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IMPLEMENTATION PLAN FOR AREA 1 PHASE II SOIL CHARACTERIZATION AND EXCAVATION PROJECT

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

INFORMATION ONLY

SEPTEMBER 1998

U.S. DEPARTMENT OF ENERGY
FERNALD AREA OFFICE

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(20710-PL-0002)
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LIST OF ACRONYMS AND ABBREVIATIONS

A1PI	Area 1 Phase I
A1PII	Area 1 Phase II
ACA	Amended Consent Agreeement
ACGIH	American Conference of Government and Industrial Hygenists
ACHP	Advisory Council on Historic Preservation
A/E	architect/engineer
ALARA	As Low As Reasonably Achievable
APM	Area Project Manager
ARAR	Applicable or Relevant and Appropriate Requirement
ASCOC	area-specific constituent of concern
ASL	analytical support level
AWAC	above waste acceptance criteria
AWWT	Advanced Wastewater Treatment Facility
BAT	best available technology
BDN-ETS	biodenitrification effluent treatment system
BTV	benchmark toxicity value
BWAC	below waste acceptance criteria
CAM	Control Account Manager
CAMU	corrective action management unit
CDL	Certification Design Letter
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFC	certified for construction
CFR	Code of Federal Regulations
CG&E	Cincinnati Gas and Electric Company
CGM	coarse grained material
CM	Construction Manager

cm	centimeter
cm/sec	centimeters per second
COC	constituent of concern
CRDL	contract-required detection limit
CRP	Community Relations Plan
CSSA	certified soil stockpile areas
CU	certification unit
D&D	decontamination and dismantlement
dBA	A-weighted decibel
DCN	Design Change Notice
DF&O	Director's Findings and Orders
DO	Dissolved Oxygen Facility
DOE	United States Department of Energy
EC	Environmental Compliance
ECDC	Engineering/Construction Document Control
EPA	Environmental Protection Agency
ESH & TRM	Environmental Safety and Health Training Requirements Matrix
FC&DP	Facilities Closure and Demolition Project
FDF	Fluor Daniel Fernald
FEMP	Fernald Environmental Management Project
FRL	final remediation level
FS	feasibility study
FTL	Field Tracking Log
g	gram
GAC	granular activated carbon
GFAA	graphite furnace atomic absorption
GIS	Geographic Information System
GMA	Great Miami Aquifer

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HPGe	high purity germanium detector
HWMU	hazardous waste management unit
ICP	inductively coupled plasma
IEMP	Integrated Environmental Monitoring Plan
IFB	invitation for bid
IIMS	Integrated Information Management System
IP	Implementation plan
IRDP	integrated remedial design package
L	liter
LDR	land disposal restriction
μg	micrograms
μg/kg	micrograms per kilogram
μg/L	micrograms per liter
MDC	minimum detectable concentration
MEF	material evaluation form
mg/kg	milligrams/kilogram
msl	mean sea level
MTL	material transfer location
NCR	Non-Conformance Report
NPDES	National Pollutant Discharge Elimination System
NRRP	Natural Resources Restoration Plan
NTS	Nevada Test Site
ODNR	Ohio Department of Natural Resources
ODOT	Ohio Department of Transportation
OEPA	State of Ohio Environmental Protection Agency
OHPO	Ohio Historic Preservation Office
OSDF	On-Site Disposal Facility
OSHA	Occupational Safety and Health Administration

OU	Operable Unit
PCDF	permitted commercial disposal facility
pCi/g	picocuries per gram
PCM	personnel contamination monitor
PEP	project execution plan
PG	performance grade
PID	photoionization detector
ppb	parts per billion
ppm	parts per million
PSP	project-specific plan
PWID	Project Waste Identification and Disposition
QA/QC	quality assurance/quality control
RA	remedial action
RCRA	Resource Conservation and Recovery Act
RCPF	radiological control point facility
RCT	Radiological Control Technician
RD	remedial design
RD/RA	remedial design/remedial action
RFP	request for proposal
RI/FS	remedial investigation/feasibility study
ROD	Record of Decision
RSS	Radiation Scanning System
RTRAK	Real-time Radiation Tracking System
RvA	Removal Action
RvAWP	Removal Action Work Plan
RWP	Radiological Work Permit
S&H	safety and health
SCEP	Soil Characterization and Excavation Project

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SCQ	Sitewide CERCLA Quality Assurance Project Plan
SED	Sitewide Environmental Database
SEP	Sitewide Excavation Plan
SMTA	Special Materials Transfer Area
SSOD	storm sewer outfall ditch
SSC	Systems, structures and components
SSR	Standard start-up review
STP	Sewage Treatment Plant
SWIFTS	Sitewide Information Forecasting and Tracking System
SWPPP	Storm Water Pollution Prevention Plan
SWRB	Storm Water Retention Basin
SWTP	Sanitary Wastewater Treatment Plant
TBC	to be considered criterion
Tc	technetium
TCLP	toxicity characteristic leaching procedure
VDS	vendor data submittal
VOC	volatile organic compound
WAC	waste acceptance criteria
WAO	Waste Acceptance Organization
WDSS	Waste Disposition Support Services
WPRAP	Waste Pits Remedial Action Project
WTP	Wastewater Treatment Project
XRF	X-Ray Fluorescence

EXECUTIVE SUMMARY

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This Implementation Plan describes the remediation of soils, sediment, perched water, and at- and below-grade structures in Area 1 Phase II (A1PII) at the Fernald Environmental Management Project (FEMP). The A1PII area consists of approximately 153 acres in the southeastern part of the FEMP, immediately east and south of the Former Production Area. The central and southern portions of A1PII consist mostly of open grasslands. The northern portion of the area is also open land, but has been disturbed during the recent Area 1 Phase I (A1PI) remediation and activities associated with the construction of the On Site Disposal Facility (OSDF). This Implementation Plan also addresses certification of two A1PI sediment traps.

The A1PII area contains FEMP facilities and impacted material that will be remediated in accordance with this Implementation Plan, including:

- Former (now inactive) FEMP Sewage Treatment Plant (STP) Area
- Underground utilities
- Surface soil contamination
- Former Trap Range
- Stockpiles

This Implementation Plan describes the area-specific remedial design/remedial action process discussed in the Sitewide Excavation Plan (SEP) (i.e., pre-design investigations, remedial design, remedial action, characterization for reuse, precertification and interim grading activities). A1PII certification will be addressed in separate Certification Design Letters (CDLs) and Certification Reports. A1PII remedial actions and certification are scheduled to start in Spring 1999 and for completion in Spring 2000. Post-certification activities (such as OSDF borrowing and final restoration) will also be conducted after certification and are not included in this Implementation Plan.

A1PII is subdivided into three geographical sectors. Sector 1 is located in the south and includes the OSDF and STP Backfill borrow areas, as well as the Trap Range. Sector 2 is the area north of the re-routed North Entrance Road. Sector 3 is the central A1PII area and includes the STP. These sectors are further divided into sub-sectors. Certification activities generally follow sub-sector boundaries.

Remedial actions in A1PII will be performed through the following remedial action design packages:

- Site Preparation
- STP Excavation
- Trap Range Remediation

Each design package consists of construction drawings and technical specifications which were developed in accordance with the remedial strategy described in this Implementation Plan.

The history and use of A1PII is well known. The nature and extent of contamination has been computer modeled using a comprehensive database including the OU5 Remedial Investigation/Feasibility Study historical data, Removal Action (RvA) 14 data, Sludge Drying Bed maintenance data and data from the A1PII pre-design investigation data. The types of impacted material expected to be encountered during A1PII remediation include:

- Sludge Cake - This material is contained within a hazardous waste management unit (HWMU) and is located on the STP Sludge Drying Beds.
- Digester Sludge - This material is currently located in the east STP Sludge Drying Beds, the west chamber of the settling basin, and the digester.
- Above-WAC Soil - There are surface soils with concentrations of uranium and technetium-99 that exceed OSDF WAC.
- At- and Below-Grade Structures - These materials include underground utilities, foundations, and structures associated with the STP and other facilities.
- Trap Range - This consists of remediating soil in the Trap Range area that is contaminated with lead.
- Other Impacted Soils - Impacted soils include both surface and deep soils within A1PII which exceed Final Remediation Levels (FRLs)
- Remediation-Generated Water - Both surface water and perched groundwater will be controlled and treated.

Material to be excavated from A1PII consists primarily of soil and fill associated with STP operations. Excavation of above-FRL material, stabilized lead-contaminated soil and removal of at- and below-grade facilities is expected to generate approximately 30,000 yd^3 of impacted material. Most of this material will be hauled to and dispositioned in the OSDF. Lead-contaminated soil will be stabilized before it is dispositioned in the OSDF. The sludge cake, digester sludge and soil contaminated with above-WAC concentrations of uranium and technetium-99 will be sent off site for disposal.

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Section 1

1.0 INTRODUCTION

This Implementation Plan describes the U.S. Department of Energy (DOE)'s proposed remediation of soils, sediment, and at- and below-grade structures and debris in Area 1 Phase II (A1PII) at the Fernald Environmental Management Project (FEMP) in southwestern Ohio (Figure 1-1). It also addresses remediation of perched groundwater that may be encountered during A1PII excavation, as well as two sediment traps (ST-2 and ST-3) in Area 1, Phase I (A1PI) that are located north of A1PII. These remediation activities are planned in accordance with the Records of Decision (RODs) issued by DOE and the U.S. Environmental Protection Agency (EPA) for Operable Unit (OU) 3 (DOE 1994, 1996a), which addresses at- and below-grade structures, and OU5 (DOE 1996b), which addresses environmental media.

The FEMP has been divided into ten areas to effectively remediate soil and at- and below-grade structures and debris, as shown in Figure 1-2. The FEMP Sitewide Sequencing Plan, included as Appendix B of the FEMP Sitewide Excavation Plan (SEP; DOE 1998a), provides the remediation schedule. As indicated in the Sitewide Sequencing Plan, Area 1 is being excavated relatively early to allow construction of the On Site Disposal Facility (OSDF). Impacted environmental media and debris from all FEMP remediation areas that meet OSDF waste acceptance criteria (WAC) will be dispositioned in the OSDF. The OSDF will be segmented in cells that will be constructed from north to south within Area 1. Borrow material needed for OSDF construction will be obtained from the southern portion of Area 1. In general, Area 1 lies upgradient of other FEMP remediation areas, so early sequencing of Area 1 facilitates surface water control and helps prevent spread of contamination to clean areas.

These and other factors also contributed to the strategy of addressing Area 1 in three phases (i.e., Phases I, II, and III; Figure 1-2, SEP Section B.2). A1PII is the second of three planned remediation phases in Area 1 and follows A1PI. Except for Sediment Traps ST-2 and ST-3 and two sections of the North Entrance Road, remedial excavation and certification of A1PI is complete; the A1PI Certification Report (DOE 1998b) provides the results of A1PI certification studies. The two sections of the North Entrance Road will be addressed as part of the corridors, which will be one of the last steps of FEMP remediation and certification.

This Implementation Plan and the SEP satisfy the Amended Consent Agreement (ACA; EPA 1991) requirement for an A1PII remedial action (RA) work plan. In addition, this plan and associated remedial design (RD) (construction drawings and technical specifications) constitute the A1PII Integrated Remedial Design Package (IRDP) in accordance with the strategy outlined in the OU5 Remedial Design Work Plan (DOE 1996c). As described in this Implementation Plan, A1PII will include the following RA design packages:

- Site Preparation
- Sewage Treatment Plant (STP) Excavation
- Trap Range Remediation

As the IRDP integrating document, the Implementation Plan describes the planned remediation activities. This will facilitate regulatory agency review and help define the scope of work necessary to procure equipment, supplies, and services to implement remediation. Activities described in this plan are being conducted in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and corrective action requirements of the Resource Conservation and Recovery Act (RCRA). The Implementation Plan generally conforms with the Model Outline for IRDPs provided in Section 7 of the SEP.

As indicated in the Section 1.3.2 of the SEP, DOE will involve the public in the A1PII remedial design as follows:

- Upon completion of the final engineering design and prior to implementing the action, DOE will prepare and distribute to the public a fact sheet describing the A1PII remedial design, and will conduct a public briefing on the remedial design.

- DOE will publish in a local newspaper of general distribution a Notice of Availability of this A1PII Implementation Plan when it is submitted to EPA and of other documents for the A1PII remediation when they are submitted to EPA.

These measures will be taken in accordance with provisions of the National Contingency Plan (40 CFR §300.435) and DOE policy as set forth in the FEMP Community Relations Plan (DOE 1995a).

1.1 SCOPE AND GENERAL APPROACH OF THE IMPLEMENTATION PLAN

As shown in Figure 1-1 of the SEP, the area-specific remedial design/remedial action (RD/RA) process at the FEMP involves several steps, including:

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- Pre-design investigations
- Remedial design
- Remedial action
- Precertification of excavated areas
- Certification
- Postremediation activities

Pre-design investigations were conducted in A1PII to better characterize the nature and extent of contamination and to evaluate surface and sub-surface conditions that might affect remedial activities. Section 2.0 summarizes the results of these investigations and their findings and describes the estimated limits of contamination. Section 2.0 also presents the results of computer modeling studies used to establish design excavation limits for removing soil exhibiting contamination above the Final Remediation Levels (FRLs) established in the OU5 ROD. Actual excavation limits will be determined based on field conditions, radiological surveys of the area, and physical sampling results.

Section 3.0 provides the technical approach. For the three A1PII RA design packages, the work associated with these activities includes:

- Preparing the site for remediation
- Removing and dispositioning material with contaminant concentrations above the OSDF WAC
- Demolishing at- and below-grade structures no longer needed for FEMP operations
- Stabilizing soil exhibiting the RCRA toxicity characteristic for lead
- Excavating construction debris and contaminated soils
- Managing these waste streams in accordance with final disposal requirements
- Demonstrating that remediated areas meet FRLs for ASCOCs

Perched groundwater encountered during A1PII remediation will also be addressed. Excavated soil and debris will be sent to the OSDF for disposal if it meets physical and chemical/radiological WAC (DOE 1996d). Materials that do not meet OSDF WAC will either be treated on site to meet WAC and then sent to the OSDF, or will be stockpiled and then shipped off site for either disposal at the Nevada Test Site (NTS) or for treatment and disposal at a permitted commercial disposal facility (PCDF) by the Waste Pits Remediation Project at a later date, as appropriate.

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Environmental controls and monitoring DOE will use during remediation are described in Section 4.0. Controls and monitoring will be established with respect to natural resources and air, surface water, and groundwater pathways. For example, DOE will control storm water runoff and remediation-generated water (e.g., water that accumulates in excavations) to ensure that FRLs for Paddys Run and the Great Miami River, and the mass-based discharge limit for total uranium established in the OU5 ROD, are not exceeded.

The specific methods and procedures to accomplish the scope of work presented in this Implementation Plan will be provided by the chosen contractor in the form of a Safe Work Plan, which will be subject to review and approval by Fluor Daniel Fernald (FDF), the FEMP remediation contractor for DOE. Section 5.0 provides an overview of project-specific health and safety requirements. Section 6.0 describes the management approach to A1PII remediation, including organization, responsibilities, schedule, contract award, waste management, data and records management, quality assurance/quality control (QA/QC), and integration/coordination of A1PII remediation with other FEMP projects.

1.2 A1PII REMEDIATION AREA BACKGROUND AND DESCRIPTION

A1PII consists of approximately 153 acres in the southeastern portion of the FEMP (Figure 1-2). The area is generally bounded on the north by A1PI, on the east and south by the FEMP perimeter fence, and on the west by trees bordering and upslope of the South Entrance Road, an unnamed Paddys Run tributary and associated ditches, the North Entrance Road, and the Former Production Area (Figure 1-3). Remediation activities described in this plan also include two A1PI sediment traps (ST-2 and ST-3) not included in the A1PI certification process. Based on predesign investigations, no off-property excavation is expected to be necessary.

For efficient planning and execution of remediation, particularly in view of the complex logistics and scheduling required to accommodate timely OSDF construction, A1PII has been subdivided into three geographic sectors (Figure 1-3). Sector 1 is south of the STP Access Road and Dissolved Oxygen (DO) Facility. Sector 2 is north of the North Entrance Road Phase I Relocation segment. Sector 3 is between Sectors 1 and 2 and includes the North Entrance Road Phase I Relocation segment and the STP Access Road. The sub-sectors are defined in Section 1.5.

Except for at- and below-grade improvements summarized in Section 1.2.1, the southern and central portions of A1PII (Sectors 1 and 3) consist of rolling grassland. The few trees present are located almost exclusively along the east fenceline and in a remnant fence row just west of the Trap Range south of the STP Access Road. Virtually all of Sector 2 has been subjected to recent land disturbance because of A1PI remediation and ongoing OSDF construction; it is presently comprised of sediment basins, soil and debris stockpiles, OSDF construction contractor support facilities, and open land. Sector 2 vegetation is essentially limited to grasses established for interim stabilization and herbaceous weeds. The off-property area adjacent to the STP that may be addressed under this plan is cropland on and near an electric transmission right-of-way operated by the Cincinnati Gas & Electric Company (CG&E).

Natural (i.e., unmodified) drainage courses are ill-defined or nonexistent within A1PII. Surface water in Sectors 1 and 3 is directed generally westward toward the unnamed Paddys Run tributary primarily via sheet flow. Ditches and culverts along and beneath the South Entrance Road and Old North Entrance Road flow directly to the stream. Surface drainage in Sector 2 is directed primarily to the A1PI and OSDF Sediment Basins (Figure 1-3; also see Sections 2.1.1.2 and 2.1.3.1). A detailed description of conditions in each sector is provided in Section 2.0; the remediation approach is discussed by remedial design package in Section 3.0.

1.2.1 Facilities and Other Improvements

Facilities and improvements used by DOE to support previous site operations included facilities in the STP Area, the DO Facility and Flume Building, the Trap Range, roads, and miscellaneous other facilities (Figure 1-3). No underground storage tanks are known to be located in the area. A1PII facilities of special concern include the Sludge Drying Beds in the STP Area, which have been designated a Hazardous Waste Management Unit (HWMU) under RCRA, and lead contaminated soil at the Trap Range, some of which exhibits the RCRA toxicity characteristic for lead. More detailed information about facilities in A1PII is provided in Section 2.1 and the construction drawings.

1.2.1.1 STP Area Facilities

The STP in A1PII began operating in 1952 to treat FEMP sanitary wastewater, and was later reconstructed to receive both sanitary and process-related wastewater. The use of the STP to treat process-related wastewater was recently discontinued after the FEMP biodenitrification effluent

treatment system (BDN-ETS) became operational in the late 1980s. A new FEMP sanitary STP was constructed and began operating in early 1998; after the new STP began operating, the A1PII STP was shut down. After shutdown, the FEMP Facilities Closure and Demolition Project (FC&DP) began decontamination and dismantlement (D&D) of all above-grade portions of STP Area structures in accordance with the OU3 RD/RA Work Plan (DOE 1997a). This D&D work also included the STP incinerator. The STP incinerator, located in the northwest corner of the STP Area, operated from November 1954 through December 1979 to burn uranium- and thorium-contaminated and uncontaminated trash. The above-grade D&D work was completed in August 1998, and all remaining remedial actions for the STP are addressed in this Implementation Plan and the associated STP Excavation Design Package.

Impacted material in the STP that is addressed by this Implementation Plan includes sludges, surface and subsurface soils, utilities and at- and below-grade structures in the STP area. The A1PII sludges include sludge cake that was located on the Sludge Drying Beds when the STP ceased operation, and digester sludge. The digester sludge is currently located on the east Sludge Drying Beds, the west chamber of the primary settling basin and the digester. More than half of the sludge was removed from the digester and placed in the Sludge Drying Beds and the west chamber of the primary settling basin during D&D activities in Summer 1998. This digester sludge exceeds the OSDF WAC for both technetium-99 and uranium. It will be stabilized with lime and soil and temporarily stockpiled in SP-7 prior to off site disposal. Based on a determination that spent tetrachloroethene, a RCRA F002 listed waste, was managed in the Sludge Drying Beds, the sludge cake contained therein must be managed as a hazardous waste.

Infiltration from the Sludge Drying Beds, leaks from STP components, and air emissions from the STP Incinerator are indicated as sources of surface and subsurface soil contamination, primarily uranium and technetium-99, in and near the STP Area. Pre-design investigations (Section 2.0) indicate that surface and sub-surface soil in and around the STP Area exhibits a concentration of total uranium and technetium-99 above applicable WAC and FRLs. Also, all remaining at- and below-grade structures in the STP Area will be removed as described in this Implementation Plan.

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1.2.1.2 Dissolved Oxygen Facility and Flume Building

The DO Facility is designed to oxygenate combined wastewater effluent from site discharges to ensure that the FEMP's National Pollutant Discharge Elimination System (NPDES) permit limit for dissolved oxygen is met. The Flume Building houses the Outfall Line Pit from which the combined wastewater is discharged. These facilities are expected to remain operational during and beyond A1PII remediation. Predesign data indicate that soil in the vicinity of these facilities meet applicable FRLs.

1.2.1.3 Trap Range

The Trap Range (referred to as the Skeet Range in the OU3 ROD) is an abandoned shooting range consisting of a small building (Skeet Range Building) on a concrete slab, concrete firing pad, and a concrete trap house (i.e., partially below-grade bunker) approximately 1200 feet southwest of the STP Area. Range operation resulted in lead contamination of soil in this area. Above-grade portions of the Trap Range Building were demolished by the FC&DP, in accordance with the OU3 RD/RA Work Plan (DOE 1997a).

Based on OU5 Remedial Investigation (RI) data (DOE 1995b), the area of lead contaminated soil at the Trap Range is the only A1PII location with the potential, upon excavation, to be toxicity characteristic hazardous waste under RCRA, which may require cost-effective treatment (see Section 2.1.1 and Table 2-1 of the SEP). Pre-design investigations (Section 2.4) at the Trap Range confirm that surface soil (0-6 inch depth) over approximately 2.4 acres exhibit lead concentrations above the 400 mg/kg FRL, and approximately 1.3 additional acres exhibit lead concentrations above the 200 mg/kg Benchmark Toxicity Value (BTV; see SEP Appendix C). The lead-contaminated soil also exhibits the RCRA toxicity characteristic for lead. The proposed plan is to address this lead-contaminated soil with on site stabilization to remove the lead toxicity characteristic prior to disposal in the OSDF.

1.2.1.4 Utilities and Pipelines

Electric utilities in A1PII include:

- A CG&E transmission line on steel lattice towers located just within the eastern FEMP boundary and east-west across the area near the STP
- Electric distribution lines on wood poles paralleling the southern perimeter fence and from the Former Production Area to the STP Area

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- A buried electric distribution cable that traverses the site from the Former Production Area to a small substation located at the DO Facility

- Pole lights with associated power supply lines along the North and South Entrance Roads, at the STP Area, and along the Former Production Area fenceline in the northwestern portion of A1PII.

Above-grade portions of the wood poles to, and within, the STP Area and associated conductors will be dismantled by the FC&DP before A1PII remediation begins. Below-grade portions of these latter facilities and the buried electric cable to the DO Facility, which will be replaced by an overhead line, will be removed as part of A1PII activities. The steel lattice towers and other electric utilities will remain.

Other utilities in A1PII include a telecommunications (fiber optic) line and buried pipelines for potable and fire water, storm water, sanitary wastewater, OSDF leachate, oil, and natural gas (Section 2.1). The OSDF leachate line, located in Sector 2, the wastewater discharge line from the Advanced Wastewater Treatment facility (AWWT) and the oil pipeline, located partly or entirely in Sector 1, will remain in service. The remaining buried pipelines, running primarily between the Former Production Area and the STP and DO Facility, will be taken out of service, isolated, excavated and dispositioned with associated bedding and backfill material. Pre-design investigations have not indicated soil contamination in the area of these pipelines. However, the STP influent and effluent lines are recognized as having high contamination potential.

1.2.1.5 Roads

Paved roads in the A1PII remediation area include the STP Access Road, the Old North Entrance Road, and a diagonal segment of the North Entrance Road Phase I Relocation. The latter will be replaced by the permanent Phase II alignment after A1PII remediation activities are completed. Gravel roads are located along the southern and eastern boundaries of A1PII to access monitoring wells, air monitoring stations, and a recently installed water supply well to support OSDF construction. The STP Access Road (from the DO Building Access Road to the STP) and associated culverts, and possibly some gravel road segment(s) in and near the STP Area, will be excavated and disposed of in the OSDF. The remaining roads are intended for use after A1PII remediation and will remain.

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1.2.1.6 Other Improvements

Miscellaneous improvements in A1PII include fencing, the OSDF water supply well, monitoring wells, air monitoring stations, and benchmarks. Fencing will be excavated or removed when located in areas where soil exceeds FRLs or as needed to accommodate construction. It is anticipated that the OSDF water supply well and all monitoring wells that have not been abandoned before A1PII remediation begins will be left intact. Air monitoring stations and benchmarks, located mostly on the area periphery, are also planned to be left intact. Old agricultural drainage tiles, encountered in Sectors 2 and 3, will be excavated and dispositioned to the OSDF with associated bedding and backfill material.

1.2.2 Implications of Site Conditions on Remedial Design

Based on information regarding the history, facilities and structures, probable mechanisms of contamination, and contaminant distribution as summarized above, the materials and associated contamination likely to be encountered during A1PII remedial activities are relatively predictable. Therefore, the strategy detailed in Section 3.0 of this plan generally involves excavation to design limits followed by precertification and certification activities to ensure that all impacted soil and debris are removed. The homogenous nature of the A1PII material to be excavated permits more selective monitoring during the excavation phase than would be necessary for highly heterogeneous areas where potential for encountering special materials and above WAC materials is relatively high and where excavation in lifts with intensive monitoring may be warranted, such as in the A2PI excavation.

1.3 SUMMARY OF THE REGULATORY DRIVERS

Regulatory requirements and criteria and legal obligations provide the basis for A1PII remediation activities. Their pertinence to the remediation of A1PII is discussed in the following paragraphs. See Section 1.3.1 of the SEP for additional discussion.

1.3.1 ARARs and TBCs

The subset of Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considered items (TBCs) from Table A-2 of the SEP pertinent to the A1PII remediation area will be used as the basis for conducting the A1PII soil remediation. They are included with the A1PII Design Criteria Package, presented in Appendix A.

1.3.2 Permits

The NPDES permit (Permit No.1IO00004*ED) for storm water and wastewater discharges to Paddys Run and the Great Miami River is the only permit that is pertinent to A1PII remediation. Storm water discharges from the remediation of A1PII are considered to be already covered under the NPDES permit through implementation of the permit-required sitewide Storm Water Pollution Prevention Plan (RM-0039; DOE 1996e). Perched water encountered during excavation and storm water from the STP Area will be collected and transferred to the AWWT Phase II facility for treatment prior to discharge in accordance with protocols detailed in Section 3.4.4. The collection and treatment of perched water and storm water is acknowledged in the application to renew the NPDES permit, which was submitted to the Ohio Environmental Protection Agency (OEPA) on September 22, 1997. Thus, no modifications to the permit are required for A1PII remediation activities.

