-66-14).

4.2.2 Water 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).

4.2.3 Radiation Protection

The 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 (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.

5.0 TO BE CONSIDEREDS

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 sump removal 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 sump removal action. The DOE Orders, draft regulations and other TBCs are summarized below.

5.1 DOE ORDER 5000.3A—OCCURRENCE REPORTING AND UTILIZATION OF OPERATIONS INFORMATION (DRAFT)

The DOE Order 5000.3A requires the establishment of a comprehensive system for the reporting of operations information. The Order requires the reporting of safety, health, environment, operations, security and property related occurrences.

5.2 DOE ORDER 5400.1—GENERAL ENVIRONMENTAL PROTECTION PROGRAM

The DOE Order 5400.1 requires that an environmental protection program be established for DOE facilities to guarantee compliance with applicable federal, state and local environmental protection laws and regulations. Chapter I enumerates the federal regulations, laws and executive orders with which DOE facilities must comply. Chapter II identifies the requirements for notification of environmental occurrences and for routine reporting of significant environmental protection information. Chapter III requires that an environmental protection program plan be drafted. Chapter IV enumerates requirements and guidance for environmental monitoring programs for ambient air, radiological, water, and groundwater.

5.3 DOE ORDER 5400.3—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 sump removal area 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, shall not exceed an EDE of 100 mrem/yr. In addition, the Order adopts the NESHAP standard for radionuclide emissions from DOE facilities. Under this Order and 40 C.F.R. Part 61, Subpart H, the exposure to the public from all airborne radionuclide emissions shall not exceed 10 mrem/yr.

The DOE Order 5400.5 also requires that radionuclide exposure from all pathways remain as low as reasonably achievable. 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.

Another method for limiting the public's exposure to radiation is the establishment of derived concentration guides (DCGs) as part of a facility's environmental protection program. The DOE Order enumerates DCG values for radiation exposure from ingestion of water and inhalation of air.

Finally, the DOE Order 5400.5 provides guidance on the release of residual radioactive materials. Before radioactive materials are released, property must be surveyed to determine whether removable and total surface contamination meet the enumerated levels in Table 5-1. The limits apply to equipment and building components, but do not apply to the demolition of a building. Surface contamination of existing structures and

Table 5-1. Surface contamination guidelines. 3828

	Allowable Total Residual Surface Contamination (dpm/100cm^2)[1/]		
Radionuclides[2/]	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.

equipment at the Pilot Plant, which includes the sump, its equipment, the drainage system, and any equipment used to remediate the site, should comply with the surface contamination guidelines in Table 5-1.[3] If residual radioactive materials exceed the limits in Table 5-1, then such material must be managed as a low-level radioactive waste. The Order also establishes interim storage, interim management and long-term management for uranium, thorium and their decay products.

Residual radionuclides in soil must comply with generic guidelines for thorium and radium. Other radionuclides must comply with background concentration levels. The residual guidelines in soil for Radium-226, Radium-228, Thorium-230, and Thorium-232 must meet the following criterion: 5 pCi/g (over the first 15 cm of soil below the surface) and 15 pCi/g (over 15 cm-thick layers of soil more than 15 cm below the surface).

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.

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3 These limits are based upon the NRC standards in Section 4 of "Decontamination of Release for Unrestricted Use," Regulatory Guide 1.86.

- Internal and external exposure for the public entering controlled area must not exceed an EDE of 0.1 rem/yr.

- The DAC shall meet the requirements set forth in Attachment 1 of the Order and the water concentrations for radionuclides in drinking water shall comply with the maximum contaminant level requirements in 40 C.F.R. Part 141.

The Order requires that workers be monitored through personal dosimetry and bioassay programs to demonstrate compliance with the radiation protection standards. The workplace must be monitored through ambient air monitoring and radiation monitoring. All radioactive areas, materials and containers must be adequately identified.