1.3.3 Natural Resource Trusteeship and Related Natural and Cultural Resource Regulations

Two mechanisms drive protection of natural resources during remediation. These include the Natural Resource Trusteeship process and compliance with pertinent federal and state regulations. Both of these mechanisms have been incorporated into A1PII remediation.

A conceptual restoration design for A1PII has been presented to the Trustee Council as part of the Natural Resources Restoration Plan (NRRP), submitted to the EPA in July 1998 (DOE 1998d). The proposed restoration, which consists of expanded prairie, upland woodlot, open water and wetland habitat, will be implemented after its review and approval by the Natural Resource Trustees and other stakeholders, and upon completion of other required remediation activities.

Regulatory drivers for the management of natural and cultural resources and associated surveys are grouped into three areas: threatened and endangered species protection, wetlands/floodplain protection, and cultural resource management.

1.3.3.1 Threatened and Endangered Species

Based on updated FEMP property surveys conducted in 1993-94, DOE does not expect to encounter any federal- or state-listed threatened or endangered species or critical habitat in the areas to be addressed by this A1PII remediation project. No additional threatened/endangered species surveys have been conducted or are planned for the area.

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1.3.3.2 Wetlands/Floodplains

Jurisdictional wetlands and waters of the U.S. on the FEMP are delineated in the 1993 FEMP Wetland Delineation Report, officially approved by the U.S. Army Corps of Engineers on August 19, 1993. Based on a review of an overlay of the A1PII boundary on the 1993 FEMP Jurisdictional Wetland Delineation, approximately 0.7 acres of jurisdictional wetlands located within A1PII are anticipated to be impacted as a result of A1PII remediation activities. These wetlands are emergent in nature and are associated with the drainage ditch systems in the vicinity of the North Entrance Road and STP. Dredge and fill activities within these wetland areas are authorized under U.S. Army Corps of Engineers Nationwide Permit 38 ("Cleanup of Hazardous and Toxic Waste") and its corresponding State Water Quality Certification.

Activities described in this Implementation Plan will support development of wetlands on the FEMP. The A1PI sediment traps which will be certified as described in this Implementation Plan will be developed into wetland areas.

The A1PII area is outside the 100-year floodplains of Paddys Run and the Great Miami River (DOE 1995b; DOE 1996f). Therefore, no floodplain impacts will result from A1PII remediation activities.

1.3.3.3 Cultural Resource Management

DOE, the Ohio Historic Preservation Office (OHPO), and the Advisory Council on Historic Preservation (ACHP) have entered into a "Programmatic Agreement Regarding Archaeological Investigations at the Fernald Environmental Management Project" (March 6, 1997), pursuant to 36 CFR §800.13. The A1PII remediation area has been surveyed in accordance with this agreement and all potential historic properties discovered have undergone data recovery after consultation with the OHPO and the ACHP. No additional archaeological surveys are planned for A1PII. However, a contingency plan is in place to ensure that any additional cultural resources discovered during remediation activities are recognized and protected (Section 6.6.3).

1.4 COMPONENTS OF THE REMEDY

A1PII remediation activities address specific components of the selected remedies set forth in the OU3 and OU5 RODs for debris and environmental media, including soil, sediment, perched water, storm water and wastewater. These activities are coordinated closely with OSDF construction (an OU2 ROD

remedy component), and D&D of above-grade structures in A1PII (an OU3 ROD remedy component), which are being conducted under other FEMP remedial action plans. The following is a summary of OU3 and OU5 remedy components (in italics) that are particularly relevant to this plan and an indication of specific actions that will be taken for A1PII:

- OU3 Interim and Final RODs (DOE 1994, 1996a)
  - *Remove gross contamination from material in facilities and dismantle facilities.* Detection of gross contamination will be ensured by visual inspection and radiological monitoring during D&D activities, particularly with respect to STP influent, effluent, and local STP pipelines and associated appurtenances (e.g., manholes, sumps), and the sludge drying beds. Some sludge from the STP digester was removed from the digester and stockpiled in the STP Area during D&D activities. The stockpiled sludge and the remaining sludge in the bottom of the digester will be addressed and properly disposed of during STP excavation activities. Material with visible residues was cleaned or diverted from OSDF disposal.

  - *Release materials (unrestricted/restricted release), as economically feasible, for recycling, reuse, or disposal.* At- and below-grade structures to be excavated generally will be processed (e.g., size reduced), if necessary, and disposed of in the OSDF. None of these materials are considered to be economically feasible for recycling or reuse.

  - *Dispose of process residues, waste product materials, and process-related metals off site.* None of these materials are expected to be encountered in A1PII; if encountered, such materials would be managed in accordance with established protocols as generally described in Sections 3.2.6 and 6.5.

  - *Treat materials to meet OSDF and/or off site disposal facility WAC.* Excavated materials that exceed OSDF chemical/radiological WAC are expected to include sludge from the Sludge Drying Beds, digester sludge, lead contaminated soil from the Trap Range and soil with technetium-99 and uranium contamination exceeding the OSDF WAC. The lead contaminated soil will be treated (stabilized) on site. The other material will be treated as necessary by FDF Waste Management Operations to meet off site facility WAC. Material that meets OSDF chemical/radiological WAC will be processed (e.g., size-reduced) as necessary to meet OSDF physical WAC before transport to OSDF. Material handling and treatment is discussed in Sections 3.2.7.2 and 6.5.

  - *Dispose of materials that exceed the OSDF WAC off site; dispose of remaining materials in the OSDF.* As described above, sludge cake from the STP Sludge Drying Beds, digester sludge and soil with technetium-99 and uranium concentrations exceeding the OSDF WAC are expected to require off site disposal, though other such materials may be encountered, and would be dispositioned appropriately. Material handling and treatment is discussed in Sections 3.2.7.1 and 6.5.

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- *Establish administrative controls through deed restrictions and access controls.* Access controls will be maintained for A1PII following remediation activities as described in Section 3.5.

- OU5 ROD (DOE 1996b)

  - *Perform verification sampling to establish horizontal and vertical boundaries of excavation required to attain FRLs for soil and sediment.* Pre-design investigations were performed to augment historical data and refine excavation limits for lead-contaminated soil at the Trap Range, above-WAC sludge at the Sludge Drying Beds, and above-FRL soil at the STP Area and elsewhere in A1PII as discussed in Section 2.0.

  - *Excavate contaminated soil and sediment as necessary to meet FRLs; use mitigation measures as necessary to minimize potential short-term impacts to human health and the environment.* Based on pre-design investigations (Section 2.0), the following types of material will be excavated as part of A1PII activities to meet FRLs:

    - Above-WAC soil (for technetium-99 and uranium)
    - Sludge including Sludge Drying Bed (sludge cake) and digester sludge
    - Above-FRL soil (surface soil and deep excavation)
    - Previously constructed stockpiles
    - Lead contaminated soil in the Trap Range

    This material will be excavated as described in Section 3.0. Mitigation measures to minimize short term impacts will be taken with respect to natural and cultural resources (Sections 1.3.3 and 4.1), air pathway (Section 4.2), water pathways (Sections 3.1.6, 4.3 and 4.4, Appendix C), and health and safety (Section 5.0).

  - *Perform certification sampling following excavation of contaminated soil and sediment to demonstrate that FRLs have been attained.* Certification of Sector 1, except the Trap Range, has been completed. It is expected that precertification and certification of the Trap Range, Sector 2 (including A1PI Sediment Traps ST-2 and ST-3, OSDF Sediment Basin, and A1PI Sediment Basin with associated sediment), and Sector 3 (including the A1PII Sediment Basin, Outfall Channel, and Conveyance Channel with associated sediment) will be accomplished sequentially as remediation activities are completed in these areas (Sections 3.1, 3.2 and 3.3).

  - *Apply DOE's As Low As Reasonably Achievable (ALARA) principles by using hand-held instruments to support verification sampling and excavation processes and, to the extent economically practical and by using detection limits achievable with hand-held instruments, reduce the remediation level for on-property soil containing relatively nonleachable uranium from 80 parts per million (ppm) to 50 ppm.* Excavation limits for the STP excavation were established on the basis of uranium concentrations at or below the ALARA goal.

of 50 milligrams per kilogram (mg/kg; same as ppm); excavation limits for surface soil elsewhere in A1PII were established on the basis of the FRL of 82 mg/kg (ppm) (see Section 2.5). No excavation control monitoring is planned in either case, although precertification and certification activities will be conducted to ensure that FRLs are achieved (Sections 3.2 and 3.3).

- *Dispose of contaminated soil and sediment that meets the onsite WAC in the OSDF. Where possible, treat soil and sediment that exceeds the OSDF WAC to meet the WAC or treat, if necessary, and dispose of such soil at an off site facility.* All of the material in A1PII that is known to be above FRLs, and meets the OSDF WAC, will be dispositioned in the OSDF. Trap Range soil which is contaminated by lead at levels above the FRL and which exhibits the RCRA toxicity characteristic are proposed to be stabilized on site. Once stabilized, this material will be either disposed of on site or off site. If stabilized on site, it will likely be disposed on site in the OSDF; if stabilized off site, it will likely be disposed off site. Other materials that do not meet the OSDF WAC (for uranium, technetium-99 or carbon tetrachloroethene) will be dispositioned off site (Section 3.2.6).

- *Excavate contaminated soil containing perched water that presents an unacceptable threat, through contaminant migration, to the underlying aquifer; disposition this excavated soil in a manner consistent with methods indicated above for soil; treat this perched water and storm water collected during these excavation operations, as required (treatment in AWWT preceded, if necessary, by pretreatment to address any listed hazardous wastes).* Contaminated soil from the STP Area, the only area in A1PII identified in the OU5 Feasibility Study (DOE 1996f) as posing an unacceptable threat to the Great Miami Aquifer, will be excavated (Sections 3.3.2 and 3.3.3). Perched water and storm water that accumulates in the STP Area excavation will be treated in the AWWT Phase II facility by granular activated carbon (GAC) filtration.

- *Collect contaminated storm water, using the existing FEMP retention basin, as necessary to minimize discharge of contaminants to Paddys Run; dewater sludges from the basin and dispose of them in the OSDF or, if they exceed OSDF WAC, in an appropriate off site facility. Collect and treat contaminated storm water and wastewater as necessary to attain FRLs in Paddy's Run and the Great Miami River and mass-based limits for discharges to the Great Miami River.* As indicated above, storm water that accumulates in the STP Area excavation will be treated in the AWWT Phase II facility (Section 3.2.1.6). Based on pre-design investigations (Section 2.0), A1PII areas outside of the STP Area exhibiting soil contamination above FRLs is limited to approximately 2.4 acres of lead contaminated soil at the Trap Range and approximately 0.6 acres of uranium-contaminated soil in Sector 3. Virtually all of the runoff from these areas will be routed to sediment traps/basins before discharge to Paddys Run; that which is not (less than ½ acre) will be appropriately controlled using best management practices (such as a silt fence). Sediment in the sediment traps/basins found to be above FRLs on the basis of precertification or certification testing will be removed and disposed of in the OSDF.

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- *Continue to employ institutional controls, including access controls and monitoring, to ensure continued protectiveness.* Access to A1PII will be restricted using barriers, warning signs, and procedural controls for the duration of remediation activities in the area and will continue after certification of the area and turnover to OSDF. Similarly, monitoring will continue to be conducted in accordance with the Integrated Environmental Monitoring Plan (IEMP, DOE 1997b). Long-term institutional controls necessary to implement restoration goals under the site's selected remedy are presented in the NRRP (DOE 1998d, see Section 3.5).

- *Restore the site.* Restoration of A1PII will be conducted in a manner consistent with the NRRP (DOE 1998d), and will include backfilling the STP excavation, grading areas disturbed by excavation as necessary to restore positive drainage, and establishing interim vegetation cover to prevent erosion. Ultimate restoration of the area will be completed as OSDF construction is completed.

1.5 GENERAL CERTIFICATION AND REMEDIAL ACTION APPROACH

A1PII remediation includes both certification and RA activities. These activities are described in detail in Sections 2 and 3 of this Implementation Plan. The certification boundaries are generally defined by the three A1PII sectors (and sub-sectors). RA boundaries are bounded by areas that do not align exactly with the sectors and sub-sectors, as described in Section 3 and as shown on the RA construction drawings.

The A1PII area is divided into three sectors. These sectors are divided into sub-sectors and are shown on Figure 1-3. As shown on that figure, they consist of the following:

- Sector 1 - Southern part of A1PII
  - Sub-sector 1A - Trap Range (lead contaminated soil)
  - Sub-sector 1B - OSDF and STP Backfill Borrow Areas and remainder of Sector 1
- Sector 2 - Northern part of A1PII
  - Sub-sector 2A - North and east areas of Sector 2
  - Sub-sector 2B - Remainder of Sector 2
- Sector 3 - Central part of A1PII
  - Sub-sector 3A - Utility corridors outside STP excavation area
  - Sub-sector 3B - STP excavation area
  - Sub-sector 3C - Remainder of Sector 3

The sector and sub-sector boundaries were, and will be, used for certification purposes. Additional sub-sectors may be defined as necessary, such as to meet OSDF and other certification and construction needs. Sub-sectors 1B and 2A have already been certified.

The three A1PII RA design packages include:

- Site Preparation
- STP Excavation
- Trap Range Remediation

These RA design packages are described in Section 3.0. Site Preparation work will occur in areas that have already been certified and include parts of Sub-sectors 1B, 3A, and 3C. STP Excavation will be performed in areas prior to certification and includes parts of Sub-sectors 3A, 3B and 1A (as an option). Trap Range Remediation will be performed in Sub-sector 1A; the Trap Range will be certified after stabilization work is completed.

1.6 LESSONS LEARNED

A lessons learned program has been implemented to apply knowledge accumulated during successive remedial efforts conducted under the SEP. Integration of lessons learned from past remedial activities (i.e., A1PI) is imperative to ensure future remedial activities meet all requirements and achieve the highest possible levels of quality at the project level. Lessons learned during the A1PI remediation project were incorporated into the SEP. Therefore, by following the guidelines provided in the SEP, these same lessons learned have been incorporated into the A1PII remediation project. In addition to the implementation of the SEP, the Soil Characterization and Excavation Project (SCEP) has been reorganized to provide a single project manager with overall responsibility for the entire remedial effort in an area. This reorganization (Section 6.1) will ensure better control over all activities associated with the remediation of each area and facilitate the dissemination of key information among project personnel.

Because of the general complexity and site-specific nature of soil remediation activities, soil remediation at the FEMP will continue to evolve based on lessons learned during successive remedial efforts. Lessons learned will continue to be applied to future work efforts to ensure the highest possible quality levels are attained.

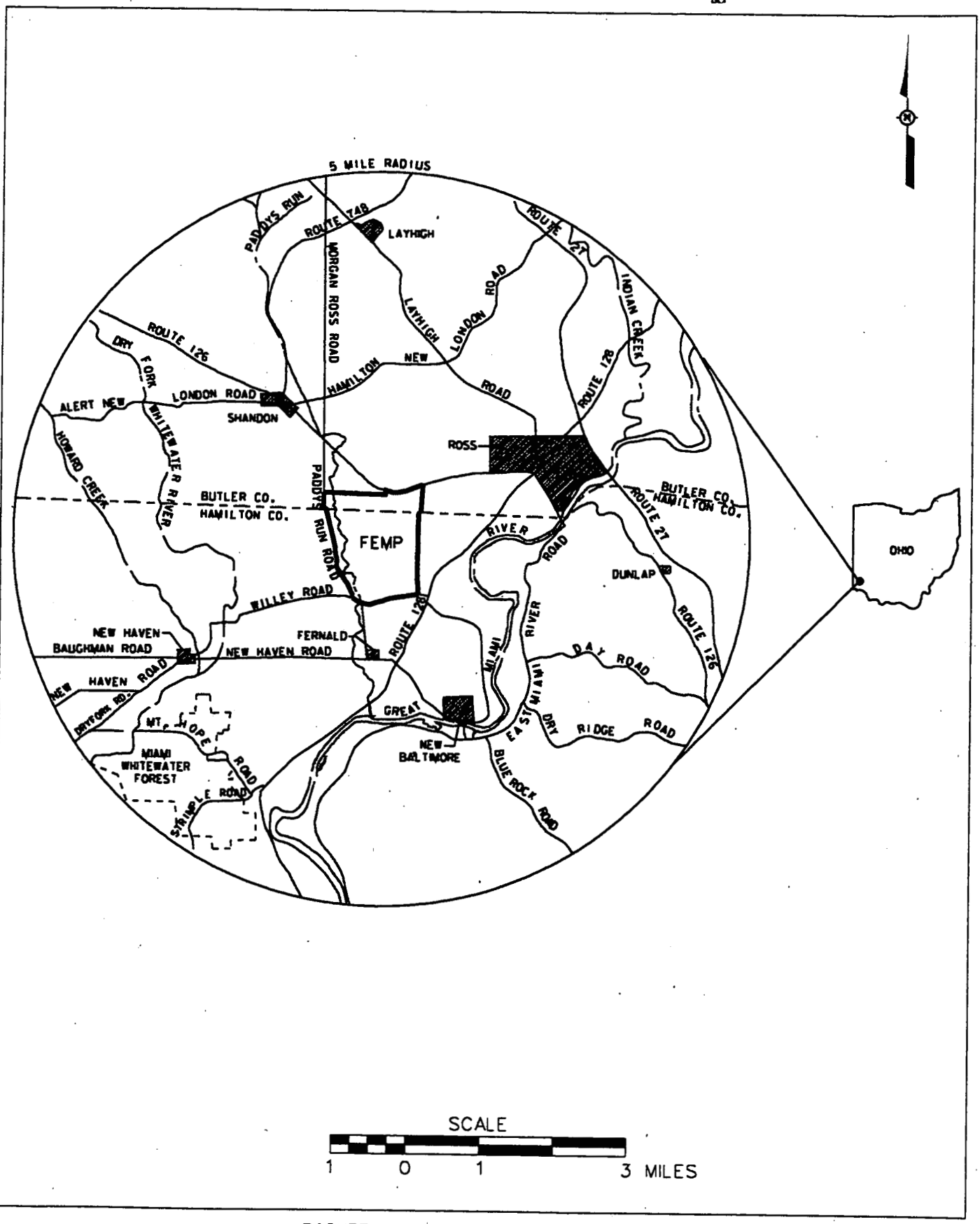

FIGURE 1-1. FEMP LOCATION MAP

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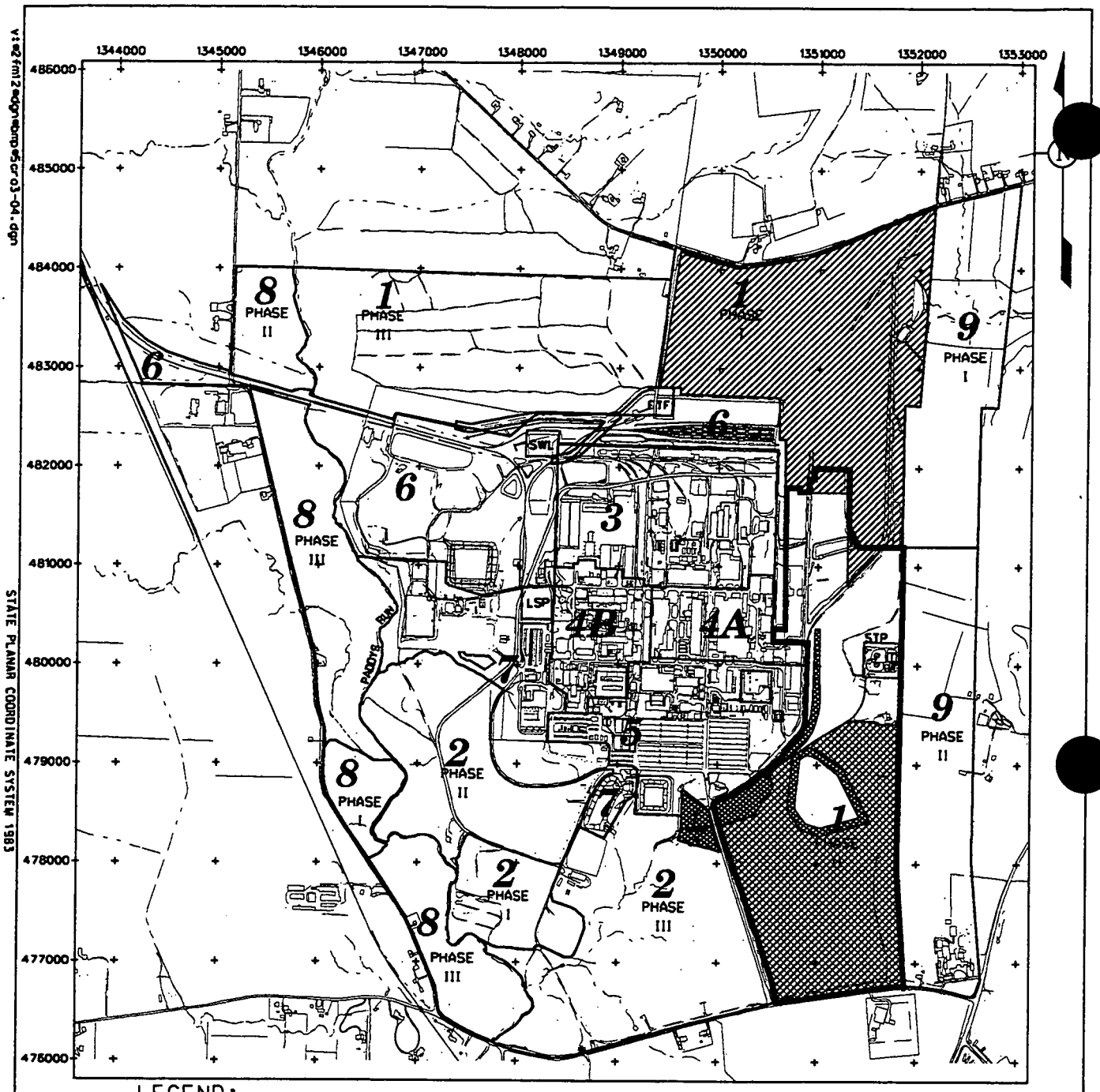
21-SEP-1998



LEGEND:

A1PII BOUNDARY

CERTIFIED AREAS

CHARACTERIZE FOR RE-USE CERTIFICATION UNITS

DRAFT

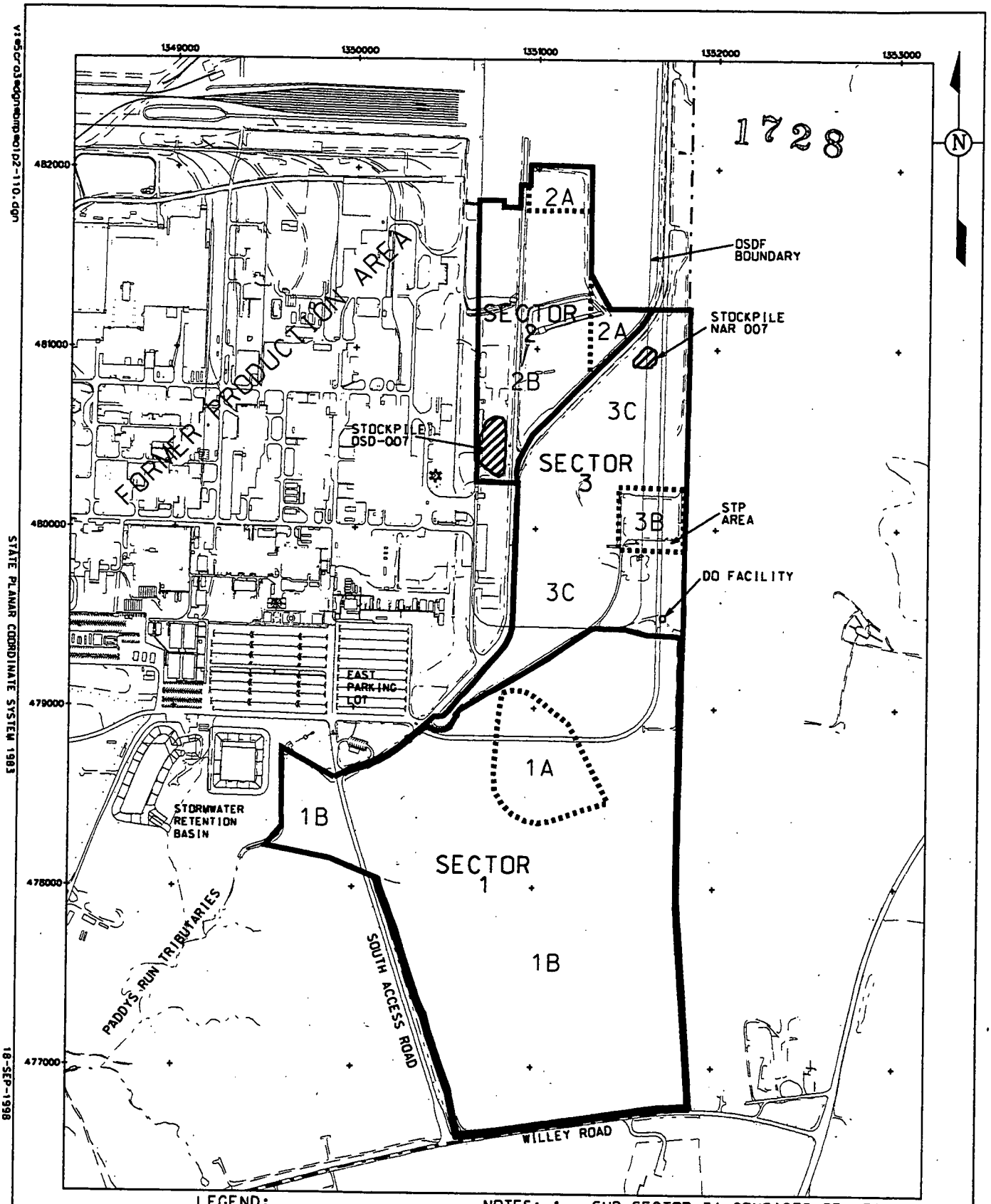
SCALE

1500 750 0 1500 FEET

STATE PLANAR COORDINATE SYSTEM 1983

18-SEP-1998

FIGURE 1-2. DESIGNATED REMEDIATION AREAS



LEGEND:

— · — · FEMP BOUNDARY

SECTOR BOUNDARY

SUB-SECTOR BOUNDARY

NOTES: 1. SUB SECTOR 3A CONSISTS OF UTILITY CORRIDORS OUTSIDE STP AREA (WITHIN 3C).
2. ADDITIONAL SUB-SECTORS MAY BE DELINEATED BASED ON CERTIFICATION REQUIREMENTS.