As part of the contamination control program, the Order requires that equipment and materials contained in radiological areas be cleaned, as thoroughly as practical, before release into other controlled areas. The equipment used during remediation and the Pilot Plant sump and its equipment should comply with these DOE standards prior to transport from the area. Before release from the radiological area, the materials must meet the standards in Table 5-1.

The Order also requires that radiological areas be posted and radioactive material and containers be labeled. The signs and labels must conform with ANSI N12.1-1971 and ANSI N2.1-1971. Areas where the surface contamination levels are greater than 10 times those specified in Table 5-1 must be clearly marked as radiological areas.

An entry control program must also be established for radiological areas. Signs, barricades, control devices at the entrance, conspicuous visual or audible alarms and any other administrative procedures should be developed to ensure entry into the area is controlled. Step-off pads and protective clothing must be provided for entry to the contaminated area.

Finally, the Order requires the maintenance of records on dosimetry, monitoring and personnel training.

5.6 DOE ORDER 5481.1B—SAFETY ANALYSIS AND REVIEW SYSTEMS

The DOE Order 5481.1B 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 Pilot Plant removal action are specified in Sections 2.1.4 and 4.1.6.

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 sump 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.

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 sump. 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 facilities storage (Section 1324) should also be considered to ensure that the storage area in which the sump mixed or radioactive wastes 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 sump removal action, require that DOE contractors develop, implement, and conduct operations in accordance with a facility maintenance plan. This regulations would require that removal activities at the sump 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 child, minors and students, and members of the public entering a controlled area. In addition, the regulation specifies the requirements for nonuniform exposure of the skin and enumerates concentration levels for radioactive material in workplace air and water. The occupational limits for workers are as follows:
1) stochastic effects must not exceed 5 rem/yr and 2) nonstochastic effects must not exceed 15 rem/yr to the lens of the eye, 50 rem/yr to the whole body, and 50 rem/yr for any organ or tissue. The concentration levels for air and water in the workplace must comply with the DAC values in Appendices A and C of the proposed rule.

Subpart E requires that the workplace and individuals be monitored to comply with the radiation dose rates, to document radiological conditions in the workplace, to detect changes in radiological conditions, and to detect gradual build up of radiation in the workplace. The specific monitoring requirements for individuals and the workplace are contained in Sections 835.402 and 835.403, respectively. The rules also require monitoring of surface radioactive contamination. Table 5-2 enumerates the limits for removable and fixed surface contaminants. If contamination levels exceed the limits for removable surface contaminants enumerated in Table 5-2, ad hoc controls will be required to decontaminate the materials. The levels of fixed surface contamination in Table 5-2 may be exceeded in areas within buildings. Outside the radiological area, the levels can be exceeded only where protective measures are provided. Any area which exceeds the limits in Table 5-2 must post caution signs, must control entry, monitor personnel and provide protective clothing.

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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	RESERVED	RESERVED

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.

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Subpart F enumerates the requirements for an entry control program in radiological areas. Signs, barricades, control devises at the entrance, conspicuous visual or audible alarms and any other administrative procedures should be established to ensure entry into the area is controlled.

Subpart G requires radiological or potentially radiological areas and containers be posted and labeled. DOE must approve the signs and labels and the signs must be placed in a clear and conspicuous manner. Subpart H specifies that documents must be maintained to comply with the dose, monitoring, employee training and facility design controls required under these regulations.

Subpart I requires that exposure records be available to employees. Subpart J requires that occupational and radiation workers be adequately trained. Subpart K specifies that the facility design and controls be established to maintain exposure to radiation ALARA.

Subpart L enumerates the requirements for releasing materials and equipment from radiological areas for use in controlled areas. Equipment and materials shall not be released if they exceed the levels enumerated in Table 5-2 or if prior use suggests that the contamination levels on inaccessible surfaces exceed the specified levels. Contaminated equipment or materials that exceed the specified levels can be released temporarily from one radiological area to another if monitoring and control requirements are met. Records must be maintained describing the property, the date of the last monitoring operation, the identity of the person who performed the monitoring, the type and identification number of the instrument, and the results of the monitoring.

Subpart M specifies the requirements for accidental and emergency occupational exposure to radiation.