SCALE

750 325 0 750 FEET

DRAFT

STATE PLANAR COORDINATE SYSTEM 1983

18-SEP-1998

FIGURE 1-3. A1PII SECTORS AND SUB SECTORS

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2.0 PRE-DESIGN INVESTIGATIONS AND CHARACTERIZATION DATA

This section presents the following information:

- A summary of historical and pre-design investigations used to form the basis of the A1PII remedial design
- Existing conditions revealed by those investigations
- Discussions of site contaminants, especially the area-specific constituents of concern (ASCOCs) that define the scope of site remediation, and
- Estimated limits of contamination and limits of excavation.

Section 2.1 provides an overview of A1PII, including surface and subsurface features, both natural and man-made, and a summary of the certification activities conducted in A1PII. The remaining subsections present historical and pre-design data for each of the three primary remedial activities in A1PII; Section 2.2 discusses Site Preparation, Section 2.3 discusses STP Excavation, and Section 2.4 discusses the Trap Range Remediation. Each subsection includes a discussion of early RI/FS investigations that provided the first understanding of site conditions. Also, the conclusions from six recent pre-design investigations performed to supplement data from earlier studies and certification activities conducted in the area are presented. Finally, each section contains a discussion of the estimated contamination limits and excavation limits within each area.

A brief summary of the remedial actions for Site Preparation, STP Excavation, and Trap Range Remediation follows:

- Site Preparation: Selected excavations in the conveyance channel, as identified during characterization for reuse activities performed as part of the certification of Sector 1.

- STP Excavation:

  - Removal of six inches of surface soil from several small areas totaling less than one acre in the general vicinity of the STP. This action will bring the area, part of a previous removal action, in compliance with FRLs.

  - Removal of surface soil in the STP area to reduce soil concentrations of total uranium and technetium-99 to below the WAC and FRL limits.

- Excavation in the STP Area to meet FRLs for total uranium, tetrachloroethene, and other constituents of concern (COCs) in subsurface soils.
- Removal of digester sludge from the STP area.

- Trap Range Remediation
  - Removal of six inches of surface soil in the formerly used Trap Range to reduce surface soil concentrations of lead and arsenic to BTV concentrations.

2.1 AREA DESCRIPTION

As discussed in Section 1.5, A1PII has been divided into three sectors. This section provides an overview of the at- and below-grade structures within A1PII, including environmental monitoring facilities, and describes surface and subsurface geological conditions. Additional detail about at- and below-grade structures and debris may be obtained from the construction drawings. Section 2.1.4 discusses Sector 1 certification activities.

2.1.1 At- and Below-Grade Structures and Debris

A summary of at- and below-grade structures and debris located in Sectors 1, 2, and 3, and how they will be addressed during A1PII remediation, is provided below. Some A1PII structures and facilities will remain in service throughout the planned remediation.

2.1.1.1 Sector 1

Utilities and at- and below-grade structures located in Sector 1 are shown in Figure 2-1. The main components are discussed below.

CG&E Electric Lines

A CG&E electric distribution line on wood poles runs east-west across the southern boundary of Sector 1, and a CG&E high voltage transmission line on steel lattice towers traverses the southern and eastern boundaries of the sector. These facilities will remain in service during A1PII remediation, and appropriate coordination will be maintained with CG&E to ensure continued safe operation of these lines. This area

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has been certified and no remedial activities with respect to, or in the area of, these lines are necessary since the area has been certified.

Mid-Valley Pipeline Company Crude Oil Pipeline

A 20-inch buried crude oil pipeline traverses the southeast portion of Sector 1. This facility will remain in service during A1PII remediation and the area east of the pipeline is planned as the borrow area for the STP excavation backfill. The planned borrow activities will not interfere with the pipeline, and appropriate coordination will be maintained with the Mid-Valley Pipeline Company to ensure remedial activities do not interfere with continued safe operation of the pipeline. No remedial activities with respect to, or in the area of, this pipeline are necessary since the area has been certified.

AWWT Discharge Line

A recently installed, high-density, polyethylene buried pipeline runs parallel to the south side of the STP Access Road through Sector 1. The pipeline carries treated wastewater from the AWWT to the Outfall Pit at the Flume Building. This pipeline will remain in service through A1PII remedial activities, though it may be removed or relocated in conjunction with the DO Facility in the future, if necessary. Appropriate precautions will be taken to avoid direct disturbance or long-term erosional effects that could interfere with continued safe operation of the pipeline, particularly during installation of the surface water management system.

Trap Range

Trap Range facilities and structures included a small metal building on a concrete slab (Trap Range Building), Firing Line slabs, and an in-ground concrete bunker (Trap House). Above-grade portions of the building, fencing, bricks, and other debris stacked adjacent to the building have been demolished and removed. The concrete slabs and below-grade portions of the concrete Trap House will be removed as part of A1PII remediation.

Perimeter Fence and Roads

Sector 1 is bounded on the east by a wire fence. Gravel access roads to the monitoring wells, air monitoring stations, OSDF construction water supply well, and other facilities are located near the southern and eastern boundaries of Sector 1. These roads have been certified and require no remedial action. The South Entrance Road is not part of A1PII, but a segment has been characterized for re-use to permit clean construction of the A1PII Sediment Basin outlet works.

Pole Lights

Lights mounted on wood poles with overhead electric power cables are located along the west side of the South Entrance Road northward to the STP Access Road. North of this point, the lights extend for a short distance on the east side of the North Entrance Road and the power cable is underground. These lights may be temporarily disconnected during construction of the A1PII Sediment Basin inlet and outlet structures.

OSDF Construction Water Well

A construction water well was constructed in Sector 1 south of the DO Facility in 1997, primarily to support OSDF construction. Based on pre-design investigations, surface soil in the area of the well do not exceed FRLs and the area was certified prior to initiation of A1PII activities in Sector 1. The well will be protected for future uses.

Foundations

The FEMP was identified as eligible for inclusion on the National Register of Historic Places during Phase I and Phase II surveys of A1PII. DOE-FEMP consulted with the ACHP and the OHPO, and Phase II Data Recovery was conducted pursuant to OHPO guidelines. Remnants of foundations from buildings which existed in Sector 1 prior to FEMP construction were investigated in accordance with Sections 106 and 110 of the National Historic Preservation Act. Surveys completed in April 1995 determined that no archeological sites or cultural resources existed in Sector 1 which were eligible for the National Register of Historic Places.

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2.1.1.2 Sector 2

Utilities and at- and below-grade structures and debris located within or near Sector 2 are shown on Figure 2-2. The main components are discussed below.

Sediment Traps AIPI-ST-2, AIPI-ST-3

Sediment Traps AIPIST-2 and ST-3 (Figure 2-3), located east of the North Entrance Road in A1PI, were not included in A1PI certification. As part of A1PII Sector 2 activities, the traps will be certified in place and then developed as part of the wetland mitigation area, which will be completed outside the A1PII scope.

A1PI and OSDF Sedimentation Basins

These sediment basins, located in the west-central portion of Sector 2, were certified but have since received runoff from uncertified areas. The impacted sediment will be removed and disposed of in the OSDF (if needed) as part of A1PII Sector 2 activities, and then the basins will be certified again. Interim and final grading and restoration of these facilities will be addressed by the OSDF Project following A1PII activities.

Fuel Gas Pipeline

An asbestos-impregnated, bituminous-wrapped, fuel gas distribution pipeline is located in and near the OSDF Sediment Basin. No contamination other than that associated with the asbestos-containing wrap is expected to be associated with this pipeline. This pipe has been plugged and cleaned and will not be removed as part of the Sector 2 remediation.

Electric Power Cable and Pole Lights

An electric power cable, partly buried and partly overhead on wood poles with lights, parallels the Former Production Area fence in the northwest corner of Sector 2. These facilities will remain in service and the area will be certified as part of A1PII.

Agricultural Drain Tiles

Buried agricultural drain tiles in Sector 2, east of the Old North Entrance Road, will be excavated as part of Sector 2 activities. Based on sampling results for tiles located in Area 1, Phase I (DOE 1996g), these tiles are not expected to exhibit above-FRL contamination.

Old North Entrance Road

The segment of the Old North Entrance Road north of the STP Access Road and associated culverts will remain in service as a clean haul route from the OSDF, but will be addressed as part of Sector 2 precertification and certification activities. Pre-design investigations indicate that soils under the road are below FRLs. The road will ultimately be removed by the OSDF Project after A1PII activities are complete.

OSDF Leachate Conveyance System

A high-density, polyethylene pipe was installed to carry leachate collected at the OSDF south along the west side of the North Entrance Road, then west to the AWWT facility. The pipe lies on the west side of the road, so remedial activities in Sector 2 should not pose a risk to the pipe.

2.1.1.3 Sector 3

Utilities and at- and below-grade structures and debris located in Sector 3 are shown in Figure 2-4. The main components are discussed below.

CG&E Transmission Lines

A CG&E high voltage transmission line was previously located in Sector 3 and provided power to the FEMP substation. The transmission line will be relocated onto wooden poles and steel lattice towers will be removed. This work will be independent of A1PII remedial actions.

The CG&E transmission line and associated lattice towers in the north-south easement near the eastern FEMP boundary will remain in service. Appropriate coordination will be maintained with CG&E to ensure that A1PII remedial activities are conducted in a manner that ensures continued safe operation of these

lines. Additional remediation is not expected for the soils adjacent to these facilities, since they are believed to be below the FRLs.

STP Area Facilities

The Stp was used to treat FEMP sanitary and process wastewater, but was shut down when the BDN-ETS was started in the late 1980s. The above-grade portions of the STP are undergoing D&D in accordance with the OU3 RD/RA Work Plan (DOE 1997a) and facility-specific implementation plan(s). D&D activities will be complete prior to the mobilization of the STP Excavation contractor. The primary facilities remaining after the D&D of the STP include the Sludge Drying Beds, trickling filters, a portion of the digester, and primary settling basins. The Sludge Drying Beds were used for management of sludge generated by the STP, but are now abandoned; this facility has been designated a RCRA HWMU since spent PCE, a RCRA F002 listed hazardous waste, was disposed of in the beds. The Sludge Drying Beds also contain sludge from the Digester Building that was placed on top of the east beds separated by a geotextile material. The Digester Building and primary settling basin contain residual sludge material. This digester sludge was placed in the Sludge Drying Beds and the primary settling basin during D&D activities.

DO Facility (Bldg. 18P) and Flume Building (Bldg. 18R)

The DO Facility and Flume Building are located south of the STP Area. The DO facility is used to oxygenate wastewater effluent from the AWWT and other site discharges as needed to ensure NPDES permit limits for DO are met. The Flume Building houses the Outfall Line Pit, where the combined discharge from the STP and AWWT are discharged to the Great Miami River. A1PII pre-design investigations indicate no above-FRL soil contamination in the vicinity of these facilities, and they will remain in place through and beyond A1PII remediation activities, which will include certification of soil up to the foundations of these facilities. However, the facilities may be relocated or removed, as appropriate, in the future to accommodate the final North Entrance Road alignment or completion of remediation.

Utility Pipelines

In addition to the AWWT discharge line discussed in Section 2.1.1.1, several utility pipelines traverse Sector 3 between the Former Production Area and the STP Area, including two water supply lines, an AWWT wastewater effluent line, the STP wastewater influent pipeline, and a CG&E fuel gas pipeline which continues to the eastern FEMP boundary and beyond. These pipelines have all been purged, plugged and abandoned. The former STP wastewater effluent pipeline runs from manhole (MH) 175 at the STP to MH 176C near the DO Facility, then to MH 176B, where it combines with the current AWWT discharge line for discharge to the Outfall Line Pit at the Flume Building. An abandoned STP effluent line runs from MH 176C off property to the Great Miami River. The fuel gas pipeline may be protected by asbestos-containing bituminous coating or wrap, and the STP influent and effluent pipelines are considered to have a high potential for contamination. The remaining pipelines are considered to have low contamination potential. The water, gas, and STP influent and effluent pipelines were plugged within the Former Production Area, and the gas and effluent lines have been plugged at the FEMP property line. The pipelines will be excavated as part of STP Excavation.

Agricultural Drain Tiles

Buried agricultural drain tiles are known to occur in Sector 3 near the North Entrance Road relocation segment, and will be excavated as part of Sector 3 remedial activities as they are encountered during excavation. These tiles are not expected to exhibit above-FRL contamination (Section 2.1.1.2).

Electric Duct and DO Facility Substation (Bldg. 16K)

A buried electric distribution cable in a concrete duct bank, possibly in an asbestos transite conduit, traverses the sector from the Former Production Area to the DO Facility Substation. This cable will be replaced by an overhead line to the substation. The buried duct bank will be excavated as part of STP excavation. On the basis of pre-design investigations (Section 2.2.2), no above-FRL soil contamination is expected to occur in the duct bank area. The overhead line and substation will remain in service and will be dispositioned in conjunction with the DO Facility.

STP Electric Distribution Line

An electric distribution line on wood poles previously traversed the site from the Former Production Area to the STP. The line has been removed and poles cut off a few feet above grade. The cut off poles will be removed by the STP Excavation Contractor.

Telecommunication Line

The FEMP main telephone fiber optic cable runs along the east side of the North Entrance Road. It is strung on wood poles along the Phase 1 relocation segment and underground southward to west of the southern Former Production Area boundary. The cable will remain in service during A1PII remedial activities. An abandoned section of buried cable remains in place on the east side of a portion of the former North Entrance Road. The abandoned cable will be left in place for removal during OSDF cell construction. Appropriate precautions will be taken to avoid direct disturbance or long-term erosional effects that could interfere with continued safe operation of the telephone cable, particularly during installation of the surface water management system.

Warning Siren, FEMP Perimeter Fence, and Roads

The site warning siren, located on a wood pole near the DO Facility, will stay in place during remediation. Sector 3 is bounded on the east by a wire fence. Based on pre-design investigations of soils in the sector, no remediation of the fence is expected to be needed. Some sections of fence may have to be moved to accommodate remedial activities around the STP. Gravel access roads to the DO Facility, monitoring wells, and air monitoring stations are located near the eastern boundary of Sector 3. Based on pre-design investigations of soils in the sector, no remediation is necessary, and the roads will be certified with the remainder of the sector.

The STP Access Road will be excavated and the area will be precertified and certified as part of Sector 3 activities. Pre-design investigations indicate that the gravel contamination beneath the asphalt surface of the road is below the soil FRLs.

The temporary North Entrance Road segment corridor (road and ditches), which forms the north boundary of Sector 3, will be addressed as part of Sector 3 precertification and certification activities. Surface soil from the corridor was removed prior to building this corridor, and pre-design investigations indicate that soil in adjacent areas does not exceed FRLs. The road will ultimately be removed by the OSDF Project after A1PII activities are complete.

2.1.2 Environmental Monitoring Facilities

Some groundwater monitoring wells, air monitoring stations, and benchmarks will not be impacted by currently planned A1PII remediation and will be left in place. Figures 2-5 and 2-6 show the locations of all monitoring stations, including those to be abandoned.

2.1.3 Surface and Subsurface Conditions

The OU5 RI (DOE 1995b), along with the OSDF and A1PII Soil Excavation Pre-design Investigations, provide much information on the hydrologic and hydrogeologic conditions within A1PII. The site surface and subsurface conditions, as determined from these studies, are discussed below.

2.1.3.1 Surface Coverage and Drainage Pattern

The FEMP site is located within the Great Miami River drainage basin. On-property topography is mainly level to gently sloping throughout, with elevations ranging from approximately 700 feet above mean sea level (msl) in the northeastern corner to approximately 540 feet above msl along Paddys Run in the southwestern corner. Severe slopes are associated with on-property stream channels (DOE 1996h).

The majority of the FEMP property drains to Paddys Run (Figure 2-7). Generally, A1PII drains southwest to drainage ditches, leading to an unnamed Paddys Run tributary [often referred to as the Storm Sewer Outfall Ditch (SSOD)]. Paddys Run is an intermittent, ungauged stream that runs generally parallel to the western boundary of the property. Most existing drainage consists of sheet flow that is uncontrolled before reaching existing conveyance channels (DOE 1996g).

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The current FEMP NPDES Permit (Ohio EPA Permit No. 1IO00004*ED) regulates storm water discharges to Paddys Run at four outfall locations. The A1PII area lies within the same drainage area that leads to Paddys Run Outfall No. *4003, except for a small narrow area along the southeastern corner of the property (DOE 1996g). Project controls for storm water runoff during soil excavation are addressed in Appendix C.

The A1PII drainage pattern varies somewhat in each sector. In Sector 1, most drainage flows overland, westward to drainage ditches along the South Entrance Road and the STP Access Road. Both drainage ditches lead to culverts that run westward below the South Entrance Road to the SSOD. The Sector 1 subarea west of the South Entrance Road drains to ditches leading to the SSOD. A small area in the extreme southeastern corner of A1PII drains eastward to the Great Miami River, either by overland flow over a steep escarpment or to the Willey Road drainage ditch.

Most of Sector 2 drains westward to the OSDF sediment basin located on the western side of Sector 2. The extreme northwestern corner drains to the A1PI Sediment Basin, which outfalls to a storm drain leading to the SWRB. A small area (less than one acre) in the southwest corner of Sector 2 drains to the drainage ditch by the North Entrance Road. Both the OSDF Sediment Basin and the drainage ditch flow to the SSOD. Similarly, Sector 3 drains westward, by overland flow, to the drainage ditches by the STP Access Road and North Entrance Road, which lead to the SSOD. The STP Area runoff is also uncontrolled and flows westward and southwest to the same drainage ditches.

Approximately 0.7 acres of jurisdictional wetlands are located in A1PII. The largest wetland is located west of the STP Area (Figure 2-7). All wetlands are shallow and characterized by emergent vegetation.

2.1.3.2 Soil Stratigraphy and Geotechnical Properties

The surface soil in A1PII consists of silty loams, specifically the somewhat poorly drained Fincastle silt loam in the northern half of the area and the moderately well-drained Xenia silt loam in the south. The southern half of the area also includes pockets of poorly drained Raub silt loam (DOE 1995b). However,

much of the soil north of the STP Access Road has been disturbed during previous construction of the STP, access roads, pipelines, the new soil stockpiles and sedimentation basins.

The FEMP is built on glacial till underlain by sand and gravel deposits which comprise the Great Miami Aquifer (GMA), designated as a sole source aquifer under the Safe Drinking Water Act. The GMA is a high-yield aquifer and supplies a significant amount of potable and industrial water to Butler and Hamilton Counties. An unsaturated sand and gravel zone, approximately 20 to 30 feet thick, separates the base of the glacial till from the regional water table in the GMA. Beneath the GMA deposits, shale and limestone bedrock is approximately 200 feet beneath the FEMP (DOE 1997c). Regional studies by the Ohio Geological Survey indicate the shale and limestone bedrock is approximately 330 feet thick in the FEMP area (Fenneman 1916).

The glacial till within A1PII is thickest (up to 50 feet) in the northeast, and thins to approximately 20 feet in the southwest (DOE 1995b, 1997c). The deepest soil excavations will occur at the STP Area and along the buried utilities/pipelines trending west-east from the process area fenceline to the STP. Excavation in the STP Area will be up to 20 feet deep and will be up to 10 feet deep along the pipeline. The till thickness in the STP Area and along the pipeline is approximately 30 feet deep, which leaves four or more feet of glacial till between the base of the excavation and the top of the unsaturated GMA sand and gravel. The sedimentation basin to be constructed at the northwestern edge of Sector 1 will require a relatively deep excavation of approximately 10 to 15 feet. In this area, the glacial till is approximately 20 feet thick, which results in approximately 5 to 10 feet of glacial till between the top of the unsaturated GMA and the base of the sedimentation basin. Unsuitable subgrade soils encountered in the perched zone will be excavated to a minimum depth of 1 foot below the proposed subgrade elevation as detailed in the Site Preparation construction drawings and technical specifications.

The glacial till is essentially dense, heterogeneous sandy clay, with occasional thin and discontinuous interbedded silt, sand and gravel lenses. The glacial till can be further divided into an upper brown clay layer and a lower grey clay layer. Within A1PII, the grey clay, which is in the protective layer of the GMA, ranges in thickness from approximately 10 to 42 feet (DOE 1995b, DOE 1997c, Parsons 1995).

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The glacial till consists of varying mixtures of fine-grained and coarse-grained soils. Fine-grained soils within the brown and grey till units are predominantly clay, with sand contents ranging between values that result in the materials being classified as sandy clay or clay with sand. The consistency of the clay generally increases with depth (through both the brown and grey till layers) from stiff to very stiff and hard; however, the plasticity tends to decrease with depth. Layers of coarse-grained materials exist in the brown till as well as the grey till, and locally display perched water conditions. The coarse-grained materials range from poorly graded to well graded sand with scattered gravel, and are typically dense. Directly below the till are sands and gravels of the GMA (Parsons 1995).

2.1.3.3 Perched Water Zone

Perched water is present above the unsaturated zone of the GMA within the glacial till. The entire section of glacial till is believed to be saturated or near-saturated (DOE 1995b, Parsons 1995). Thin, heterogeneous, and discontinuous silty and sandy zones that can more readily transmit perched water exist within the glacial till (DOE 1995b). The OU5 RI/FS identified such an area within and adjacent to the STP; the general perched water in the till and in the STP Area are discussed below.

2.1.3.4 Perched Water in Till

Overall, the till exhibits between 90% and 100% saturation (close to field capacity) and has the general properties of an aquitard (DOE 1995b, Parsons 1995). When the till reaches fill capacity, it can release water downward under a unit vertical hydraulic gradient into the underlying unsaturated zone of the GMA. Eventually, this downward-moving water will enter the saturated portion of the GMA as recharge. Depths to perched water in the till are generally 6 feet or less in the eastern portion of the FEMP (DOE 1995b, DOE 1997c).

Slug test data from perched water wells installed in the till indicate that, for wells screened across the brown and grey clay layer interface, the average horizontal hydraulic conductivity is 6.30×10^{-6} cm/sec (DOE 1997c). Slug tests in A1PII till wells indicate a horizontal permeability of 9.51×10^{-7} cm/sec, 2.62×10^{-6} cm/sec, and 1.6×10^{-4} cm/sec, in brown clay, grey clay, and grey silt, respectively (DOE 1995b). Overall, the grey clay layer beneath the brown clay is the least permeable layer above the GMA

(DOE 1997c, Parsons 1995). Laboratory (vertical) hydraulic conductivities conducted on grey clay samples range from 9.53 x 10^{-9} cm/sec to 5.83 x 10^{-8} cm/sec, and on brown clay samples range from 6.4 x10^{-6} cm/sec to 9.0 x10^{-9} cm/sec. Other laboratory and field measurements indicate the till has an effective porosity of 4% to 10%, and a representative bulk density of 1.85 g/cm^3 (DOE 1997c).

Model calibration studies conducted during the OU5 RI/FS indicate the average vertical groundwater flow rate through the glacial till (including the grey clay layer) to be approximately six inches per year. The time it takes a contaminant to move through the glacial till and break through into the GMA is controlled by the thickness of grey clay present in the till, the groundwater infiltration rate through the grey clay, and the retardation properties of the grey clay. In the OSDF area (Sectors 2 and 3), modeled breakthrough travel times for uranium, the FEMP's predominant contaminant, range from approximately 210 years (to have a 20 g/L concentration in the aquifer) to 260 years (to have 1% of the source concentration). These breakthrough times were calculated using a retardation factor of 165 for the grey clay, without respect to movement through the brown clay, and not including any retardation in the unsaturated GMA sand and gravel. The modeled breakthrough travel time for 1% of a technetium source, the FEMP's most mobile contaminant, is approximately 3.6 years. This breakthrough time was calculated using a retardation factor of 2.29 for the grey clay, without consideration of movement through the brown clay, and not including any retardation in the unsaturated GMA sand and gravel. This modeling strategy was later used in the OU5 FS to calculate OSDF WAC (DOE 1996f).

Although the till is generally saturated, there are no identified thick or laterally continuous coarse-grained zones in A1PII (DOE 1995b, DOE 1997c). The discontinuous nature of the perched water in the glacial till does not allow measurement of a continuous water table gradient in the OSDF area. Groundwater flow meter readings from 22 wells taken during the OSDF Pre-design Investigation indicate that the horizontal flow directions vary abruptly from well to well, with no discernable patterns. Consequently, horizontal flow regimes are interpreted to be very localized (perhaps on the order of tens to hundreds of feet in length) and not laterally persistent due to the discontinuous nature of the interbedded coarse-grained lenses. Taken collectively, the water levels obtained during the OU5 RI (DOE 1995b) indicate that, if the perched water

zones were connected, the horizontal gradient would range between 0.008 to 0.015 feet/foot (DOE 1997c). The general flow direction is toward the southwest.

2.1.3.5 Perched Water in the STP Area

The OU5 FS defined a perched water zone within the STP Area that poses an unacceptable threat of contaminant levels within the GMA via vertical migration through the grey clay (DOE 1996f). This zone is comprised of several discontinuous silt and sand lenses within the top 20 feet of till (Figure 2-8). Although the interconnection between the sand and silt layers has not been confirmed through field pump tests, if connected, the flow in this zone is indicated by water levels to the northwest (DOE 1995b). This perched water zone (like all identified perched water zones) will be excavated along with the excavation planned to address soil FRLs.

The extent of excavation will be based upon achieving soil FRLs, which incorporate cross-media impacts from contaminated soil to (uncontaminated) perched water, which then migrates vertically to the GMA. Any coarser-grained lenses visible along the excavation wall will be sampled for soil FRLs (see Section 3.0).

As summarized in the OU5 RI (DOE 1995b), a total of 24 constituents (11 radionuclides; 8 inorganics, VOCs, semi-VOCs; and 3 general chemistry parameters) were detected at above-background concentrations in the perched water in the STP area. Besides uranium, the most frequently detected parameters above background were VOCs. Four VOCs were detected in perched water: 1,1-dichloroethane (maximum 3 μg/L), 1,2-dichloroethene (maximum 89 μg/L), tetrachloroethene (maximum 39 μg/L), and trichloroethene (maximum 13 μg/L). Two semi-VOCs were detected at concentrations only slightly above the quantitation limit: diethyl phthalate (a common laboratory contaminant) and phenol (DOE 1995b). According to the OU5 RI, the source of the uranium contamination in the STP Area perched water was air deposition from the STP Incinerator ash. However, the sludge in the Sludge Drying Beds contained uranium and may have been a localized source of uranium contamination in the perched water. The source of VOC contamination within the STP Area appeared to be from the Sludge Drying Beds, which previously held sludge contaminated with VOCs, including RCRA-listed tetrachloroethene (DOE 1995b).

As part of the pre-design investigation, the perched water was sampled in suspect areas to identify the current nature of contamination for perched water management purposes (DOE 1997c). The analytical results of this investigation indicated no VOC and no total uranium contamination. The decrease in contamination levels may be explained by the elimination of the source of contamination, which was the sludge in the Sludge Drying Beds, and by natural attenuation through one or more mechanisms. Most of the sludge has since been removed, once in August 1989, and once in December 1990; pockets on the surface remain.

2.1.4 Certification Activities

Two separate certification activities have been undertaken in A1PII. The first is the certification of Sector 1, 2a, and the Conveyance Ditch areas, which is complete and has been approved by the regulatory agencies. The second effort is the certification of A1PI Sediment Traps 2 and 3, which is currently in progress.

2.1.4.1 Certification of Sector 1, 2a, and the Conveyance Ditch

A certification effort was completed in July 1998 for several areas within A1PII, as described in the Certification Report for Area 1, Phase II - Sector 1, 2a, and the Conveyance Ditch (DOE 1998e). The report presented the information and data used to determine that contaminated soil cleanup objectives were successfully achieved in the subject areas.

The certification activities were conducted within three areas: A1PII Sector 1 (A1PII-S1), A1PII Sector 2a (A1PII-S2a), and the A1PII Conveyance Ditch, as shown in Figure 2-9. A1PII-S1 is an approximately 80 acre area located south and east of the former production area, south of the old STP and east of the South Entrance Road, and is currently being developed for the OSDF borrow area. The certification excluded Sector 1A, the Trap Range Area. A1PII Sector 2a is divided into two separate areas of approximately three acres each; both are contiguous with the A1PI certified area. These areas required certification to expedite construction of OSDF Cell 3 and an associated haul road tie in. This certification effort included characterizing the Conveyance Ditch area for reuse. The Conveyance Ditch, a long corridor approximately 50 feet wide and 600 feet long (approximately two thirds of an acre), is designed to accommodate drainage

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during A1PII Sector 3 remediation and will be constructed by the Site Preparation contractor. Figure 2-9 shows the location of the areas certified and characterized for reuse as part of this effort. All Certification Units (CUs) for A1PII Sector 1, 2a and the Conveyance Ditch passed the certification criteria, and the data are presented in the Certification Report (DOE 1998e).

2.1.4.2 Certification of Area 1 Phase I Sediment Traps

A1PI Sediment Traps 2 and 3, shown in Figure 2-3, are currently in the process of being certified. After the traps are certified, the area will be developed as a wetland mitigation area. Construction activities to develop wetland mitigation are not within the A1PII scope.

2.2 CHARACTERIZATION DATA SUPPORTING SITE PREPARATION ACTIVITIES

2.2.1 Historical and Certification Activities

As discussed in Section 3.1, Site Preparation work will be conducted in Sectors 1 and 3; the primary objective is to construct a surface water management system. In order for these activities to occur, several areas in Sectors 1 and 3 were certified in July 1998. As discussed in the Certification Design Letter (CDL) (DOE 1998f), all historical data were reviewed, and it was determined that no remedial actions were necessary prior to certification. Based on the findings as discussed in the CDL, the certification effort proceeded for the areas shown in Figure 2-9.

The certification effort included several characterization for reuse areas to support Site Preparation. These areas were characterized for reuse as below FRL so that the Site Preparation construction activities could be performed in non-impacted areas. The characterization for reuse areas included four CUs, as shown in Figure 2-9. The first CU is A1PII-S1-01 and represents the approximately four acre outfall area west of the South Entrance Road. CU A1PII-S1-03 is the location of the sediment basin connecting the Conveyance Ditch and outfall area, and CU A1PII-S1-19 is the location of run-on and run-off control ditches protecting the trap range area. This certification effort also included characterization for re-use of the Conveyance Ditch CU (A1PII-S3-CD-01). Furthermore, two roadway areas were also characterized for reuse. The portion of the South Entrance Road where a culvert will be located connecting the sediment basin and the outfall area, and the area on the STP

access road where a culvert will be placed connecting the sediment basin and the Conveyance Ditch were both characterized for reuse.

All CUs for A1PII Sector 1, 2a and the Conveyance Ditch passed the certification criteria on the first round of certification, including the characterization for reuse CUs, without any additional corrective actions. However, review of the data showed that in two CUs, A1PII-S1-19 and A1PII-S3-CD-01, there is localized contamination. In CU A1PII-S1-19 the lead and arsenic results were elevated for one sample. The corrective action will be to excavate approximately 15 yd^3 around this sample, and place the excavated material in the Trap Range to be treated. Figure 2-10 shows the location of the sample and stockpile area in the Trap Range. This action will be not be in the scope of the Site Preparation contractor or the Trap Range Remediation contractor, and will be completed prior to their mobilization.

While CU A1PII-S3-CD-01 passed the certification criteria, two areas will be excavated as shown in Figure 2-11. These excavations will be performed per an agreement with the regulatory agencies. Although the SEP would not have required corrective action, this agreement was made prior to regulatory approval of the SEP (DOE 1998a). The first area is the northern portion of the CU, where the total uranium results for Samples #10, #11, and #16 are 51.20 μg/g, 51.20 μg/g, and 40.70 μg/g, respectively. The second area is around Sample #2, which is close to the STP Access Road in the southern portion of the CU. The total uranium result for this sample is 102.00 μg/g. Since the elevated values in this CU are localized, DOE will excavate all material up to one foot in depth above northing 479959 (midpoint from Sample #11 and #12) to the northern boundary of the CU. This soil will be used to build the STP haul road that connects the STP Area to the OSDF haul road. Furthermore, a separate excavation one foot deep and extending laterally to a 20-foot radius will be centered around Sample #2. This excavation will terminate at the northern edge of the STP Access Road pavement. Additionally this one foot excavation will extend 80 feet beyond the radius in the ditch both upstream and downstream from Sample #2. Its width will be from the northern edge of the STP Access Road through the centerline of the ditch and include the northern bank of the ditch. This

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soil will be sent to the OSDF. The planned excavations are shown in Figure 2-11 and will be performed by the Site Preparation Contractor.

2.2.2 Pre-design Activities

Historical data and process knowledge showed that widespread contamination in the Site Preparation areas was unlikely (this was subsequently confirmed by certification sampling). The only pre-design activity performed was an investigation survey in the entire A1PII area, except for the STP area which is discussed in Section 2.3.2.5. The objective of this investigation was to achieve, to the extent possible, 100% scanning of the entire A1PII area using real-time monitoring systems, including the real time Radiation Tracking System (RTRAK), a mobile system fitted with a sodium iodide (NaI) detector, and the High Purity Germanium (HPGe) detectors. Physical samples were collected in every acre of A1PII, and in areas where the real-time systems indicated elevated contamination. The primary purpose was to collect data to help delineate those areas within A1PII requiring excavation and to delineate areas where soil contamination may exceed the OSDF WAC.

The investigation proceeded in three phases. In Phase 1, all RTRAK-accessible areas were scanned using NaI detector systems. If observed total uranium concentration values exceeded the 66 mg/kg and 800 mg/kg trigger levels, additional measurements were performed in the second phase. Note that these trigger levels were selected prior to development of the FEMP in-situ gamma spectrometry user guidelines (DOE 1998g). In Phase 2, HPGe measurements were taken in every block in the grid, as shown in Figure 2-12. Each block is approximately one acre. Phase 2 also included taking HPGe measurements where the NaI detector measurements exceeded the 66 mg/kg trigger level used in Phase 1. Within each block, measurement points were established at the center of the block and at the center of each quadrant within the block. At least five non-overlapping HPGe detector measurements were taken at each measurement point to determine if concentrations exceeded the total uranium FRL of 82 mg/kg.

Phase 3 consisted of physical sampling to confirm HPGe measurements. The sampling rate was one sample for every two HPGe measurements below the 66 mg/kg trigger level, and one sample for each

HPGe measurement above the 66 mg/kg trigger level. One physical sample was taken from each block in Sector 1.

RTRAK results for total uranium, thorium-232, and radium-226 are shown in Figures 2-13, 2-14, and 2-15, respectively. A more detailed map of the RTRAK coverage is available on the SCEP web page at www.ead.anl.gov/~femp/. Note that several areas in the northern part of A1PII were inaccessible because of OSDF construction and existing stockpiles. The RTRAK measurements for total uranium are below the 66 mg/kg trigger level except for areas adjacent to the STP, and no measurements approached the 800 mg/kg WAC trigger level. These areas were further evaluated using HPGe and physical samples. Initial RTRAK runs in some areas indicated elevated concentrations of radium-226 approaching the FRL. However, further evaluation of the data indicates that these readings are caused by elevated radon from natural uranium in soil, since field records show the measurements were taken early in the morning before the radon dissipated. Additional sampling and, subsequently, certification sampling confirmed this hypothesis.

The data from the Phase 2 HPGe results for total uranium, radium-226, and thorium-232 are presented in Appendix B-1. A more detailed map of the HPGe coverage is available on the SCEP web page at www.ead.anl.gov/~femp/. These measurements include HPGe measurements taken within the grid, where RTRAK measurements exceeded the 66 mg/kg trigger level for total uranium, and areas inaccessible by the RTRAK. In general, the HPGe complemented the RTRAK in finding elevated readings adjacent to the STP.

Figure 2-16 shows the location and the associated results of the physical samples for total uranium. This figure is also available on the SCEP web page. These data were used in conjunction with historical data to determine the surface excavation limits as discussed in Section 2.3.3. The RTRAK and HPGe data were not used as the basis for determining excavation limits, but for selecting sample locations that would supplement and better refine the model.

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2.2.3 Excavation Limits

The only remedial action planned during Site Preparation is the excavation of the above ALARA total uranium soil in the Conveyance Ditch, as shown in Figure 2-11.

2.3 CHARACTERIZATION DATA SUPPORTING STP EXCAVATION ACTIVITIES

2.3.1 Historical Investigations

In general, results of the RI/FS studies in A1PII (DOE 1995b, 1996f) indicated above-FRL contamination, primarily for total uranium, in surface soil throughout much of the north and central parts of A1PII Sector 3, and at depth in the STP Area. Subsequent analysis of the RI/FS results indicated additional sampling and analysis could substantially improve estimates of the extent of contamination in the area. This section discusses three important historical investigations in A1PII STP and surrounding areas, and the relevant findings from each. This section also addresses data from activities that are unrelated to the OU5 RI/FS, specifically waste management activities associated with the STP Sludge Drying Beds, and the results of a leachability and partitioning coefficients study.

2.3.1.1 STP Investigations

Two STP Area investigations were conducted as part of the OU5 RI/FS. All sampling locations from this investigation are depicted in Figure 2-17. The first investigation was the surface soil sampling program, conducted in 1988. All samples were collected within the upper 18 inches of soil and were analyzed for radiological parameters only. Surface radiological measurements and limited soil samples collected in the STP Area indicated the presence of localized above-background uranium concentrations. Airborne deposition (i.e., surficial soil contamination) from the incinerator stack was identified northeast of the STP. Some subsurface radiological contamination was also indicated beneath the STP.

The second investigation, conducted in 1990, involved installing six monitoring wells in accordance with the Production and Additional Suspect Areas Work Plan. Subsurface soil samples from selected intervals were analyzed for full radiological parameters and results indicated that total uranium concentrations decreased with depth. These data and process knowledge indicated that the STP was the

source of subsurface total uranium. The available data indicated that perched water under the STP contained uranium and tetrachloroethene, but the extent of this contamination in the STP Area was unknown.

2.3.1.2 Removal Action 14 Testing

Removal Action 14 (RvA 14) involved the time-critical removal of contaminated soils adjacent to the STP Incinerator. The Removal Action Work Plan (RvAWP) was approved by the regulatory agencies in July 1992, and field work began in August 1992. The work was conducted in an iterative manner that:

1. Identified areas with uranium contamination in excess of the following removal criteria:

Areas	Uranium Action Levels	
On-property areas within the STP	300 pCi/g	= 444 μg/g
On-property areas outside the STP	100 pCi/g	= 148 μg/g
Off-property	35 pCi/g	= 51.8 μg/g

2. Performed initial excavations within these areas to remove and containerize radiologically-contaminated soils.

3. Performed post-excavation verification sampling to assure that the action levels were met.

The result was the excavation of 1,320 yd^3 from 12 on-property areas, as shown on Figure 2-18. An additional 1,740 yd^3 were excavated from off-property areas. The goals of RvA 14 were met, and the pre- and post-excavation verification sampling data are presented in the RvA 14 Summary Report (DOE 1995c). The OU5 RI presents additional information about this and other OU5 removal actions (DOE 1995b).

2.3.1.3 Leachability and Partitioning Coefficients Testing

Batch desorption tests were performed to find the leachability coefficient (K_l) of site surface soil (DOE 1996f). Additional details may be found in the OU5 FS. Surface soil samples in source areas of suspected contamination, including the former production area and the STP, have a K_l value of

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15 L/kg, indicating the possible presence of a relatively soluble form of uranium, the dominant contaminant in the STP Area. Uranyl nitrate is the main contaminant in such areas, where uranium was dissolved in a water carrier. Because of its high solubility, uranyl nitrate poses a potential risk to the underlying aquifer.

Soils containing relatively insoluble forms of uranium, such as uranium oxides, exhibit a K_l of 222 L/kg. These forms are probably particulates from stack or incinerator emissions. These less soluble oxides are less soluble and mobile than uranyl nitrate and pose less risk to underlying groundwater.

The FRL in areas with low K_l levels (15 L/kg), including the western portion of the STP, is 20 mg/kg (mg/kg) total uranium. This level will protect the aquifer from the more soluble and transmissible chemical fraction. The FRL of 82 mg/kg total uranium applies to the remainder of A1PII. Figure 2-19 shows the K_l study results in the STP area.

K_D, the soil/water partitioning coefficient, is closely related to K_l and is a critical parameter in soil modeling. The estimated limits of excavation presented in Section 2.3.3 are based on the assumption that, for A1PII soils, K_D equals K_l.

Investigations revealed two types of uranium and uranium compounds at the STP, one more soluble than the other. The leachability testing described above provided the leachabilty coefficient (K_l) for each type. The coefficients, in turn, were the bases for FRLs established in the OU5 ROD (DOE 1996b). Figure 2-19 shows the corresponding on-property areas in A1PII.

2.3.1.4 Waste Management and In Situ Gamma Spectroscopy Sludge Drying Beds Data

The Sludge Drying Beds lie north of the sludge digester unit, within the STP Area. There are two sets of beds, east and west, but only the east beds were used (see Figure 2-4). The beds consist of sand and gravel layers with approximate dimensions of 70 feet wide by 92 feet long by 5 feet deep. The beds were used for dewatering STP sludge by draining and air drying. The Sludge Drying Beds were

taken out of service and sludge was removed from the drying beds and containerized in August 1989 and December 1990. No previous sludge removals are documented. Approximately 35 yd^3 of sludge remain in the beds.

Sludge from a Service Building sump was directly added to the drying beds. This sump serviced the site laundry unit, which included dry cleaning operations using tetrachloroethene, a RCRA-listed spent solvent (F002). Based on process knowledge, the Sludge Drying Beds were designated HWMU No. 41. The OSDF may accept RCRA-listed hazardous wastes that do not exceed WAC.

Containerized sludge removed from the beds was characterized, and the results were summarized on Material Evaluation Forms (MEFs) as part of site waste management activities. Radiological analyses indicated a mean total uranium concentration of 1,910 mg/kg (mg/kg), but the detected RCRA toxicity characteristic constituents were less than their respective toxicity characteristic regulatory limits. In addition, all sample results were at least one order of magnitude below the toxicity characteristic regulatory limit when the total concentrations of various constituents were converted to their Toxicity Characteristic Leaching Procedure (TCLP) equivalent concentrations using the 20-fold method dilution factor. Tetrachloroethene was not detected, and only arsenic exceeded its FRL. The historical waste management characterization data for the sludge indicate the remaining sludge exceeds the WAC for total uranium, but is not a RCRA characteristic waste.

Also, as part of the Comparability of In Situ Gamma Spectrometry and Laboratory Data study (DOE 1997d), additional measurements were taken in the Sludge Drying Beds confirming that sludge is above the OSDF WAC threshold of 1,030 mg/kg (mg/kg) for total uranium. Because the sludge does not meet the OSDF WAC for total uranium, it will need to be disposed off site. The sludge will be containerized and evaluated to determine if the Land Disposal Restriction (LDR) treatment standards have been met for F002-listed tetrachloroethene as part of arranging for its off-site treatment/disposal. The results associated with waste management activities and those from the Comparability Study are presented in Appendix B-2. The characterization data were also used to determine data needs for the underlying sand and clay till, which was sampled as part of the pre-design field sampling for

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miscellaneous areas. Data from this investigation show no contamination of the gravel or soil underneath the beds.

During D&D activities, the east Sludge Drying Bed was modified and the area was used to store above-WAC digester sludge. The Sludge Drying Bed modifications included removal of the distribution boxes and vegetation (and placing it on the west Sludge Drying Bed), construction of an earth berm at the perimeter, and placement of geotextile liner. Approximately 500 yd^3 of digester sludge was placed on the east Sludge Drying Bed. The digester sludge is 3e to 4 feet deep and is covered with a layer of plastic.

2.3.2 Pre-design Activities

In order to supplement existing data for the A1PII design several pre-design investigations were performed. The pre-design investigations included:

- Total Uranium in the STP
- Investigation of Technetium-99 in the STP
- Perched Water Sampling in the STP
- Field Sampling in Miscellaneous Areas
- Pre-design Survey Investigation.

The primary findings of each of these studies are summarized below.

2.3.2.1 Total Uranium in the STP

The primary objective of this investigation was to collect additional data to better define the horizontal and vertical extent of contamination and the subsequent amount of excavation required near the STP. Kriging the data collected during early investigations predicted that uranium concentrations exceeded FRLs over a broad area, requiring extensive remedial excavation. However, the number of sampling points was insufficient to establish a high degree of confidence in the modeling. The kriging model evaluates trends along a path to estimate the boundaries of areas requiring remediation. The technique is conservative, overestimating contaminant plumes or required excavations when insufficient data are available.

The project-specific plan (PSP) proposed up to 20 borings advanced to depths of 8 to 25 feet, with samples collected at multiple intervals and analyzed for total uranium. The PSP was executed in two phases. Phase 1 consisted of 15 borings within the FEMP boundary in and around the STP Area, including those along the FEMP property line. If any of the borings along the east property boundary indicated above-FRL contamination, the off-property Phase 2 borings would have been performed. The analyses from all the Phase 1 borings were below the FRL; therefore, no Phase 2 borings were completed. These data, in addition to other data from previous investigations, were used in the kriging model to develop the excavation model.

The soil boring locations are shown in Figure 2-20, STP Pre-design Investigation Boring Locations, and the associated results are shown in Appendix B-3. In general, the results indicated successful delineation of uranium concentrations in the STP area. The deep excavations for the STP will be limited to excavating the foundations. In order to confirm the assumption that total uranium is the driver for excavation in the STP area, all the samples from this investigation were submitted for analysis for isotopic thorium and radium. Results showed no values that would alter the excavation strategy. The entire data set is presented in Appendix B-3.

2.3.2.2 Investigation of Technetium-99 in the STP

Historical data collected to support the OU5 RI (DOE 1995b) indicated that technetium-99 concentrations in soils near the STP exceeded the 30.0 pCi/g FRL and the 29.1 pCi/g WAC. These data were considered to be potential false positives. The objective of this investigation was to collect additional data to re-evaluate earlier OU5 RI results. The original scope of this project was limited to collecting and analyzing surface and subsurface soil samples at two locations where earlier investigations had detected technetium-99 within the STP, and in limited areas surrounding the two locations. At each location, samples were collected at 0 - 0.5 feet, 1.0 - 1.5 feet, 2.0 - 2.5 feet, and 3.0 - 3.5 feet intervals. This investigation was also executed in phases. In Phase 1, samples were collected at the original detection locations and in a symmetrical pattern around the locations. Phase 2 samples were to be collected and analyzed only if any Phase 1 samples exceeded the FRL or WAC.

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Figure 2-21 shows the sampling locations for Phase 1 and the proposed Phase 2 sample locations. Results of the Phase 1 sampling confirmed the presence of technetium-99 at 50.8 pCi/g located adjacent to the northern trickling filter in the 0 - 0.5 feet sample taken at point 14 as shown on Figure 2-21. Also, a duplicate result at location #12 from the sample taken at the 3 – 3.5 feet interval was 34.0 pCi/g, while the original result was 17.8 pCi/g. Based on these results, the Phase 2 sampling was redesigned to try to identify a source for the technetium-99 and to delineate the contamination.

The Phase 2 sampling consisted of sampling at 22 additional locations around the STP area, as shown in Figure 2-22. Samples were analyzed for total uranium and technetium-99 to determine if the contamination was collocated, and consisted of the following:

- Borings were extended to a depth of 5 feet at locations 22, 23, and 24 as shown in Figure 2-22. Samples were taken from the 0 – 0.5 feet, 1 – 1.5 feet, 2 – 2.5 feet, 3 – 3.5 feet, and 4 – 4.5 feet intervals. The intent of these samples was to determine if any contamination could be located at depth to confirm the duplicate result seen at the 3.0 – 3.5 feet depth at location 12 in the Phase I sampling. All samples from locations 22 and 23 were below the FRL and WAC levels; however, the 0 –0.5 feet samples from location 24 was 121.99 pCi/g, and all other results were below the WAC and FRL limits.

- Surface soil samples were taken from the 0 – 0.5 feet interval at locations 25, 26, 27, 28, 29, and 30 (Figure 2-22), located at the berms of the trickling filters, to determine if wastewater spills from the filters may have contaminated the adjacent soil. Results from these samples showed technetium-99 contamination on the berms. The results of the samples around the northern trickling filter, locations 25, 26, and 27, were 44.22 pCi/g, 51.37 pCi/g, and 102.25 pCi/g, respectively. A duplicate taken at location 27 was 335.01 pCi/g. The results of the samples around the southern trickling filter, locations 28, 29, and 30, were 47.92 pCi/g, 19.68 pCi/g, and 25.50 pCi/g, respectively.

- Borings were taken at locations 31 and 32 (northern trickling filter), and at 33 and 34 (southern trickling filter) to determine if contamination exists at depth from exfiltration from the trickling filters. These borings extended 10 feet from the ground surface to identify any contamination from the base of the trickling filter, which is 9 feet in height. The borings were located at the edge of the berm. Samples were taken from the first 6 inch interval of every foot in depth for a total of 10 samples. For the northern trickling filter, the surface interval from location 31 was 56.9 pCi/g, however no contamination approaching the WAC or FRL levels was seen at depth. Samples from location 32 were all below the FRL and WAC limits. For the southern trickling filter the surface samples from locations 33 and 34 were 30.46 pCi/g and 108.32 pCi/g, respectively. None of the samples taken at depth showed contamination.

- Surface soil samples were taken at locations 35, 36, 37, 38, and 39 were taken to determine if the incinerator located in the northwestern corner of the STP was potentially the source of the technetium-99, and to provide additional coverage in the area. Samples from locations 36, 37 and 39 showed technetium-99 concentrations of 67.84 pCi/g, 52.19 pCi/g, and 91.77 pCi/g, respectively. Samples from 35 and 38 were below the FRL and WAC limits. A duplicate taken at location 37 was 40.31 pCi/g.

- Finally, additional surface samples were taken at locations 40, 41, 42, and 43 to provide additional coverage where technetium-99 data were not as dense as other locations in the STP. The sample from location 40 was 37.33 pCi/g; all other results were well below the technetium-99 action levels.

Since the Phase 2 sampling did not delineate the technetium-99 contamination and identified other areas of contamination, Phase 3 sampling was implemented. Part of Phase 3 included sampling wastewater and STP process material at various points in the STP. Sampling also consisted of taking additional samples from the 0 – 0.5 feet and 0.5 – 1.0 feet intervals at 41 locations. These 41 locations are shown in Figure 2-23. This figure includes the results for this phase as well as for Phases I and II. The Phase 3 Sampling Locations and the results are summarized below.

- In order to determine the source of technetium-99, water samples were taken at various locations in the STP. Samples were taken from the Primary Settling Basin influent, the Trickling Filter Sludge, the Chlorine Contact Chamber effluent and the Recirculating Sludge from the Digester. The technetium-99 results for these samples were 11 pCi/L, 25 pCi/L, 41 pCi/L, and 97 pCi/L, respectively. Unfortunately, these data yielded little information with regard to the source of technetium-99.

- Samples were taken from locations 44 through 55 to delineate the technetium-99 contamination found in the Phase 2 samples (locations 36, 37, and 39) in the northern portion of the STP. All the samples from both intervals were well below the WAC and FRL levels.

- Samples from locations 56 through 61 were taken around the base of the northern trickling filter. Samples from the top interval at locations 56 and 59 were 48.3 pCi/g and 40.0 pCi/g, respectively. A duplicate sample from the 0 – 0.5 feet interval at location 59 was 37.6 pCi/g. All other results including the samples from the 0.5 – 1.0 feet intervals at these locations were below the action levels.

- Samples from locations 62 through 69 were taken around the base of the southern trickling filter. Samples from the top interval at locations 63, 64, and 65 were 39.1 pCi/g, 39.0 pCi/g and 28.6 pCi/g, respectively. A duplicate sample from the 0 – 0.5 feet interval at

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location 65 was 46.8 pCi/g. All other results including the samples from the 0.5 – 1.0 feet intervals at these locations were below the action levels, except for the 0.5 – 1.0 feet interval at location 65 which could not be collected since the material from this interval was primarily gravel.

- Samples from locations 77 through 89 were taken at various locations in the STP area for additional coverage. The results from these samples were all below the FRL and WAC limits.

Figure 2-23 shows the locations and results of all three phases of the technetium-99 sampling performed during this pre-design investigation. The entire data set is presented in Appendix B-4 Based on this extensive sampling in the STP, the technetium-99 above-WAC soil areas are limited to five areas in the STP. These areas include both trickling filters, two small areas in the northern areas of the STP, and one small area on the berm between the digester and the primary settling basins. Since the sampling shows contamination primarily located on the surface, and little contamination at depth (duplicate result at 3 – 3.5 feet interval at location 12), the planned above-WAC excavation for technetium-99 contaminated soils will be 0 – 0.5 feet within these areas. The estimated limits of contamination and proposed excavation limits are shown in Figure 2-24.

2.3.2.3 Perched Water Sampling in the STP

The purpose of this project was to obtain perched water quality data to facilitate design of the STP excavation with respect to perched water management. Previous investigations indicated that the perched water was contaminated with VOCs, including RCRA F-listed tetrachloroethene from the Sludge Drying Beds (DOE 1995b). To further define the nature and extent of the perched water contamination, the investigation included the following objectives:

1. Sample perched water for VOCs and total uranium to determine if water collected during excavation requires treatment.

2. Obtain additional information on the area's geological stratigraphy. Historical information indicated that discontinuous sand lenses were found.