5.12 OHIO EPA 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 sump.

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5.13 OHIO EPA GUIDANCE—"CLOSURE PLAN REVIEW GUIDANCE"

The OEPA guidance identifies current interpretations of the Ohio regulatory requirements as they are applied to closure of HWMUs in Ohio. This guidance should be considered in identifying and conducting removal or decontamination of equipment and structures in and adjacent to the Pilot Plant sump and floor drain system.

6.0 CONCLUSION

Under the NCP, the EPA and the OEPA require that removal actions under CERCLA attain ARARs to the extent practicable under the circumstances. For removal actions, in determining whether attainment of ARARs is necessary, the agencies will examine the urgency of the situation and the scope of the removal action. In addition, CERCLA actions under § 121 (d)(4), which specifies requirements for remedial actions, provide six reasons to waive ARARs:

- The remedial action is an interim measure, where the final remedy will attain ARARs upon completion.
- Compliance will result in greater risk to human health and the environment than will other options.
- Compliance is technically impracticable.
- An alternative remedial action will attain the equivalent performance of the ARAR.
- For state ARARs, the state has not consistently applied (or demonstrated the intention to consistently apply) the requirements in similar circumstances.
- For CERCLA-financed actions under Section 104, compliance with the ARAR will not provide a balance between the need for protecting public health, welfare, and the environment at the facility, and the need for fund money to respond to other sites (this waiver is not applicable).

DOE will comply with ARARs unless determined otherwise by the OEPA and U.S. EPA pursuant to the Consent Agreement and Consent Decree signed by the parties.

Attachment 6

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ATTACHMENT 6
SOP 20-C-916 CLEANING SUMP SYSTEMS

PILOT PLANT SUMP
REMOVAL ACTION NO. 24 WORK PLAN
[ABANDONED SUMP WEST OF PILOT PLANT]

Fernald Environmental Management Project

October 1992

1.0 **PURPOSE**

The purpose of this document is to provide the procedure for cleaning sumps and sump systems.

2.0 **APPLICABILITY**

This procedure is applicable to all sump systems located at the FEMP.

3.0 **RESPONSIBILITIES**

3.1 Supervisors shall be responsible for the following:

3.1.1 Coordinating with support organizations when assistance is required.

3.1.2 Ensuring that sump systems are emptied in accordance with this procedure.

3.1.3 Ensuring that material removed from sumps and sump systems is disposed of in accordance with this procedure.

3.1.4 Ensuring that personnel are qualified per the established training requirements identified by the Department/Staff Manager.

3.1.5 Obtaining material and equipment required to clean sumps and dispose of removed material.

3.1.6 Contacting Industrial Hygiene or Radiological Safety to determine the appropriate respiratory protection and/or protective clothing/equipment required for the process being performed.

3.1.7 Issuing the required respiratory protection to operators.

3.1.8 Ensuring that empty rinse drums are cleaned and stored for reuse or disposition.

3.1.9 Obtaining and posting "Radiation Work Permits" and "Confined Space Entry Permits" when required.

3.1.10 Ensuring that work areas are surrounded by barriers when necessary.

3.1.11 Reviewing applicable "Material Safety Data Sheets" (MSDS) with operators.

3.1.12 Ensuring that sump liquid and sludge characterization has been performed prior to starting work.

3.0 **RESPONSIBILITIES** (cont.)

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.

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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.)

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.

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.

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.)

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"

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DAILY SUMP SYSTEM ACTIVITY VERIFICATION CHECKLIST

This set of checksheets comprise a document to provide daily verification of Procedural and Task or Project Specific Health and Safety Plan & SOP Compliance.

Work Location: ____________ **Sump System:** ____________ **Date:** ________

Activity of Day:

Content Removal ________ Purging ________

Closure ________ Dismantling ________

Work Crew Members:

Name:	Badge Number:

Cognizant Supervisor: ____________________ **Badge No.:** ________

Comments or Additions:

____

____

DAILY SUMP SYSTEM ACTIVITY VERIFICATION CHECKLIST
FIGURE 1

SUMP SYSTEM CONTENT REMOVAL - EQUIPMENT CHECKLIST

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 3828

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

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.	______

omments: ______________________________________

____

____

SUMP SYSTEM CONTENT REMOVAL - DRUM ACTIVITY COMPLETED CHECKLIST
FIGURE 4

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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):
EMPTY CONTAINER AT START
RUST HOLES OR DENTS
MATERIAL IS AS CODED
PROHIBITED MATERIALS
LIQUIDS IN CONTAINER
MINIMUM OF VOID SPACE
PACKAGE SECURED
DRAIN PLUG SECURED

PLANT | PROD. MBA
PLANT TO | MBA TO

WASTE DESCRIPTION AND COMMENTS

PACKAGE TYPE
PACKAGE SIZE

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):
EMPTY CONTAINER AT START
RUST HOLES OR DENTS
MATERIAL IS AS CODED
PROHIBITED MATERIALS
LIQUIDS IN CONTAINER
MINIMUM OF VOID SPACE
PACKAGE SECURED
DRAIN PLUG SECURED

PLANT | PROD. MBA
PLANT TO | MBA TO

WASTE DESCRIPTION AND COMMENTS

PACKAGE TYPE
PACKAGE SIZE

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):
EMPTY CONTAINER AT START
RUST HOLES OR DENTS
MATERIAL IS AS CODED
PROHIBITED MATERIALS
LIQUIDS IN CONTAINER
MINIMUM OF VOID SPACE
PACKAGE SECURED
DRAIN PLUG SECURED

PLANT | PROD. MBA
PLANT TO | MBA TO

WASTE DESCRIPTION AND COMMENTS

PACKAGE TYPE
PACKAGE SIZE

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

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

321-A

ATTACHMENT 7
ENGINEERING DATA
PROPOSED DRAIN LINE END CAP

PILOT PLANT SUMP
REMOVAL ACTION NO. 24 WORK PLAN
[ABANDONED SUMP WEST OF PILOT PLANT]

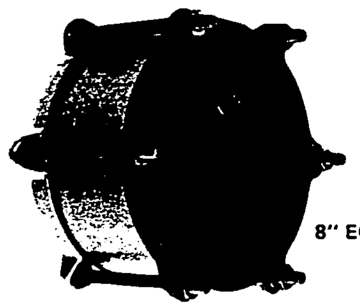
Fernald Environmental Management Project

October 1992

ROMAC INDUSTRIES, INC.

EFFECTIVE DATE 9/15/89

DUCTILE +PLUS STYLE "EC501" END CAP COUPLING



8" EC501 Complete

FOR TESTING OR CAPPING A PIPELINE

MATERIAL SPECIFICATIONS

CENTER RING: Ductile+Plus (ductile iron) exceeding ASTM A-536-80, Grade 65-45-12. Yellow shop coat.
END RINGS: Ductile+Plus (ductile iron) exceeding ASTM A-536-80, Grade 65-45-12. Color coded red for O.D. and standard weight steel, black and yellow for cast iron and A/C.
END CAP: Ductile+Plus (ductile iron) exceeding ASTM A536-80, Grade 65-45-12. Color coded black to be used with cast iron size 501 gasket. The end caps are furnished with 2" IPT female threads with plug.
GASKETS: Virgin SBR compounded for water service. Meets ASTM D2000 3 BA715. Other compounds available for oil, etc.
BOLTS and NUTS: High strength, low alloy steel track head bolts. National coarse rolled thread and heavy hex nuts, with black finish. Steel meets AWWA C-111-80 composition specifications. Other materials available on request. Threads protected with plastic caps on each bolt end.