The scope of this project included modeling the Coarse Grained Material (CGM) in the area using historical data and additional lithological data collected from the STP total uranium investigation described in Section 2.2.1. Based on the CGM model, three sample locations were selected as shown in Figure 2-25. At each location, exploration borings were completed to determine if saturated sand lenses existed at the location. Perched water samples were collected from sand lenses greater than 1 foot thick in two locations, and no lens was found in one location. Boring 12119 revealed the presence of three thin (1.0 to 1.5 feet thick) silt layers within the clay till. The uppermost layer is very moist and is at a similar elevation (5.5 to 6.5 feet depth) as the uppermost silt layer in Boring 1442, which is located nearby. The middle layer is at 12.5 to 14 feet depth and was designated as very moist in the field lithologic logs. The lowermost layer was at 18 to 19.5 feet depth and was slightly moist. Boring 12120 also revealed three silt or silt/sand layers.

The uppermost silt/sand layer is at the ground surface, 4 feet thick, and dry, with the bottom foot being comprised of sand. The middle silt layer is 2.5 feet thick, wet, and at 9 to 11.5 feet depth. The lowermost silt layer was 2 feet thick, wet, and at 21 to 23 feet depth. Boring 12118 revealed only a dry, shallow, two foot thick silt layer corresponding to the silt layer in adjacent Boring 1448. The remainder of the boring was drilled through clay, therefore there was no zone in which to sample perched groundwater.

Water samples were taken from middle silt layers encountered in Borings 12119 and 12120. In Boring 12119, the uppermost silt layer had been sampled via Boring 1442 during the OU5 RI and the lowermost layer was only slightly moist and therefore would not yield much water. In Boring 12120, the top silt/sand layer was dry and therefore would not yield water, and the lowermost silt layer is below the extent of excavation. Two water samples, each related to the middle silt layer encountered in borings 12119 and 12120, were collected and analyzed for VOCs and total uranium. The boring locations, sample identification numbers, sample intervals, and analytical results are presented in Appendix B-5. No VOCs were detected except for acetone (a common laboratory contaminant) at 6 parts per billion (ppb) (below the detection quantitation limit of 10 ppb) in the perched water sample from Boring 12119. However, VOCs were not detected in the duplicate sample from this boring. No total uranium was detected in the water samples at detection limits of 9.8 and 7.3 mg/kg in Borings 12119 and 12120, respectively.

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In conclusion, it appears that the perched groundwater has only very low VOC levels or may no longer be contaminated with VOCs. There are two reasons for this: 1) the source, being the sludge in the Sludge Drying Beds, has been removed since the sampling was conducted during the RI, and 2) the residual VOC contamination has since degraded to nondetectable levels naturally attenuated through one or more potential mechanisms such as flushing, dilution, dispersion, volatilization or biodegradation. However, the detection limit under this investigation was 10 ppb; the detection limits under the RI investigation were lower and revealed low levels of contamination below 10 ppb. Regardless, any residual VOC contamination that was below 10 ppb during the RI has most likely since been degraded to very low or nondetectable levels.

2.3.2.4 Field Sampling of Miscellaneous Areas

The objective of this study was to obtain additional data from miscellaneous areas around the STP Area, as well as existing underground utilities and roadways, to fill data gaps not covered by other investigations. The scope included soil boring and surface soil sampling locations depicted in Figures 2-26 and 2-27, and the entire data set is presented in Appendix B-6. A variance to the plan added the sampling and analysis of digester sludge, which was originally planned to be removed by D&D operations, but will be left in the STP area for removal and disposal by the STP Excavation contractor. The following is summary of the areas sampled in this investigation and the findings.

- Twelve borings (12310 through 12321) (Figure 2-26) were placed along the entire length of the STP sanitary sewer influent and effluent pipeline which traverses the A1PII area, to identify the presence of radionuclides, sitewide COC and NPDES permit metals (As, Be, Pb, Mn, Sb, Cd, Ni, Zn, Cr, Cu, Hg), and VOCs in the adjacent soils. The borings extended to 3 feet below the depth of the pipeline trench, to an approximate total depth of 10 to 15 feet. One of the borings was placed adjacent to the electrical tower north of the pipeline, in order to investigate whether any leakage from the pipeline extends laterally into soil surrounding the tower. The objective of sampling soil adjacent to the pipeline was to identify if the pipeline is a source of contamination at levels above the FRLs and OSDF WAC. The pipeline will be excavated in order to remove the pipe; however, it is not certain whether the adjacent soil is contaminated adjacent to and below the pipeline. The results of the pipeline investigation indicate no radionuclide or VOC contamination above the FRLs. The only metal contamination above the FRL was beryllium in samples A1P2MIS-12318-17, A1P2MIS-12319-10, A1P2MIS-12319-13, and A1P2MIS-12321-10. The contamination at levels ranging ranged from 1.63 to 2.04 mg/kg, which is within the same order of magnitude as the beryllium FRL of 1.5 mg/kg. Although beryllium was

detected at levels above the FRL, their depths correspond to the planned depth of excavation to remove the pipeline in that area. Therefore, no change in the design of excavation is warranted by these results.

- Five borings (12322 through 12326) (Figure 2-26) were placed at various locations within the STP area to identify the presence of total uranium contamination within gravel. The depth of the borings was approximately 5 feet or less in order to extend into the clay beneath the gravel. Because this information was used to fill a general data gap for gravel, as opposed to determine excavation depth, the boring extended only 1 foot beneath the base of the gravel. The results of the total uranium analysis reveal that the gravel is not contaminated at levels above the FRL.

- The Sludge Drying Beds were sampled to identify the presence of contamination above the OSDF WAC for total uranium. The sludge itself, where present, does exceed the OSDF WAC. The beds will be excavated as part of the soil excavation in the STP Area; however, it was uncertain whether the material underlying the sludge would also exceed the OSDF WAC. VOC analyses were also taken to identify the presence of RCRA F-listed tetrachloroethene. If tetrachloroethene was present, and the underlying sand/gravel and clay till also exceeded the OSDF WAC, the excavated material would have to be disposed of off site as a mixed (RCRA hazardous and radioactive) waste, as opposed to a radioactive waste. Two soil borings (12327 and 12328) (Figure 2-26) were drilled into the eastern STP Sludge Drying Bed to identify the severity of total uranium contamination and the presence of VOC contamination in the underlying gravel beds and soils. The borings extended several feet into the clay that is below the bottom of the gravel underlying the sludge. The total depth was estimated to be 12 ft. The only samples that exceeded the FRL for total uranium was that the surface samples of the Sludge Drying Bed sand. The levels were 32.1 and 69.3 mg/kg, well below the FRL and the OSDF WAC. Any VOC contamination indicated by the data were at levels below the FRLs, including that for tetrachloroethene.

  Tetrachloroethene was detected in only one sample at 5 μg/kg below the method detection level of 12 μg/kg. The data indicates that the excavated sand and soil underlying the sludge (where present) in the Sludge Drying Beds can be disposed into the OSDF and does not have to be managed as a mixed waste.

- Six borings (12329 through 12334) (Figure 2-27) were drilled along the asphalt access road leading to the STP. The borings extended to approximately 5 feet or less, through the gravel/clay interface underlying the asphalt. Because this information was used to fill a general data gap for total uranium in gravel, as opposed to determining excavation depth, the boring extended only one foot beneath the base of the gravel. The results confirmed that the gravel is not contaminated with uranium at levels exceeding the FRL.

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- Three borings (12335 through 12337) (Figure 2-27) were drilled through RvA 14 fill material, to confirm that the material (most likely clay and silt) does not contain total uranium or sitewide COC metals (As, Be, Pb, Mn, Sb, Cd) above the FRLs. The borings extended to the base of the fill material, at approximately 1 to 4 feet depths. The borings were located within the off-property portion of RvA 14, where it was anticipated that excavation of the fill and underlying soil would not be necessary. Samples were taken in off site backfilled areas to identify possible contamination in the fill. The soil below the fill was previously sampled (post-excavation) for uranium as part of RvA 14. The results indicate that the fill is not contaminated at levels exceeding the off site FRL for total uranium. The metal analytical data indicate levels exceeding the off site FRL for beryllium, cadmium, chromium, copper, and potentially antimony. Beryllium was detected at levels ranging from 0.23 to 0.91 mg/kg. The off site FRL for beryllium is 0.62 mg/kg; two samples (A1P2MIS-12335-6 and A1P2MIS-12336-1) exceeded the FRL and were 0.69 and 0.91 mg/kg. Sample A1P2MIS-12336-6 also exceeded the FRL for cadmium, chromium, and copper (0.91, 11, and 20, respectively) at values of 1.1, 19.26, and 21.65, respectively. The antimony results are inconclusive because the laboratory detection limit (ranging from <39.8 to 44.2) exceeded the antimony off site FRL of 0.61 mg/kg.

- During the D&D of above-grade STP structures, it was determined that the sludge that had accumulated in the digester required special handling. The original D&D plan was to pump the sludge to the AWWT; however, the consistency of the sludge made it difficult to pump or remove. The sludge volume is approximately 650 yd^3. Therefore, the D&D operations left the digester sludge in the following locations within the STP for the STP Excavation contractor to remove and disposition:

  1. The Sludge Drying Beds were cleared and a small berm, approximately three feet high, was built around the perimeter. The area was lined with a filter fabric. Sludge was removed from the digester using a track hoe, dumped into a front end loader bucket and transported to the bermed area. The material was covered with plastic.

  2. Some additional sludge was removed from the digester and placed in the west chamber of the primary settling basin.

  3. The remaining sludge was left in place in the digester. The bottom of the digester is an inverted cone. The remaining sludge appears to be approximately 1.5 to 3 feet deep on the sides, within the full diameter of the digester, and about 5 to 8 feet deep near the middle. It has been covered with a tarp to prevent rain from entering the sludge.

During the removal of the sludge, eight samples were taken from the track hoe bucket during transfer from the digester to the Sludge Drying Beds. Each sample was analyzed for technetium-99 and total

uranium. Preliminary data shows that the sludge exceeds the WAC limits for both total uranium and technetium-99. The total uranium results ranged from 2470 mg/kg to 5000 mg/kg, and the technetium-99 results ranged from 5900 pCi/g to 11,800 pCi/g. An additional four samples were collected for TCLP metals analysis. The analysis indicated that the sludge is not RCRA characteristic.

2.3.2.5 Pre-design Investigation Survey

The objective of this investigation was to collect data to help delineate those areas within A1PII requiring excavation and to delineate areas where soil contamination may exceed the OSDF WAC within the STP. The survey was conducted using real-time monitoring systems, including the HPGe and RTRAK. The findings of this investigation are summarized below:

STP RTRAK Survey Findings:

- Figure 2-28 shows the RTRAK coverage in the STP area. Several areas were inaccessible due to D&D operations.

- Figure 2-29 shows RTRAK measurements greater than two times the FRL for radium-226, thorium-232, and total uranium. Radium-226 measurements greater than the FRL were concentrated in the southern portion of the STP area, where measurements were as high as three times the FRL. The RTRAK also identified a thorium-232 result greater than three times the FRL along the western fenceline. The RTRAK also identified total uranium contamination east of the incinerator on the paved surface. A more detailed map of the RTRAK coverage is available on the SCEP web page at www.ead.anl.gov/~femp/.

STP HPGe Survey Findings:

- HPGe measurements were also taken in the areas that are inaccessible by the RTRAK as well as confirmatory measurements for high RTRAK readings. Figures 2-30, 2-31, and 2-32 show the total uranium, thorium-232, and radium-226 data, respectively. As shown in Figure 2-30, the HPGe shows potential above-WAC areas in three locations. The first is the area on the pavement east of the incinerator identified by the RTRAK scan. The HPGe measurement in this area was 1425 μg/g. This area has been determined to be a fixed contamination area and has been surveyed by radiological technicians. The second area is a small area south of the incinerator, where the HPGe measurement was 466 μg/g. The third area is located between the Sludge Drying Beds and the digester. The HPGe confirmed the high thorium-232 concentration (4.76 pCi/g) located close to the western boundary of the STP (Figure 2-31). As shown in Figure 2-32, high radium-226 measurements corrected for moisture and radon are

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located south of the primary settling basins. A more detailed map of the HPGe coverage is available on the SCEP web page at www.ead.anl.gov/~femp/.

2.3.3 Estimated Limits of Contamination and Planned Excavation Limits

Excavations in and around the STP area will be performed by the STP Excavation Contractor and will consist of the following activities:

- Approximately 1,000 yd^3 will be excavated from the STP from above-WAC areas for technetium-99 and total uranium. An additional 650 yd^3 of digester sludge will be dispositioned by the contractor.
- Approximately 200 yd^3 will be excavated from the surface in the STP and surrounding areas for compliance to FRL limits.
- Approximately 29,500 yd^3 of material will be removed from deep excavations in the STP area for compliance to the FRL limits.

2.3.3.1 Above-WAC Excavations

The above WAC remedial actions in the STP consist of three activities. The removal of above-WAC soil for technetium-99, total uranium, and the removal of the digester sludge currently located in three areas in the STP.

Technetium-99 Above-WAC Areas

As discussed in Section 2.3.2.2, technetium-99 was found in five areas in the STP. These areas include both the trickling filters, two small areas in the northern areas of the STP, and one small area on the berm between the digester and the primary settling basin. The estimated contamination limits and planned excavations will be 0 –0.5 feet in depth and consist of approximately 900 yd^3, as shown in Figure 2-24.

Total Uranium Above WAC Areas

There are four areas within the STP area that are above WAC for total uranium. The first area is the Sludge Drying Beds. As discussed in Section 2.3.1.4, there are two sets of beds, east and west, but only the east beds were used during process activities. The east Sludge Drying Beds contain approximately 35 yd^3 of residual sludge. Evaluation of historical waste management data shows that

the material is above the WAC for total uranium, which was confirmed by recent HPGe measurements. Although the waste management data do not show that the sludge from the beds is RCRA characteristic, it will be treated as RCRA characteristic material since it contained a RCRA-listed solvent. The sand and gravel material below the sludge will not be treated as mixed waste, based on the data collected during pre-design investigations (Section 2.3.2.4), and can be disposed of in the OSDF.

Pre-design real-time monitoring of the STP area identified three additional above-WAC areas. As shown in Figure 2-30, the HPGe shows potential above WAC areas in three locations. The first is the area on the pavement east of the incinerator identified by the RTRAK scan. The HPGe measurement in this area was 1425 μg/g. This area has been determined to be a fixed contamination area and has been surveyed by radiological technicians. The second area is a small area south of the incinerator, where the HPGe measurement was 466 μg/g. The third area is located between the Sludge Drying Beds and the digester, where two measurements were 465.18 μg/g and 470.80 μg/g. These three areas are shown in Figure 2-33.

Above-WAC Digester Sludge

As discussed in Section 2.3.2.4, approximately 650 yd^3 of digester sludge are in three locations in the STP area: the east Sludge Drying Bed, the digester, and the west chamber of the primary settling basin. Analyses indicate that the sludge is above WAC for both total uranium and technetium-99, with levels as high as 5,000 mg/kg and 11,800 pCi/g, respectively. However, analyses have confirmed that the sludge is not RCRA characteristic. The location of the sludge is shown in the STP Excavation construction drawings.

During the removal of the sludge material from the digester during D&D, two additional areas may have been contaminated. Prior to the placement of the sludge in the east Sludge Drying Bed, the bed was cleared of vegetation and debris, which was placed in the west Sludge Drying Bed. Unfortunately, some of this debris may have been contaminated with the residual sludge left in the east bed. Therefore, any debris and sludge from the west Sludge Drying Bed is considered above WAC for

total uranium and RCRA-listed waste. The second area includes the top six inches of soil between the Digester Building, the southern boundary of the Sludge Drying Bed and the southern trickling filter. Cross-contamination may have occurred in this area during sludge removal activity.

Figure 2-33 shows all the estimated above-WAC areas, limits of contamination, and excavation limits in the STP. Figure 2-33 includes the technetium-99 only above WAC areas (four locations), the total uranium only above WAC areas (2 areas), the total uranium above WAC areas with RCRA listed waste (one area - east Sludge Drying Bed), cross contaminated total uranium WAC area with listed waste (one area - west Sludge Drying Bed), and areas cross-contaminated with total uranium and technetium-99 from digester sludge removal activities (area between the southern trickling filter, the Digester Building and the southern boundary of the Sludge Drying Beds). Figure 2-33 also shows a WAC-pending area at the location of the STP incinerator. After D&D of the STP incinerator, the at-grade area will be scanned using real-time monitoring equipment to determine if there is any surface contamination approaching WAC limits. Furthermore, borings will be done in the area to determine if any contamination is seen at depth.

2.3.3.2 Surface Excavations in the STP Surrounding Areas

In order to determine if any areas within the STP and surrounding areas required any remedial actions to comply with FRL limits, the following actions were taken:

- All surface uranium data for the entire A1PII area were compiled and kriged to find above FRL areas. The data set included all historical RI/FS data, pre-design data, and certification data. The kriged 82 mg/kg and 50 mg/kg contour results are shown in Figure 2-34. The 82 mg/kg for total uranium contour was used a basis to determine if excavation was needed. The limits of excavation, shown as 6-inch stripping areas in Figure 2-34, were based on the ALARA limit of 50 mg/kg once it was determined that excavation was needed.

- In order to ensure that total uranium enveloped all the surface contamination for radium-226, radium-228, and thorium-232, samples with results approaching the FRL were plotted to ensure that they fell into the total uranium driven 6-inch stripping areas. Figures 2-35, 2-36, and 2-37, show the results approaching the FRL for radium-226, radium-228, and thorium-232, respectively. All existing sample results fell into the total uranium excavation footprint, except for two radium-226 areas west

of the STP area and the STP Access road. The results, shown in Figure 2-35, were 18.50 pCi/g and 27.60 pCi/g in a small area west of STP southwestern corner, and 5.61.pCi/g and 10.30 pCi/g for the small area west of the STP Access Road. These two areas have been added to the 6-inch stripping area, and are shown in Figure 2-35.

Within the STP area, the excavation limits for the deep excavations as shown in the construction drawings encompass all surface contamination. As noted in Section 2.3.2.5, the real time measurement in the STP identified radium-226 contamination in the southern part of the STP. Once the excavation of above-FRL areas is completed, the entire area will be surveyed again with real time measurement equipment to ensure that all contamination has been removed.

2.3.3.3 STP Deep Excavations

The estimated depth of soil excavation within the STP fenced boundary is depicted in Figure 2-38. These depths were determined based upon the results of the STP Area total uranium analytical model. This model incorporated all available lithologic data within the STP Area, total uranium soil data within the STP Area, and the excavation of at-or-below-grade structures (e.g., building foundations and piping) in the STP Area. As previously discussed, the assumption that total uranium is the driver for the excavation was confirmed by performing isotopic thorium and radium analyses on pre-design investigation samples in the STP (Section 2.3.2.1) which were originally analyzed for total uranium only. These results showed no contamination outside the total uranium excavation limit. The excavation will result in 29,500 yd^3 of soil. Figure 2-39 shows the impacted zones with the STP. Note that the removal of the foundations generally envelopes the contamination.

2.4 CHARACTERIZATION DATA SUPPORTING TRAP RANGE REMEDIATION ACTIVITIES

2.4.1 Historical Investigations

During the OU5 RI (DOE 1995b), a 1993 soil study of the Trap Range included analysis of 18 soil samples to characterize the general distribution of the lead shot. The locations and results associated with this study are shown in Figure 2-40. This preliminary study confirmed lead contamination in near-surface soils but failed to define the horizontal and vertical extent. The data did, however, provide the basis for the pre-design investigation. Figure 2-40 also shows the pre-design investigation sample locations.

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2.4.2 Pre-design Activities

Previous investigations showed that lead concentrations exceed the 400 mg/kg FRL, but did not fully define the areal extent of contamination. The concentrations of arsenic, an alloying agent commonly used to control hardness in the lead, also exceeded the 12 mg/kg FRL in some locations. The A1PII investigation had three objectives:

1. Delineate the areal extent of contamination in the Trap Range.
2. Confirm that no vertical contamination through the soil has occurred.
3. Determine if the lead or arsenic concentrations in soils exceed their corresponding FRLs, or their common TCLP limit of 5 mg/L.

The scope of this project included collecting and analyzing 50 surface samples. Sample locations were selected based on existing data and on an area walkover which included scooping and sieving the soil for lead shot at each node of a pre-established grid. When a scoop revealed no lead shot, the location was marked, establishing an assumed periphery of contamination. Sample locations were then selected in areas where previous investigations indicated contamination above the FRL, with a greater sampling density along the assumed periphery. Also, several samples were located beyond the assumed periphery, as well as several locations within the middle of the shot distribution pattern. Figure 2-40 includes the locations of historical OU5 RI/FS samples and the locations associated with this pre-design investigation.

The PSP was executed in two phases. Phase 1 included the analysis of all samples from the 0 - 0.5 feet interval for both lead and arsenic using the Graphite Furnace Atomic Absorption (GFAA) and Inductively-Coupled Plasma (ICP) analytical methods. Phase 1 also included the analysis of select samples for TCLP lead from the 0 - 0.5 feet interval, and for total lead from the 0.5 - 1.0 feet interval. These samples were selected based on historical data which showed lead concentrations above the 400 mg/kg FRL.

Phase 2 samples were analyzed based on the results of the Phase 1 analysis. At locations where the Phase 1, 0 - 0.5 feet interval sample revealed lead concentrations greater than the FRL, the sample was analyzed for TCLP lead, and the 0.5 - 1.0 feet interval was analyzed for total lead and arsenic to

determine the vertical extent of contamination. The Phase 1 analysis showed that lead concentrations exceeded the 400 mg/kg FRL at four sampling locations. The TCLP lead results from these samples also exceed 5 mg/L (the TCLP limit), the level at which it may be considered toxicity characteristic hazardous. One duplicate sample was below the 400 mg/kg FRL, but above the TCLP limit. The TCLP results were 7200 μg/L and 1630 μg/L; one value is above the TCLP regulatory threshold value (5000 μg/L = 5 mg/L, and one is below. The results of the lead analysis for these samples were 239 mg/kg and 281 mg/kg, respectively. Review of the data does not indicate which TCLP measurement is more accurate. Since these samples lie within the treatment area for lead, no further action is necessary. All these results lie in close proximity to RI samples with elevated lead concentrations.

Two locations contained arsenic concentrations that exceed the FRL of 12 mg/kg from the 0 - 0.5 feet interval. Arsenic concentrations in corresponding samples from the 0.5 - 1.0 feet depth were below the 12 mg/kg FRL.

The following points about TCLP analyses for lead are important:

- Soil below the FRLs may remain in place even if it exceeds the TCLP limits. Soil becomes a remediation waste only if it is excavated for remediation; otherwise soil is not a waste [OAC 3745-27-01(B)(40)].
- Soil meeting the OSDF WAC may be disposed in the OSDF; if the above-FRL Trap Range soil is also above the lead TCLP limit, it must be treated to remove the lead toxicity characteristic prior to on-site disposal in the OSDF, or treated to meet the LDR treatment standards prior to off-site disposal.
- Soil exceeding both the OSDF WAC and TCLP limit must be treated as hazardous waste for off-site disposal.

During certification sampling in the area southwest of the Trap Range, a sample was found to exceed the FRL for both lead and arsenic (1430 mg/kg and 37.1 mg/kg, respectively). An area of approximately 15 yd^3 surrounding the sample location will be excavated prior to Site Preparation activities and stockpiled in the Trap Range until remediation occurs, when it will be stabilized with the remaining lead-contaminated soil.

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2.4.3 Surface and Subsurface Conditions

The Trap Range excavation limits are based upon the soil BTV for lead of 200 mg/kg (mg/kg) (Figure 2-41). This results in an excavation "footprint" that also incorporates any arsenic contamination above its soil FRL of 12 mg/kg. The top 6 inches of soil will be excavated within the 3.7 acre footprint, resulting in approximately 3,000 yd^3 of excavated soil.