NOM. PIPE SIZE	COLOR CODE	GASKET RANGE	APPROXIMATE USE	END CAP COUPLING COMPLETE			END CAP ONLY		
				CATALOG NUMBER	WT.EA. (lbs.)	LIST PRICE	CATALOG NUMBER	WT.EA. (lbs.)	LIST PRICE
4"	RED	3.80— 4.05	O.D. Stl.	EC501-4.05	21	$69.51	4" EC501*	3.2	$21.06
		4.06— 4.31	Riv. Stl.	EC501-4.31					
		4.50— 4.70	Std. Stl.	EC501-4.70					
		4.50— 4.81	Std. Stl. & D.I.	EC504-4.81					
	BLACK	4.80— 5.00	Cast Iron	EC501-5.00					
		4.74— 5.10	C.I. & A/C M.E.	EC501-5.10					
		5.11— 5.30	A/C R.B.	EC501-5.30					
	YELLOW	5.11— 5.40	A/C R.B. CL. 200	EC501-5.40					
6"	RED	5.80— 6.10	O.D. Stl.	EC501-6.10	30	94.28	6" EC501*	5.4	28.49
		6.05— 6.30	Riv. Stl.	EC501-6.30					
		6.55— 6.76	Std. Stl.	EC501-6.76					
		6.60— 6.91	Std. Stl. & D.I.	EC501-6.91					
	BLACK	6.90— 7.10	Cast Iron	EC501-7.10					
		6.86— 7.20	C.I. & A/C M.E.	EC501-7.20					
		7.15— 7.35	A/C R.B.	EC501-7.35					
	YELLOW	7.36— 7.60	A/C R.B. CL. 200	EC501-7.60					
8"	RED	7.80— 8.10	O.D. Stl.	EC501-8.10	39	126.06	8" EC501*	6.5	43.60
		8.05— 8.30	Riv. Stl.	EC501-8.30					
		8.55— 8.75	Std. Stl.	EC501-8.75					
		8.60— 9.06	Std. Stl. & D.I.	EC501-9.06					
	BLACK	9.05— 9.30	Cast Iron	EC501-9.30					
		8.99— 9.40	C.I. & A/C M.E.	EC501-9.40					
		9.31— 9.50	A/C R.B.	EC501-9.50					
	YELLOW	9.51— 9.79	A/C R.B. CL. 200	EC501-9.79					
10"	RED	9.80— 10.10 AB	O.D. Stl.	EC501-10.10	72.5	204.28	10" EC501*	20	110.92
		10.70— 11.00 AB	Std. Stl.	EC501-11.00					
	BLACK	10.70— 10.80 B	Std. Stl.	EC501-10.80					
		10.89— 11.40B	Cast Iron	EC501-11.40					
	YELLOW	11.55— 11.75 B	A/C M.E.	EC501-11.75					
		11.80— 12.12 B	A/C R.B.	EC501-12.12					
12"	RED	11.81— 12.10 AB	O.D. Stl.	EC501-12.10	AB-101.5	260.13	12" EC501*	31.5	148.74
		12.65— 12.95 AB	Std. Stl.	EC501-12.95					
	BLACK	12.70— 12.80 B	Std. Stl.	EC501-12.80					
		13.15— 13.55 B	Cast Iron	EC501-13.55					
	YELLOW	13.85— 14.10 B	A/C M.E.	EC501-14.10	B-92.5				
		14.20— 14.40 B	A/C R.B.	EC501-14.40					
16"	BLACK	17.05— 17.40	D.I. & Cast Iron	EC501-17.40	157	524.29	16" EC501*	67	286.49
		17.40— 17.80	D.I. & A/C R.B.	EC501-17.80					
	RED	18.00— 18.40	O.D. Stl.	EC501-18.40					
	YELLOW	18.45— 18.97	A/C M.E. & R.B.	EC501-18.97					

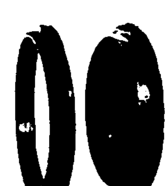
ger Sizes Available—P.O.A.

ER BY CATALOG NUMBER

OPTIONAL FEATURES — Contact factory for prices and availability
End Cap can be furnished without plug.
Additional tap sizes can be furnished on End Cap.

Flexible Couplings do not provide protection against possible pullout of pipe ends in unrestrained conditions.