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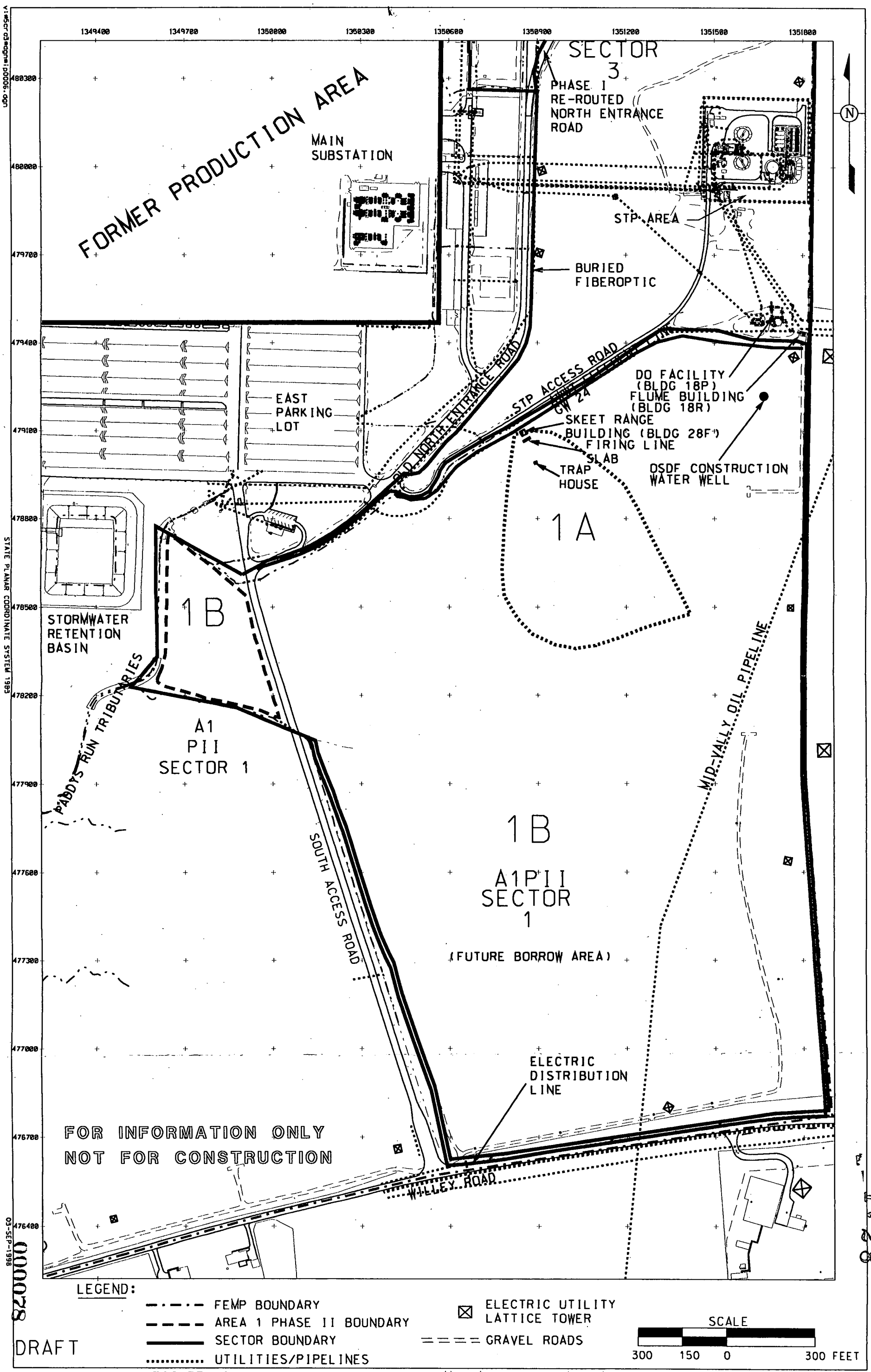

FIGURE 2-1. SECTOR 1 UTILITIES AND AT OR BELOW GRADE STRUCTURES

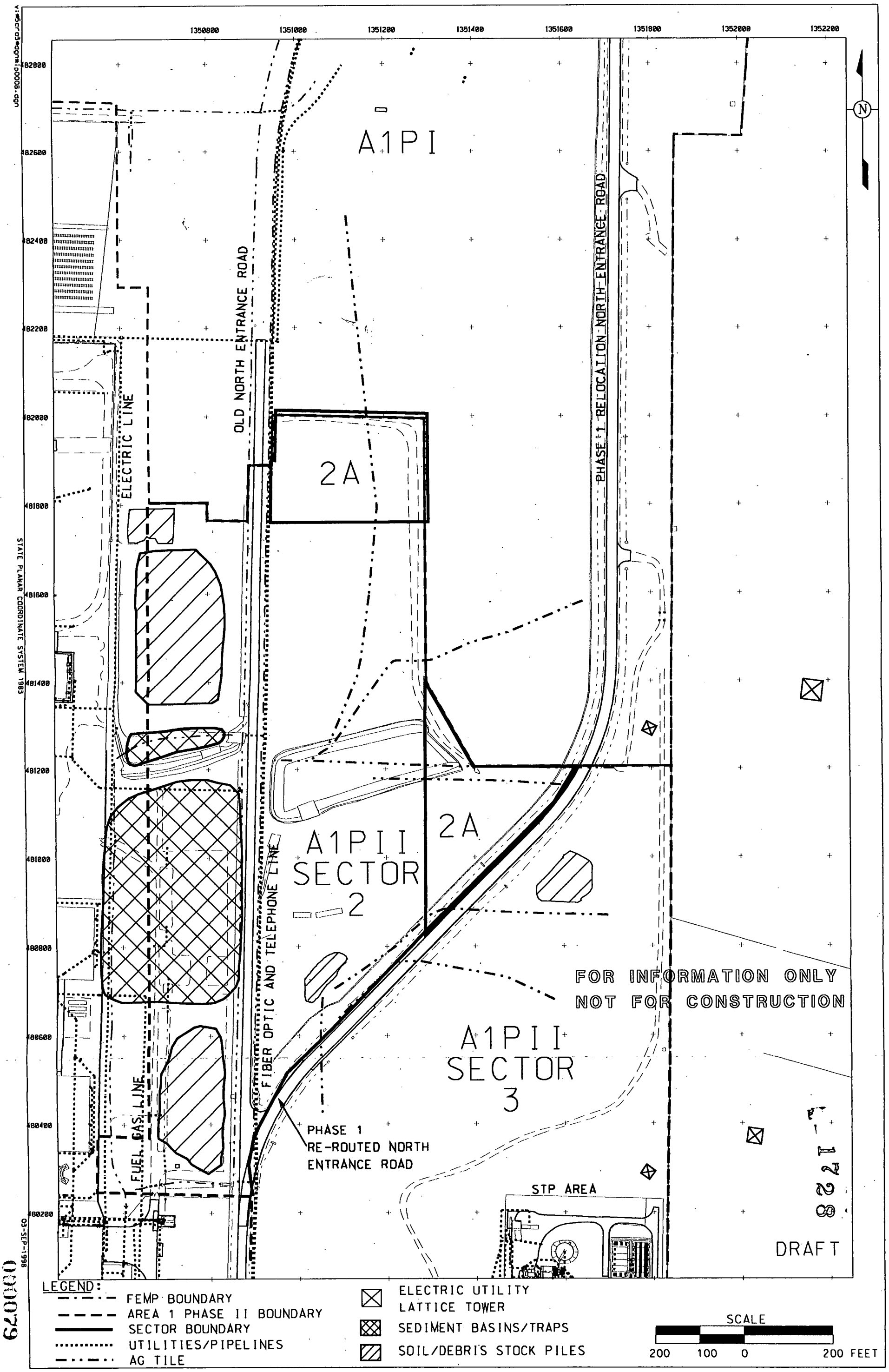

FIGURE 2-2. SECTOR 2 UTILITIES AND AT OR BELOW GRADE STRUCTURES

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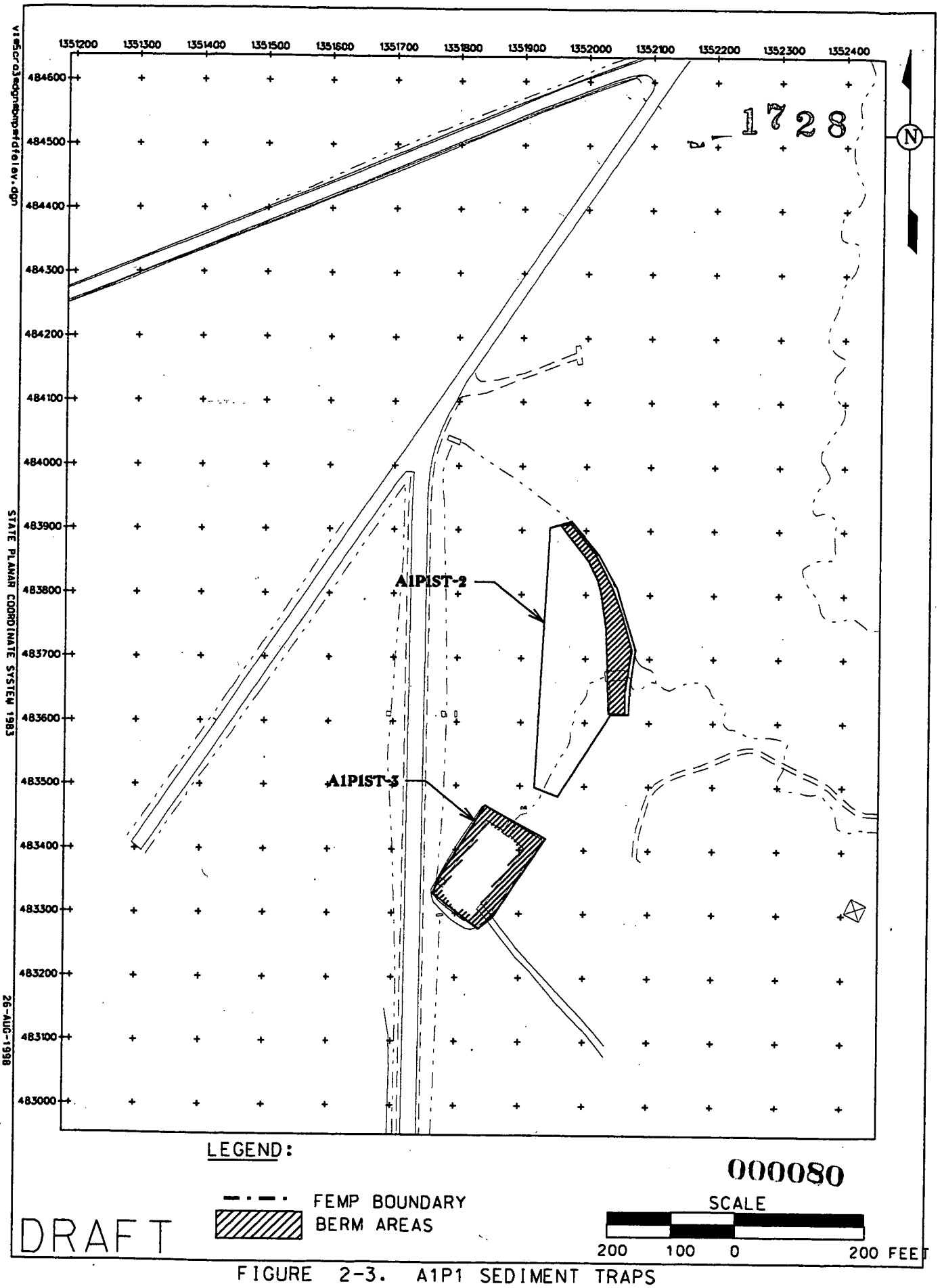

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FIGURE 2-3. A1P1 SEDIMENT TRAPS

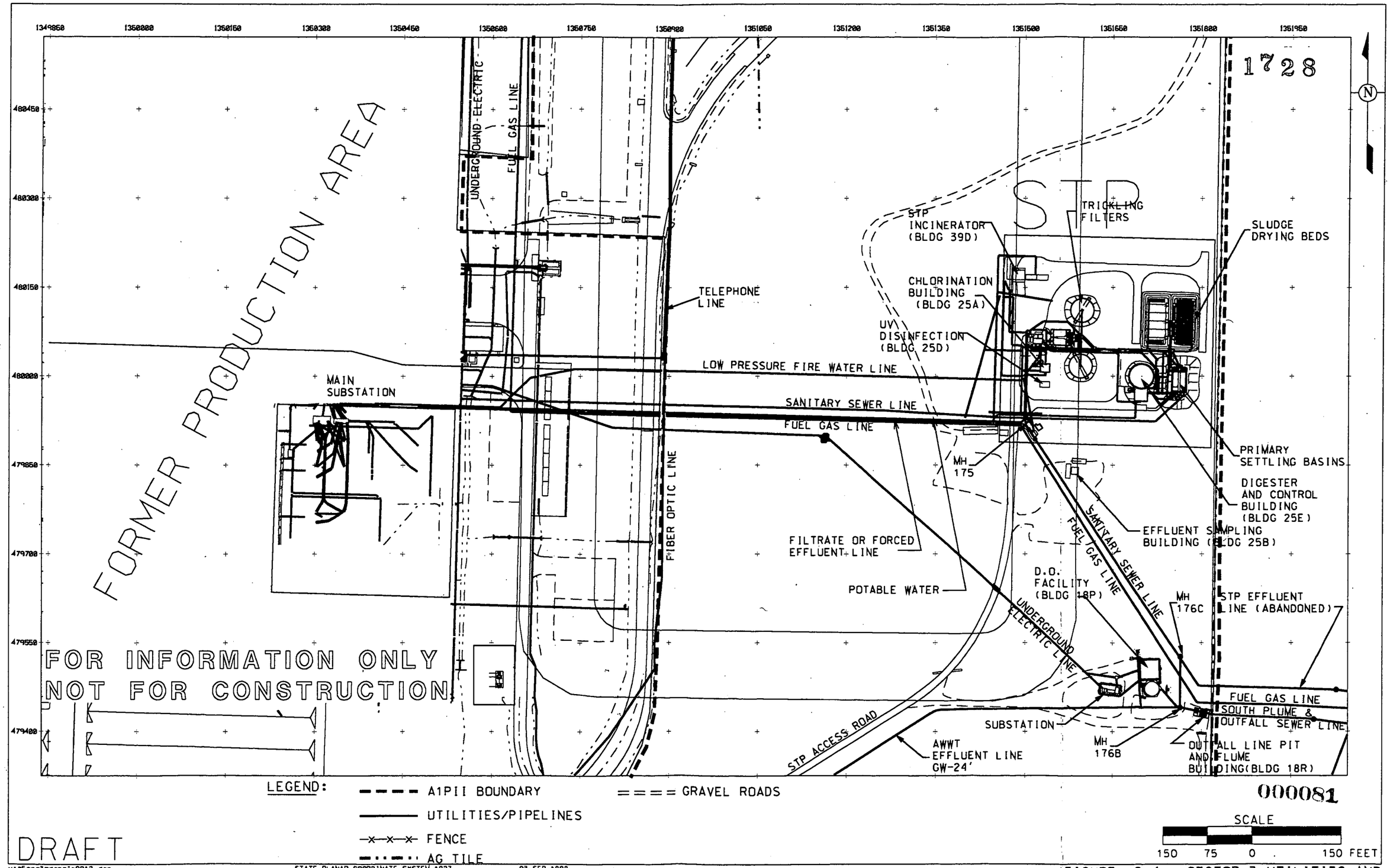


FIGURE 2-4. SECTOR 3 UTILITIES AND AT OR BELOW GRADE STRUCTURES

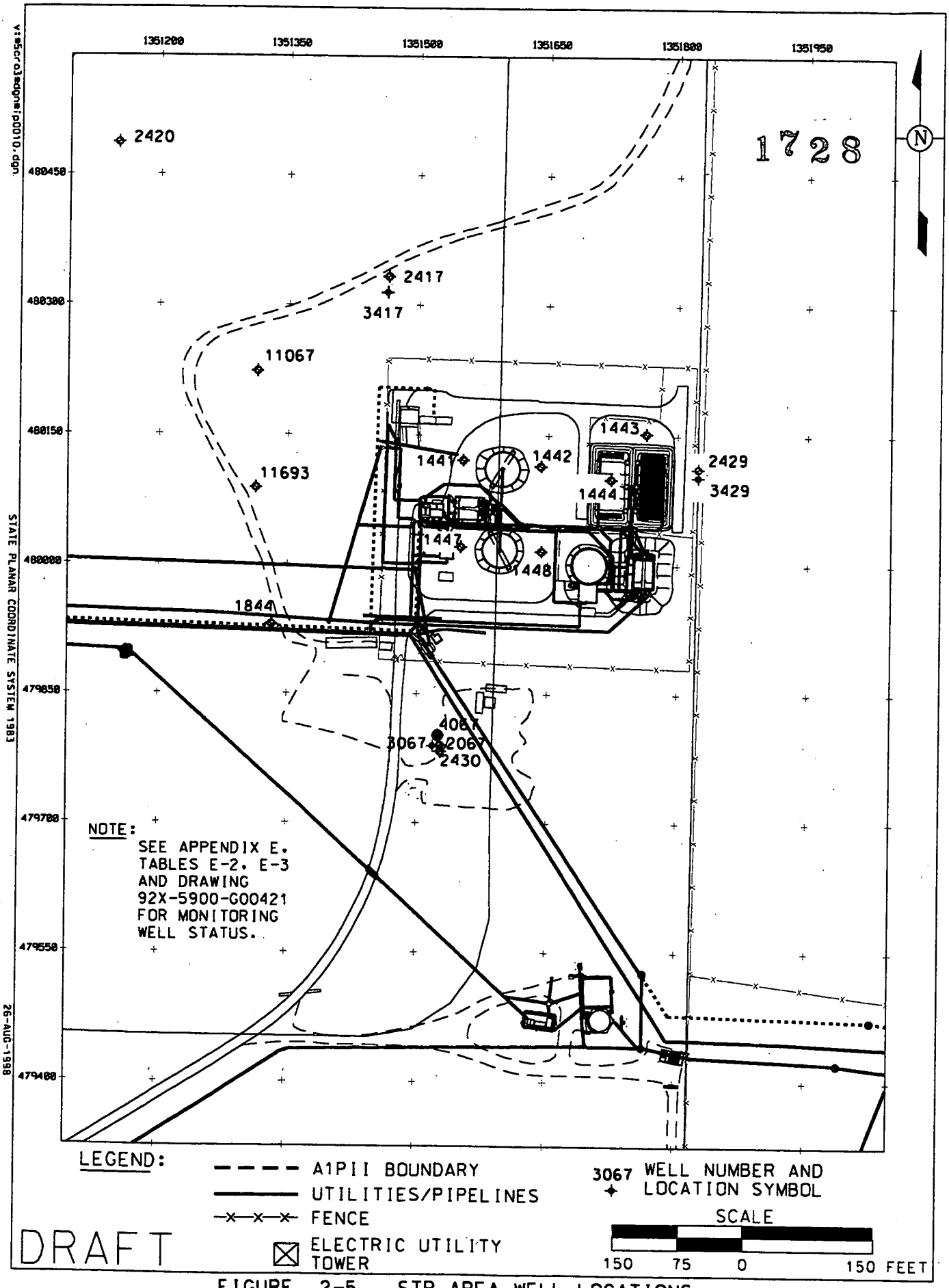


FIGURE 2-5. STP AREA WELL LOCATIONS

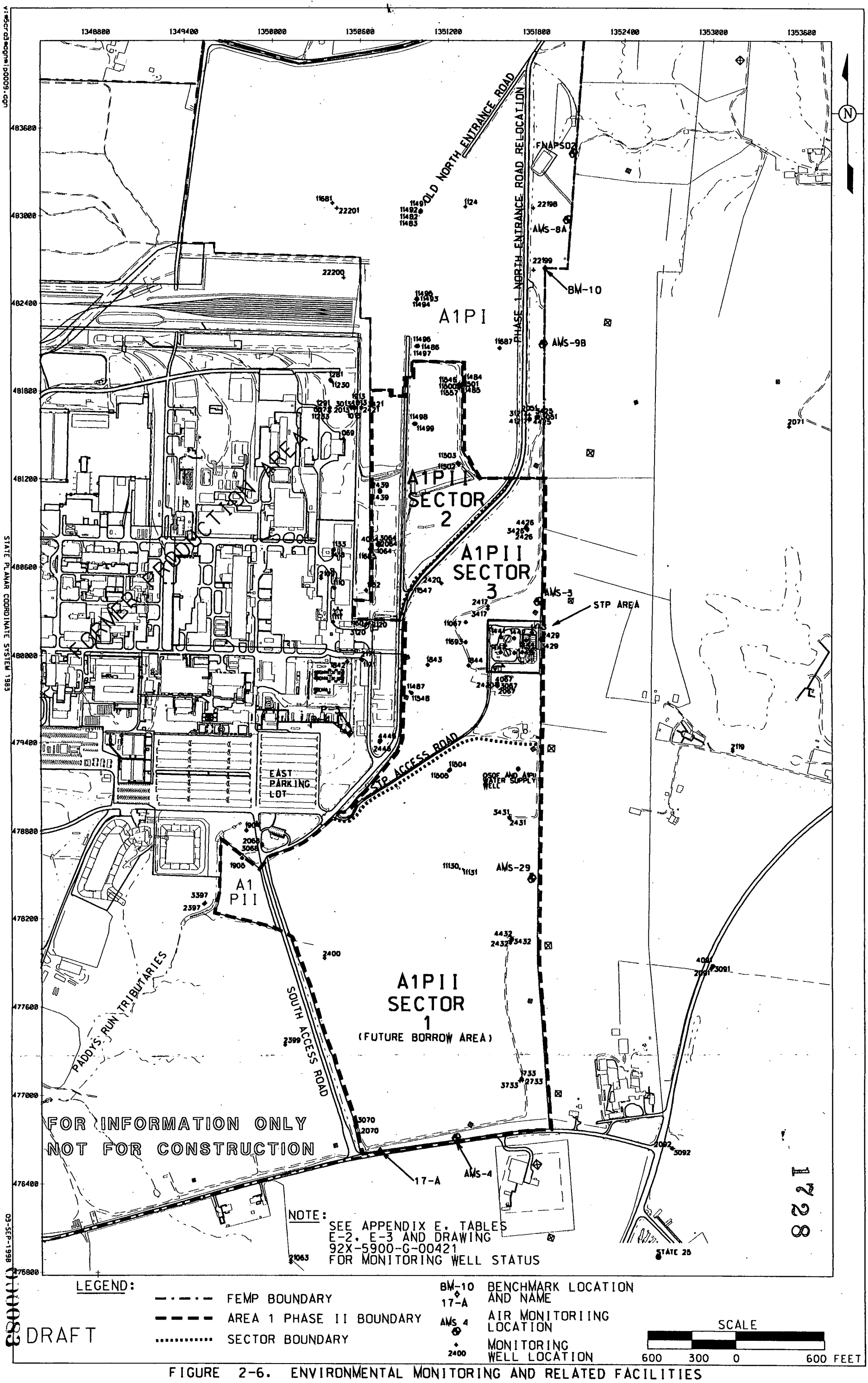


FIGURE 2-6. ENVIRONMENTAL MONITORING AND RELATED FACILITIES

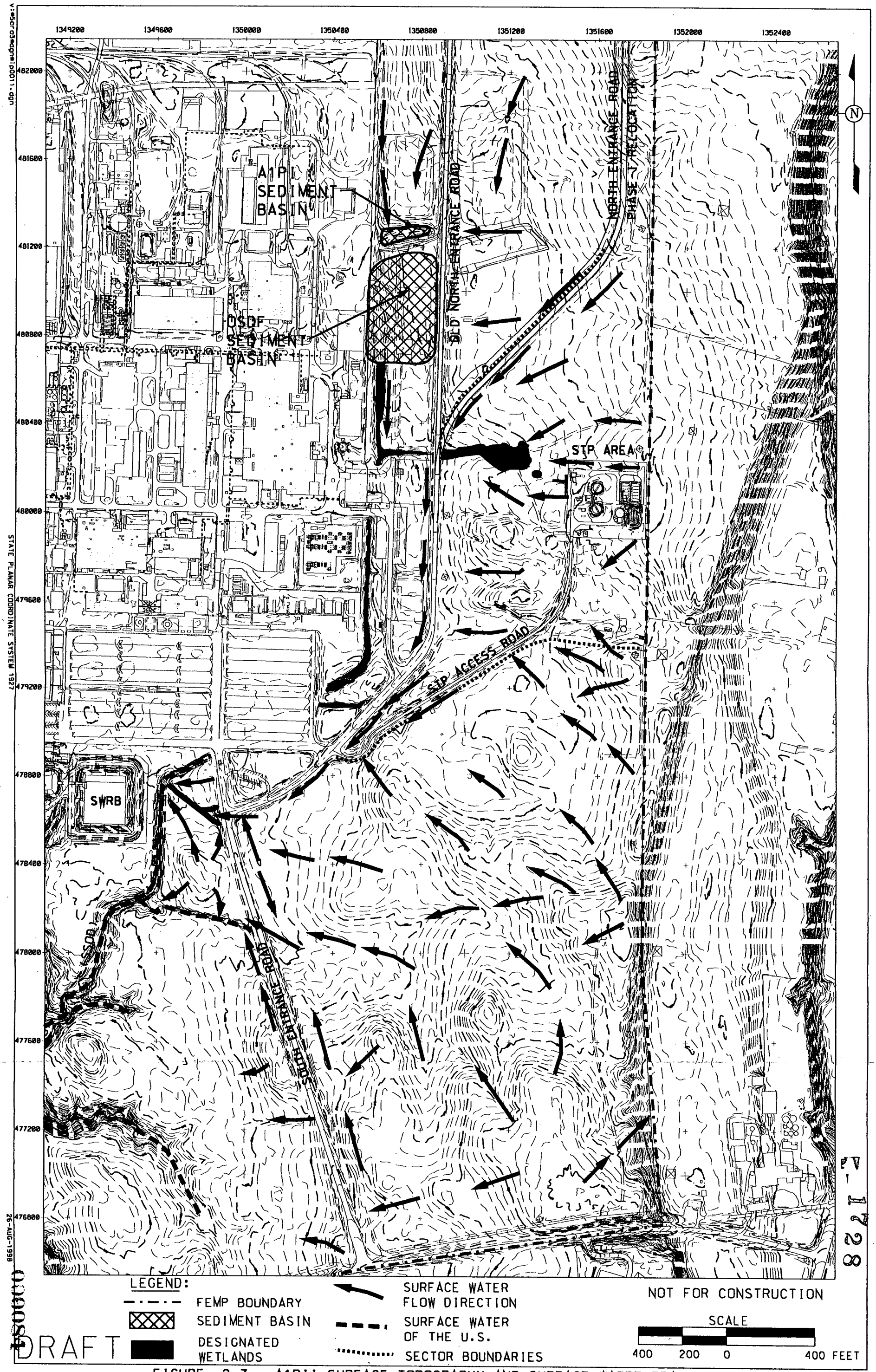


FIGURE 2-7. A1P11 SURFACE TOPOGRAPHY AND SURFACE WATER FEATURES

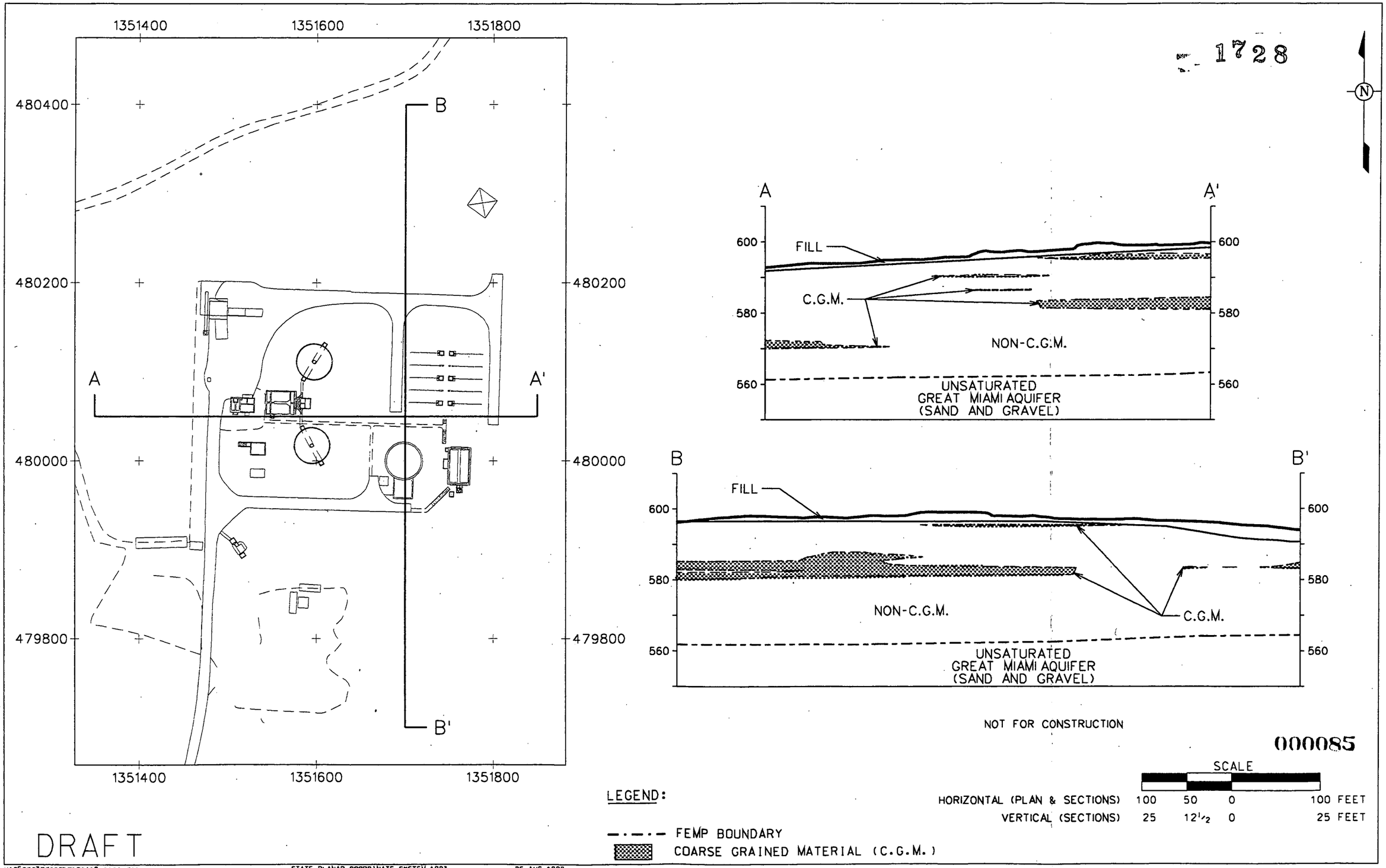


FIGURE 2-8. S.T.P. AREA GEOLOGIC SECTIONS

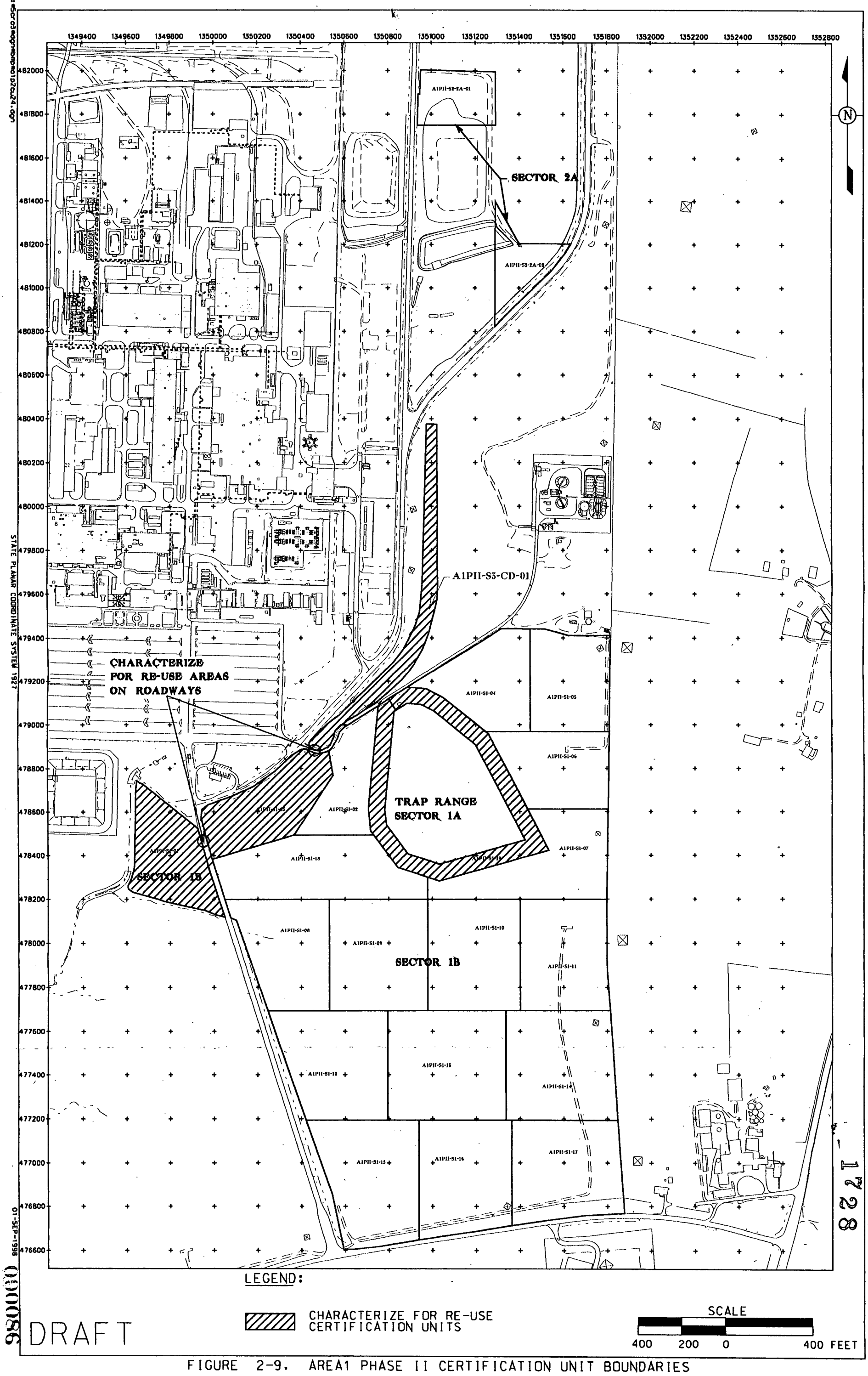
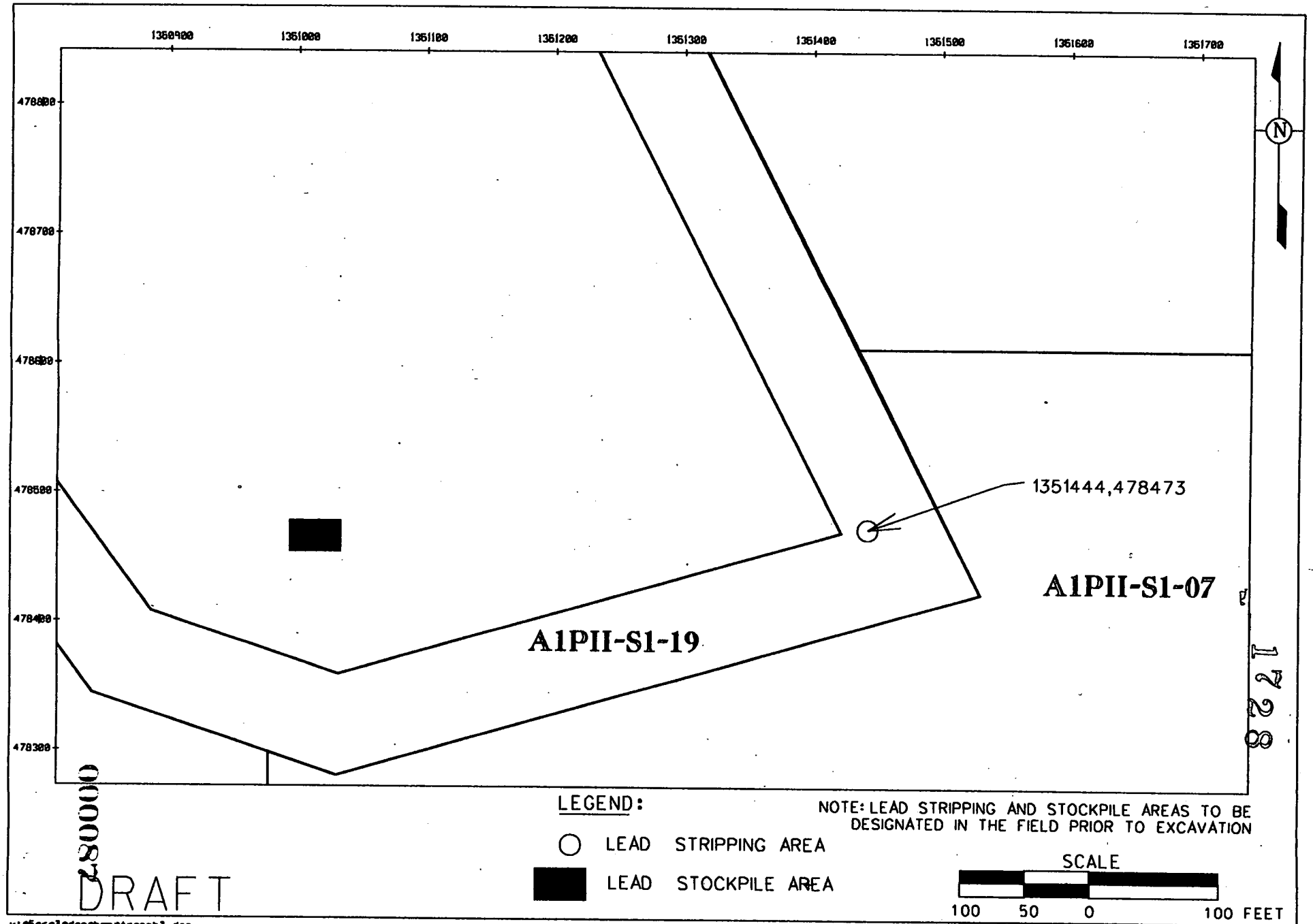


FIGURE 2-9. AREA1 PHASE II CERTIFICATION UNIT BOUNDARIES



v1=5cro3=dgn=bmp=troppb3.dgn
STATE PLANAR COORDINATE SYSTEM 1983

FIGURE 2-10. PLANNED EXCAVATION AROUND SAMPLE A1PII-S1-19-10

31-AUG-1998

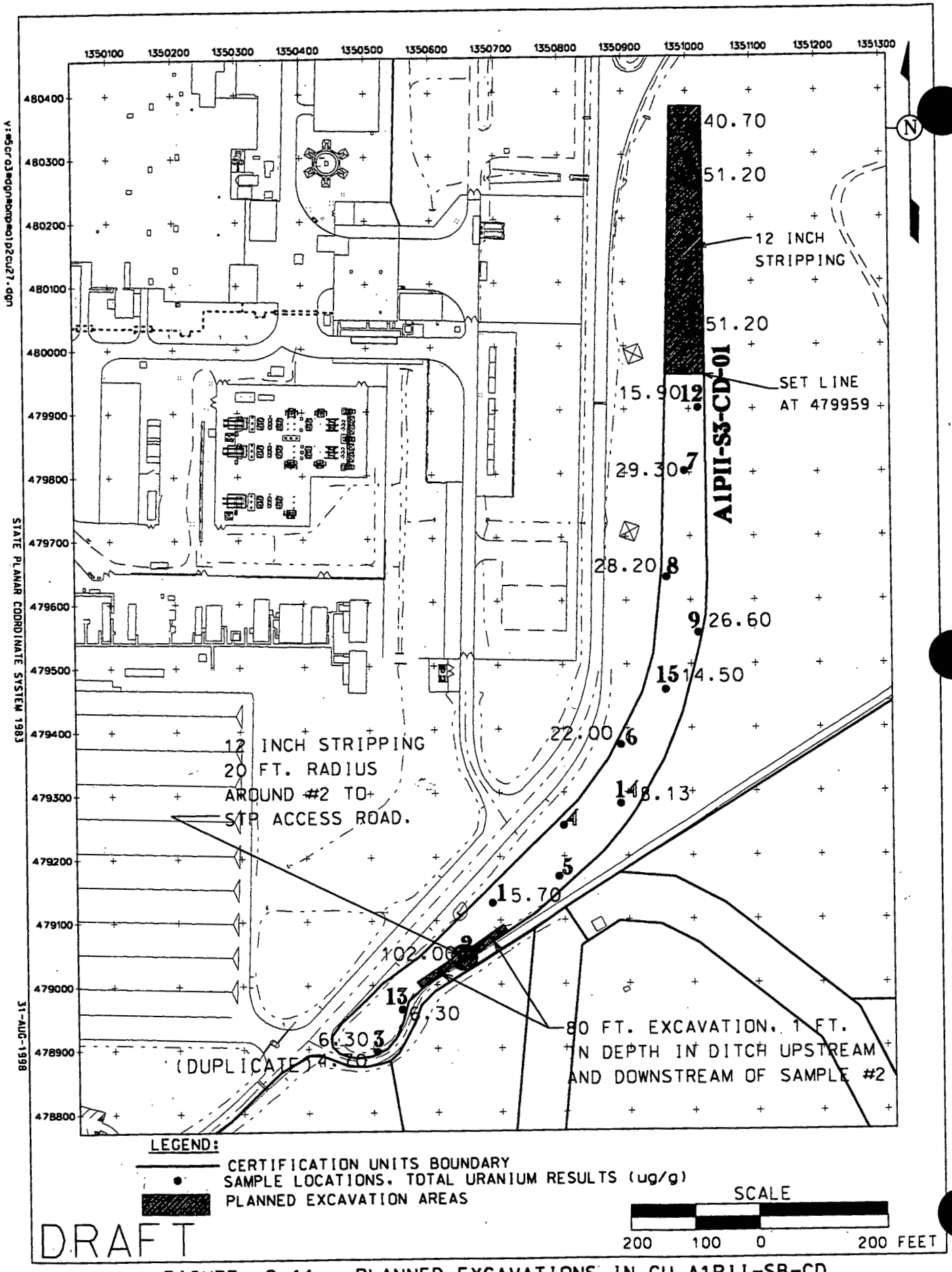


FIGURE 2-11. PLANNED EXCAVATIONS IN CU A1PII-SB-CD

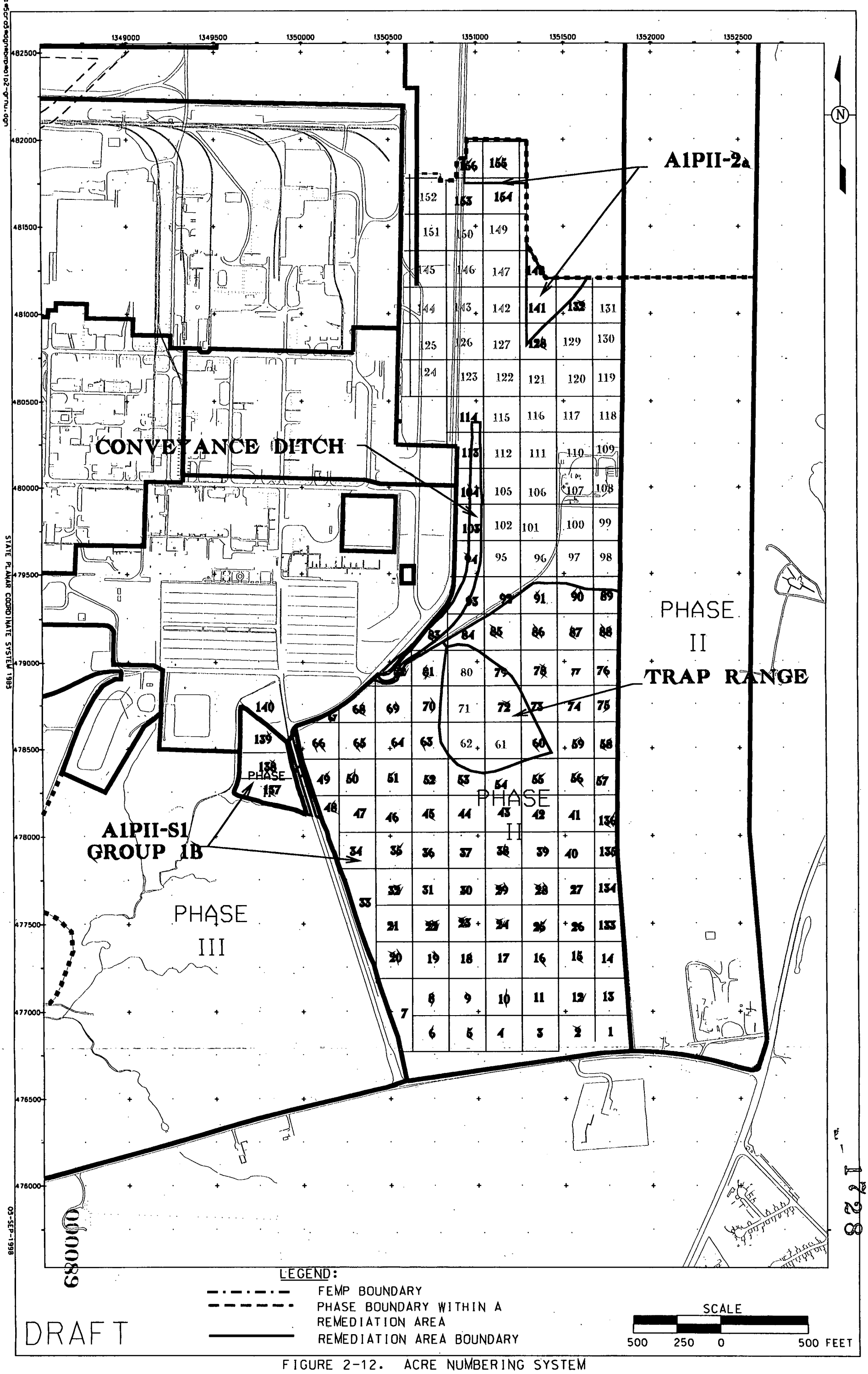


FIGURE 2-12. ACRE NUMBERING SYSTEM

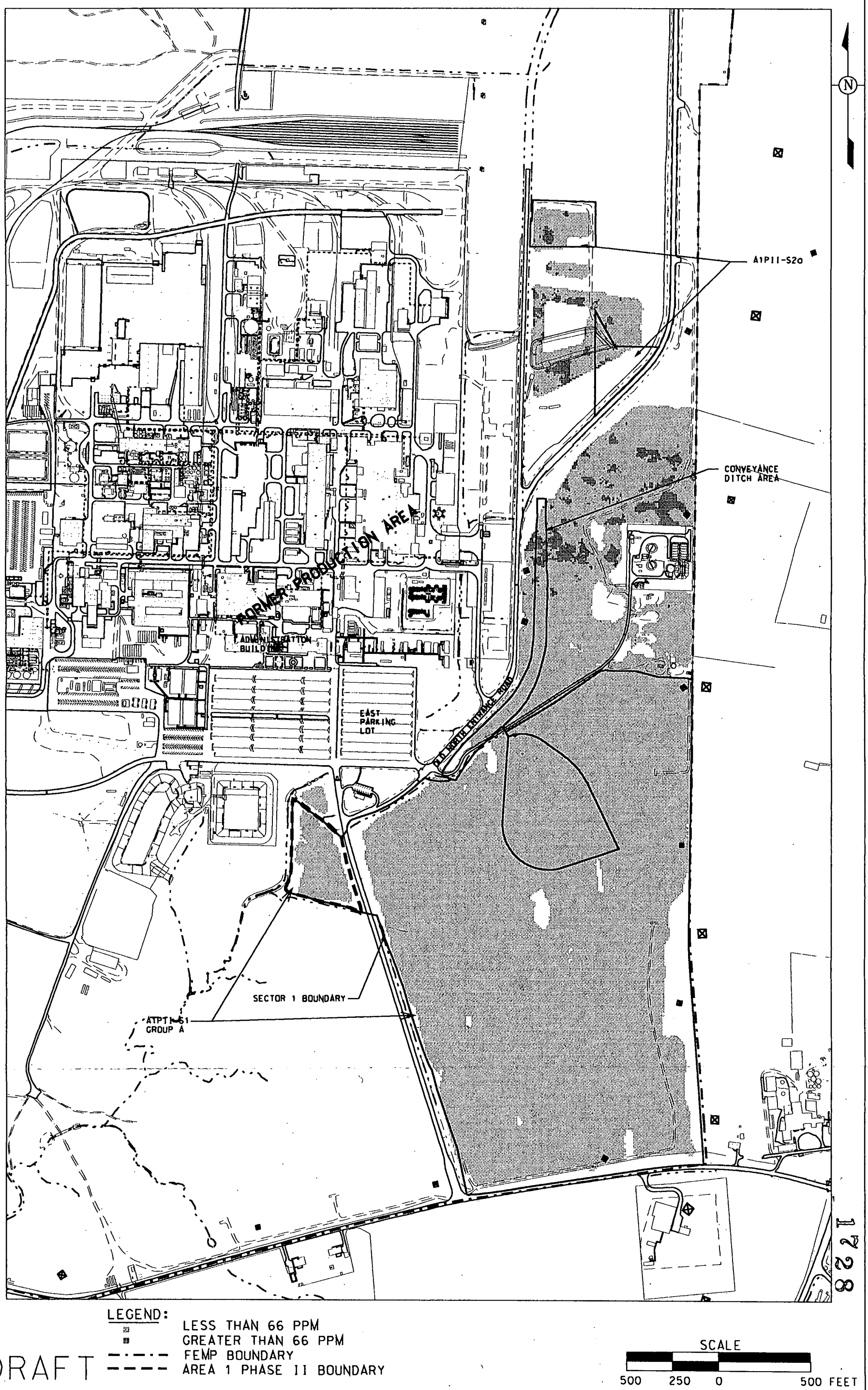
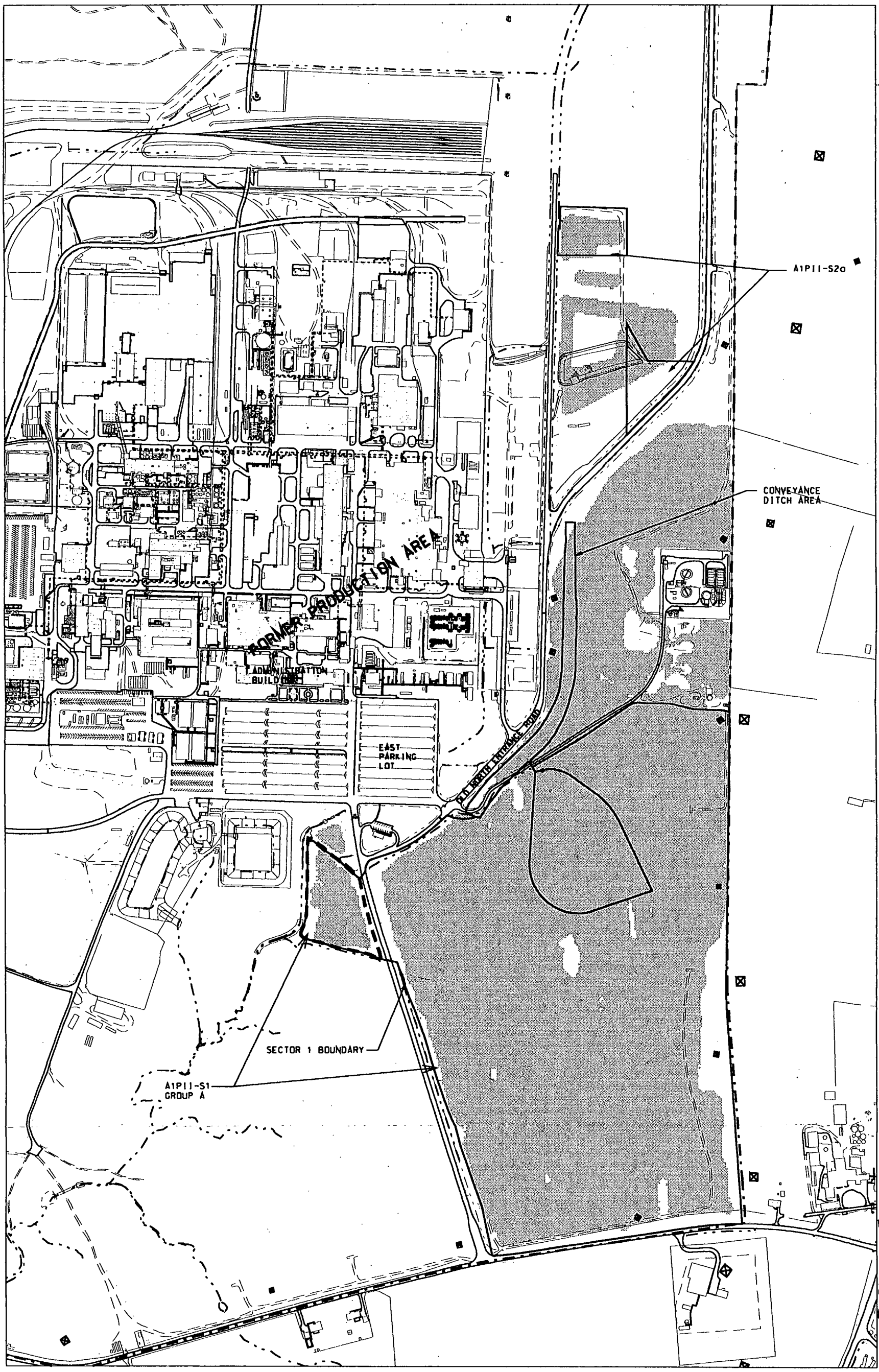


FIGURE 2-13. RTRAK SPATIAL AVERAGES, TOTAL URANIUM CONCENTRATIONS

v:\scr03\dgn\ebmpei02015.dgn
STATE PLANAR COORDINATE SYSTEM 1983
31-AUG-1998
060000
1228