*The End Caps are designed to be used with 501 coupling parts. Cast iron size 501 gasket is required with End Cap. The end rings can be either color. END CAP ONLY — price does include gasket.



501 C.I. SIZE GASKET **END CAP ONLY**

323

ROMAC INDUSTRIES, INC.

EFFECTIVE DATE 9/15/89

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"ANOTHER ROMAC ORIGINAL"

After Five Years of Intense Research Romac Industries Introduces...

DUCTILE + PLUS™

Ductile Cast Iron

U.S. Patent #4,702,886

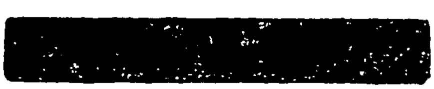
A Minimum of 22% to 28% Longer Life and 10% to 12% Increased Strength Over Common Ductile Cast Fittings, at no Additional Cost!

Increased Corrosion Resistance

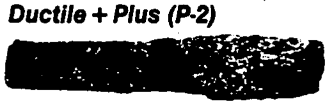
Make this *your* new standard. Greatly improved corrosion resistance increases longevity.

Increased Strength

Specially alloyed ductile cast iron will provide greater strength than ordinary ductile iron and will not cost you a penny more.



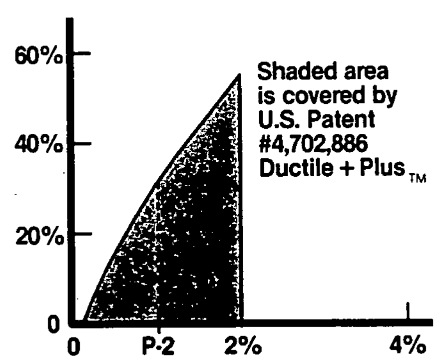
Ductile + Plus (P-2)



Common Ductile Iron

These two ductile iron bars were buried together in North Carolina. Note the corrosion of common ductile iron, as compared to Ductile + Plus

Increased Corrosion Resistance Over Common Ductile Iron



Nickel Added to Achieve Ductile + Plus

Ductile + Plus, Another Romac Original

Ductile + Plus is the result of 5½ years of research and testing. Extensive analysis at the University of Washington laboratory and in ground tests conducted with water districts throughout the U.S. continue to prove the value of Ductile + Plus.

Specify "Plus" and Save!

For more information on how Ductile + Plus can improve the life of your distribution system, call ***1-800-426-9341.***

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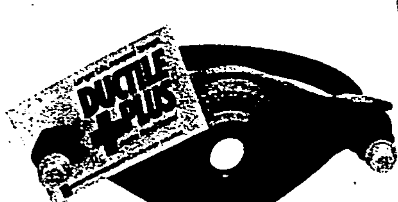

Technical Information about:

DUCTILE +PLUS™

Ductile Cast Iron

Randy K. Kent

Introduction

Some people feel ductile iron is as old as the hills, yet actually it is still in it's infancy. Gray cast iron was introduced in 600 B.C. in China, and ductile iron was introduced in 1948. Within the last ten years at least four patents on modified ductile irons have been awarded, including Romac's Ductile+Plus, Patent #4,702,886. Each of these modified ductile irons have an application to a specific industry, and have definite improvements in applicable properties. Ductile+Plus improvements provide a minimum of 22-28% increased corrosion resistance and from 10-12% higher strength, with little if any change in ductility. In fact, one field tests has shown far more than 28% increased corrosion resistance within a two year period. This is very important to the water works industry.

Ductile+Plus Economics

The goal of this research was: "To economically add to the longevity of ductile iron as it applies to the water works industry". Success was confirmed through long term testing performed at the University of Washington and throughout North America.

Before Ductile+Plus, methods to improve corrosion resistance of ductile iron fittings and pipe were normally costly and sensitive to installation. We asked the question: "Why not build the corrosion resistance into the material?" We did it with Ductile+Plus. Whether you use coatings, wraps, or nothing at all, the life of your pipe or fitting will be extended!!

Ductile+Plus is cost effective. With no extra money up front you extend the system life by the minimum of 22-28%. This dramatically lowers the life cycle cost. So the true cost to the customer is much less.

Corrosion Resistance

To understand the difference between Ductile+Plus and ordinary ductile iron, compare mild steel to Cor-Ten. Both Ductile+Plus and Cor-Ten provide a dense oxide or rust layer to inhibit corrosion. Ductile+Plus offers the same type of benefit to the water works industry as Cor-Ten. If the dense oxide of Ductile+Plus insulates the surface well enough, the corrosion resistance could be increased well beyond the 22-28% indicated.

The graph in Figure 1 compares the corrosion resistance of ordinary ductile iron with Ductile+Plus. Ductile+Plus contains up to 2% nickel and is divided into several grades by varying the additions of nickel. Romac will be utilizing grade P-2, which contains .75-1.0% nickel. Due to the greater slope of the curve between 0-1.0% nickel, it was determined this grade is the most cost effective.

Proof: Corrosion Testing

Long-term field tests of buried samples are in progress throughout North America. A photo of the samples buried in North Carolina is shown in Figure 2. Obviously, Ductile+Plus greatly improved the corrosion resistance. Accelerated corrosion tests performed in the Department of Metallurgical Engineering at the University of Washington were also successful.

Summary

From the test results and cost analysis it was found Ductile+Plus is a major cost effective improvement compared to common ductile iron. Due to the excellent response by the technical community, presentations of Ductile+Plus were given at the 1988 National AWWA Conference, the 1987 National Conference of the National Association of Corrosion Engineers (NACE), and at several regional conferences. If further

information is needed about Ductile+Plus, you may order proceedings from these conferences or call Romac Industries at 1-800-426-9341 U.S.A. or 1-800-426-3775 Canada.

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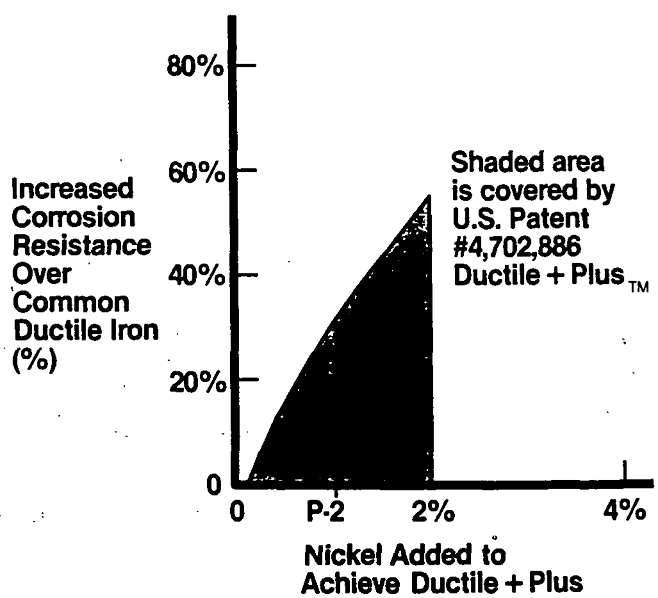
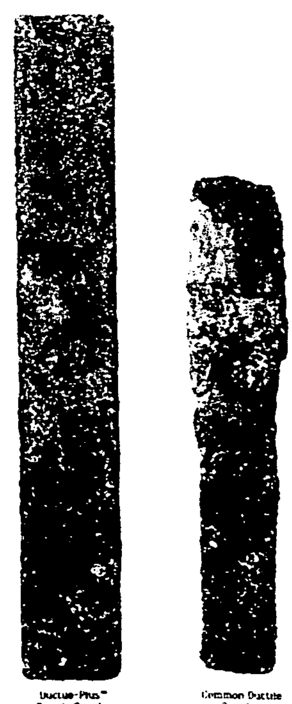


Figure 1 The amount of increased corrosion resistance compared to common ductile cast iron.



Ductile+Plus (P-2) Common Ductile Iron

Figure 2 Corrosion tests in North Carolina.