LEGEND:
- LESS THAN 1.47 PCI/g
- GREATER THAN 1.47 PCI/G
- FEMP BOUNDARY
- AREA 1 PHASE II BOUNDARY

DRAFT

SCALE
500 250 0 500 FEET

FIGURE 2-14. RTRAK SPATIAL AVERAGES, THORIUM-232 ACTIVITY

STATE PLANAR COORDINATE SYSTEM 1983

v:\5cr03\dgn\sbrdsip2016.dgn

31-AUG-1998

160091

1228

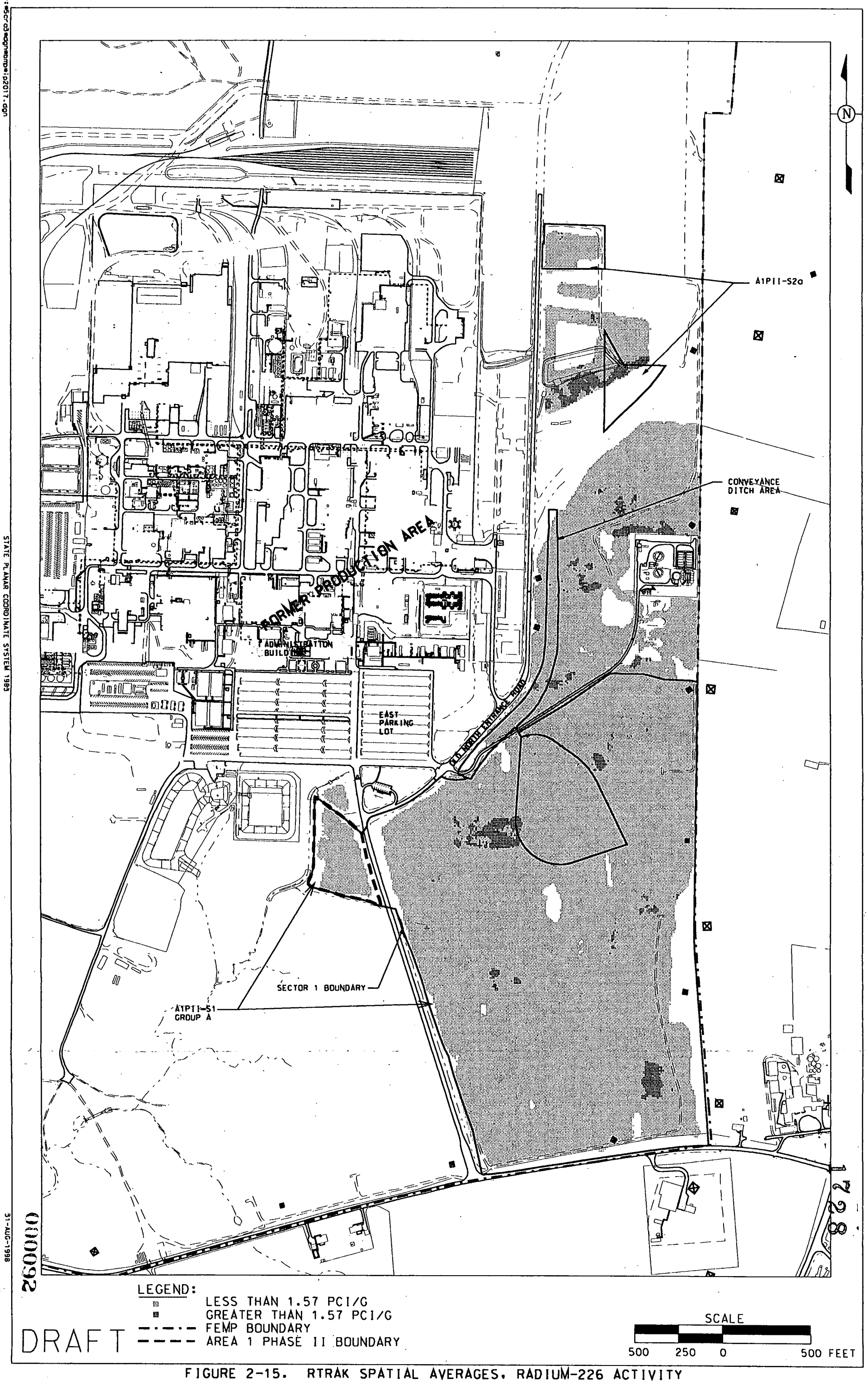


FIGURE 2-15. RTRAK SPATIAL AVERAGES, RADIUM-226 ACTIVITY

v:\5cr03\dgn\ssbmap2017.dgn
STATE PLANAR COORDINATE SYSTEM 1983
31-AUG-1998
260000
1228

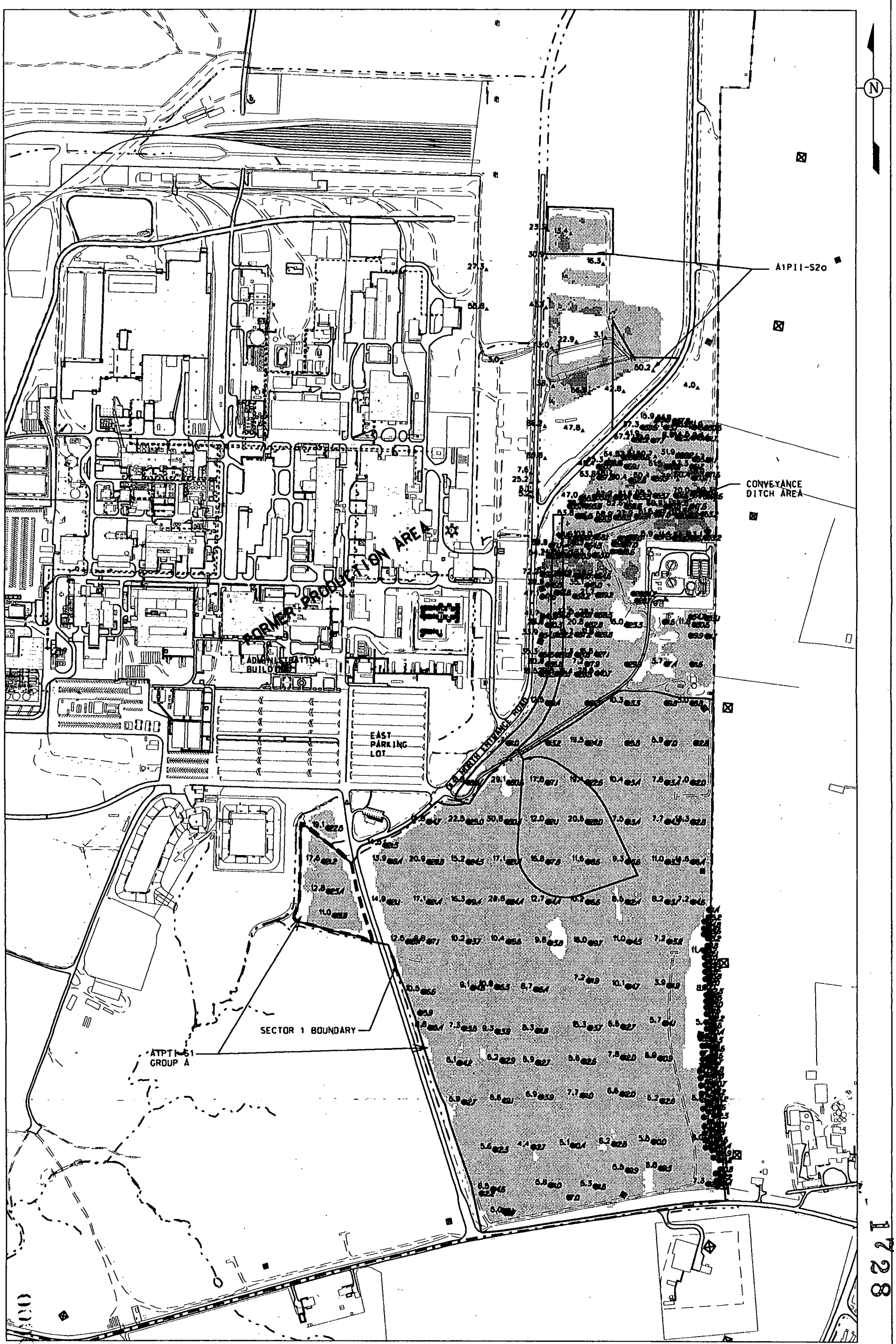


FIGURE 2-16. RTRAK SPATIAL AVERAGES, HPGe RESULTS, AND PHYSICAL SAMPLES FOR TOTAL URANIUM

v:\Scr03\dgn\bnd\:p2018.dgn
STATE PLANAR COORDINATE SYSTEM 1983
31-AUG-1998
1728
000093

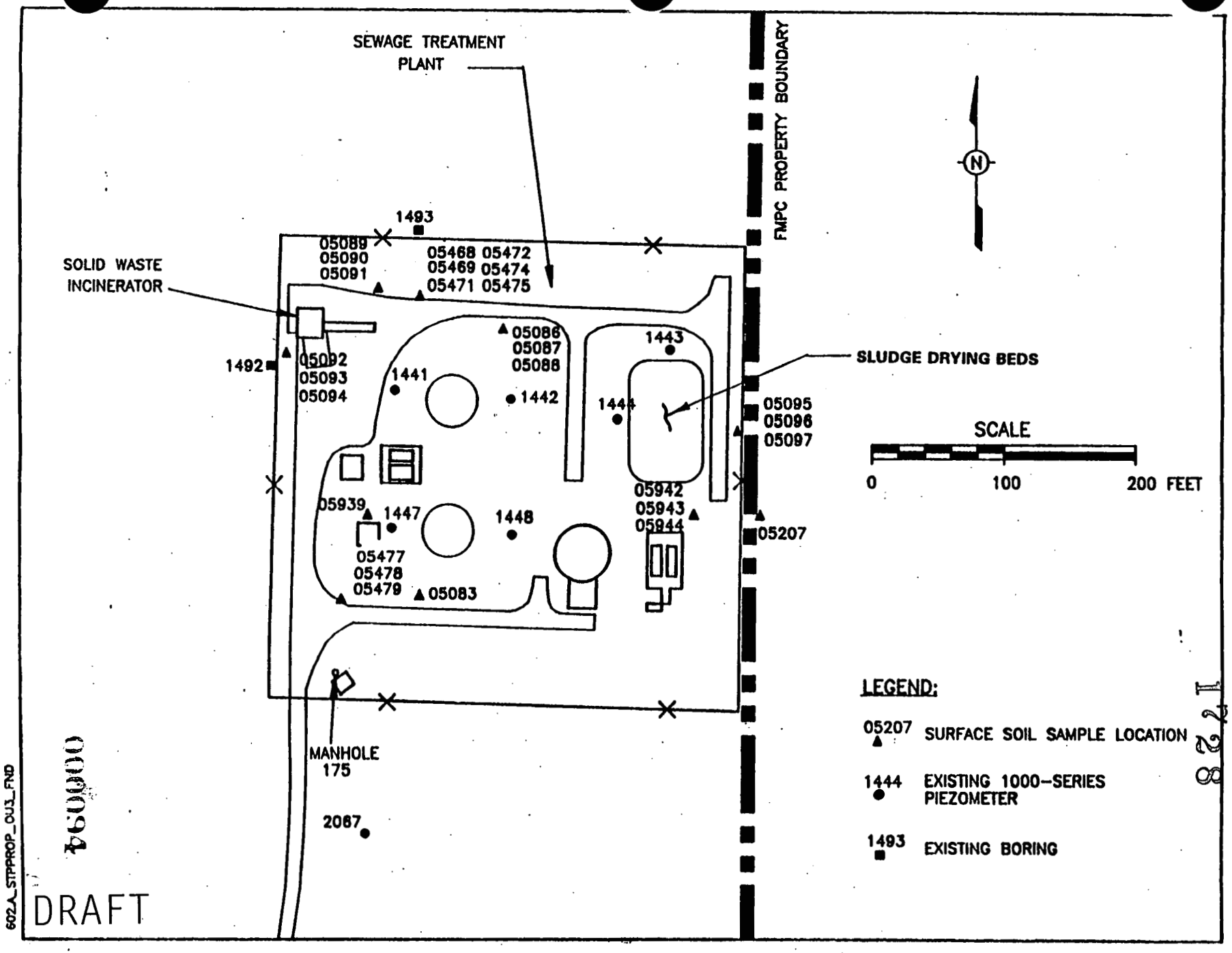


Figure 2-17
Historical Sampling Locations in the Sewage Treatment Plant

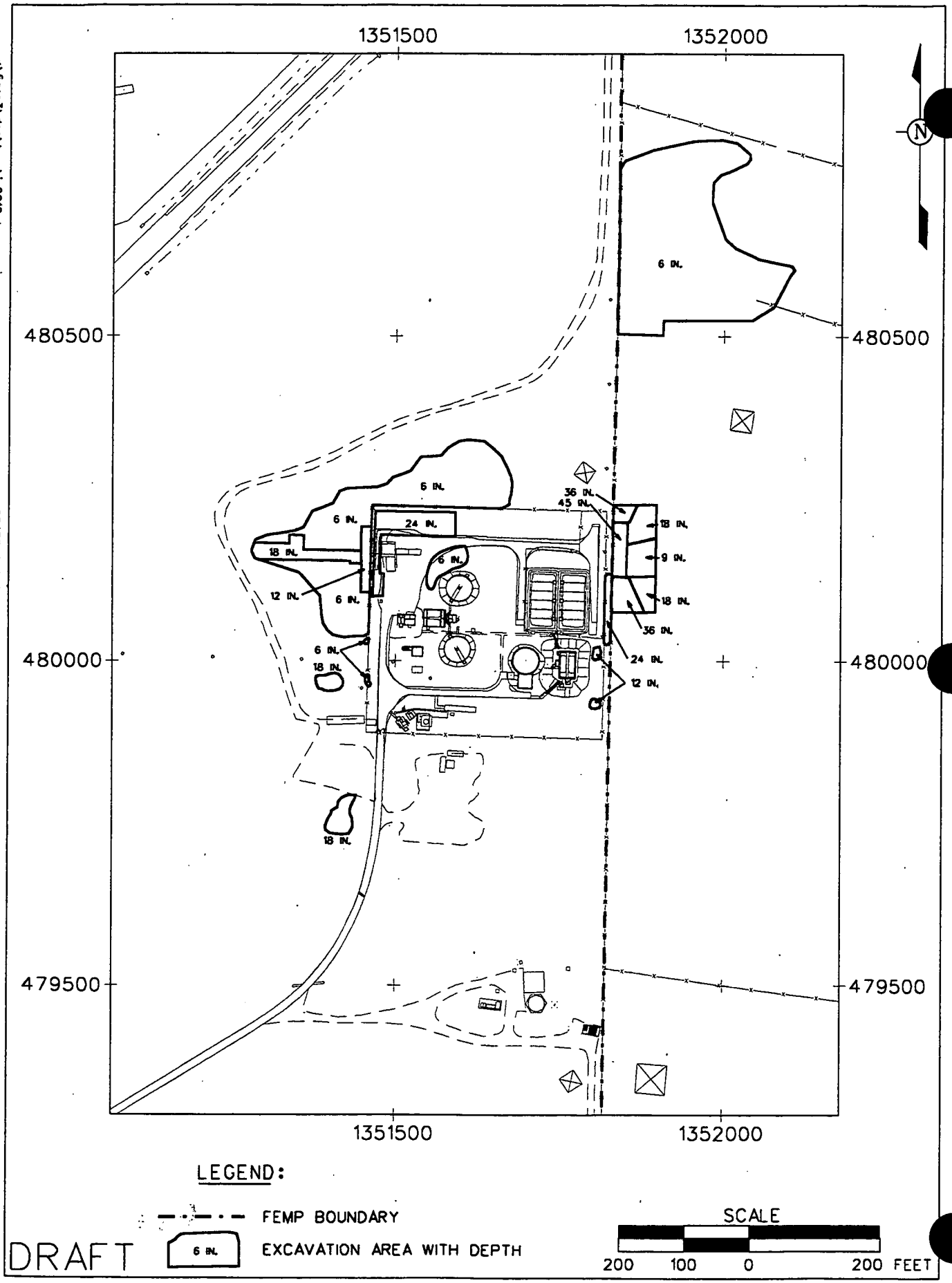
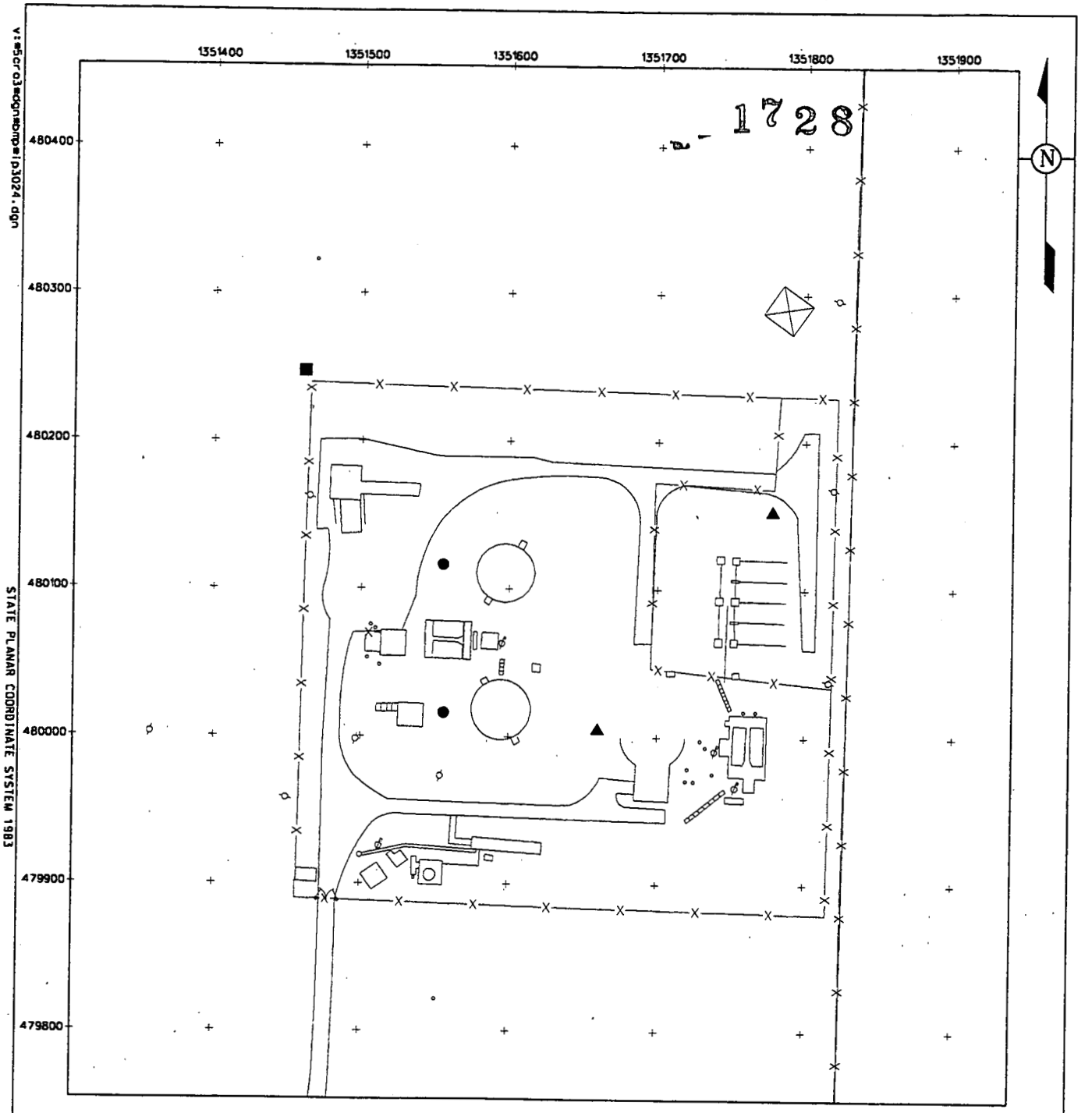


FIGURE 2-18. REMOVAL ACTION 14 EXCAVATION AREAS

000095



LEGEND:

- FEMP BOUNDARY
- ■ BATCH TEST (K_1 OR K_d > 100 L/kg)
- ● SOIL/PERCHED WATER CONCENTRATION (K_1 OR K_d < 100 L/kg)
- ▲ SOIL/PERCHED WATER CONCENTRATION (K_1 OR K_d > 100 L/kg)

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SCALE

100 50 0 100 FEET

FIGURE 2-19. STP K_1 OR K_d STUDY RESULTS

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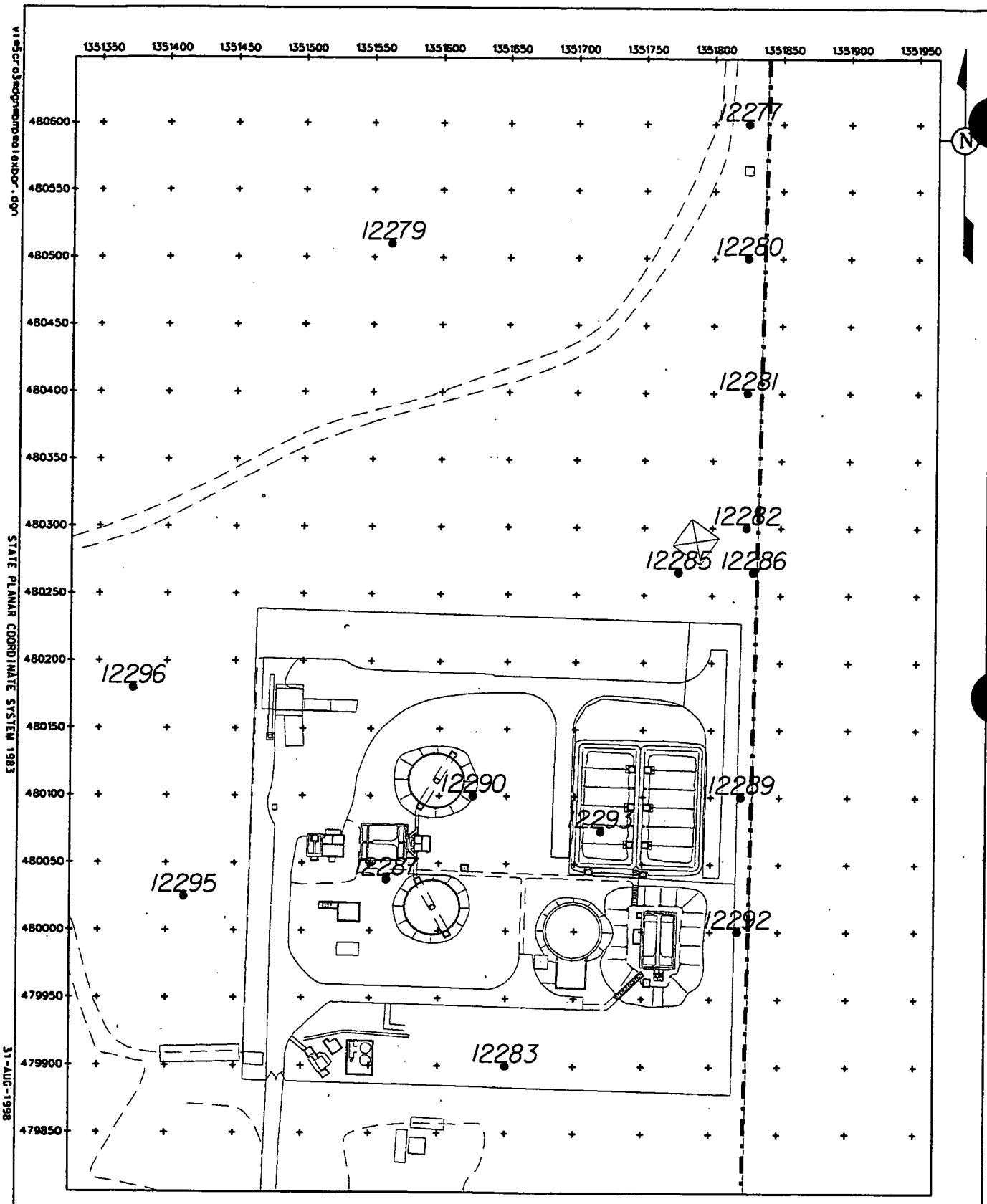


FIGURE 2-20. STP PRE-DESIGN INVESTIGATION BORING LOCATIONS

000097

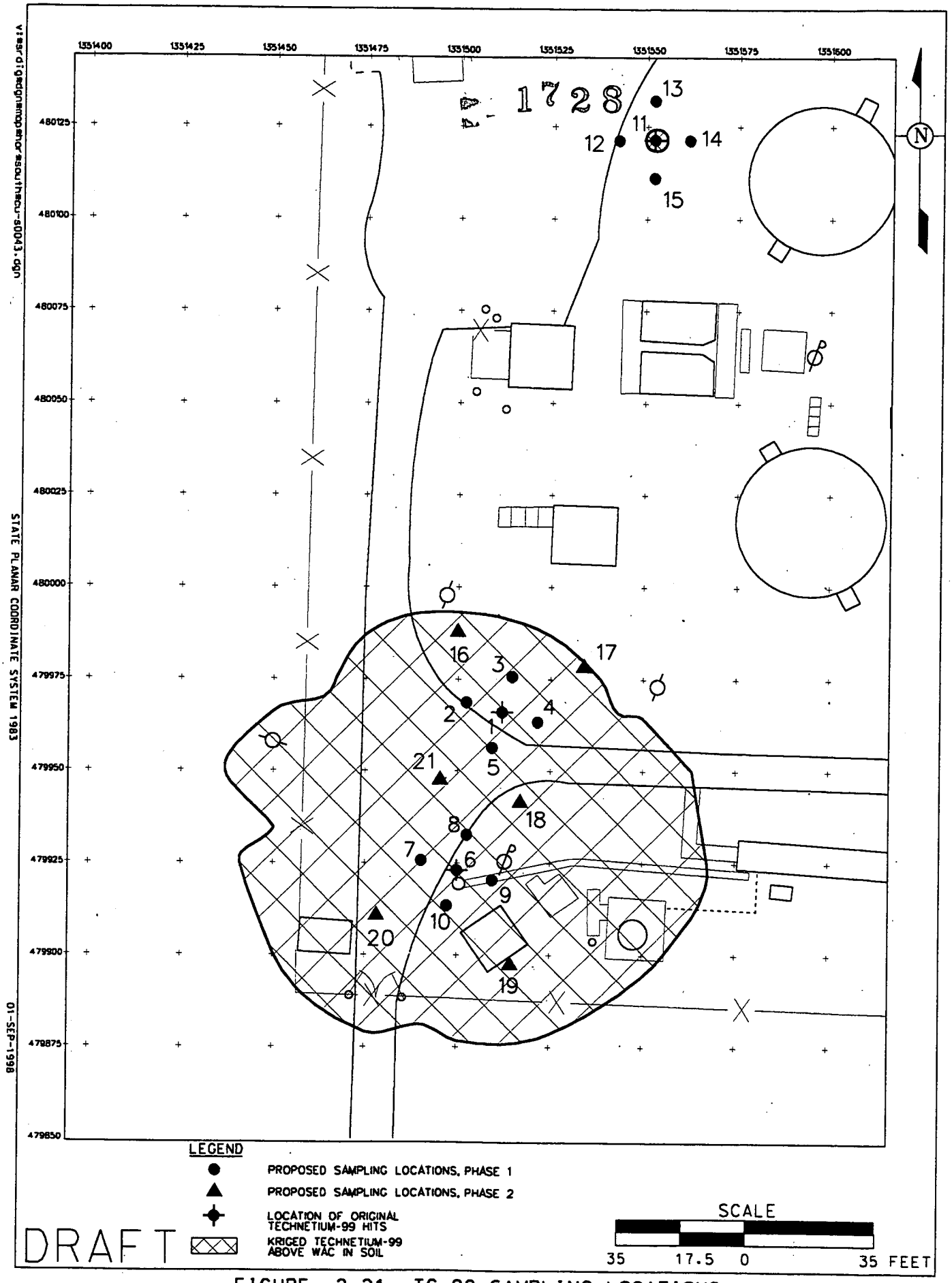


FIGURE 2-21. TC 99 SAMPLING LOCATIONS

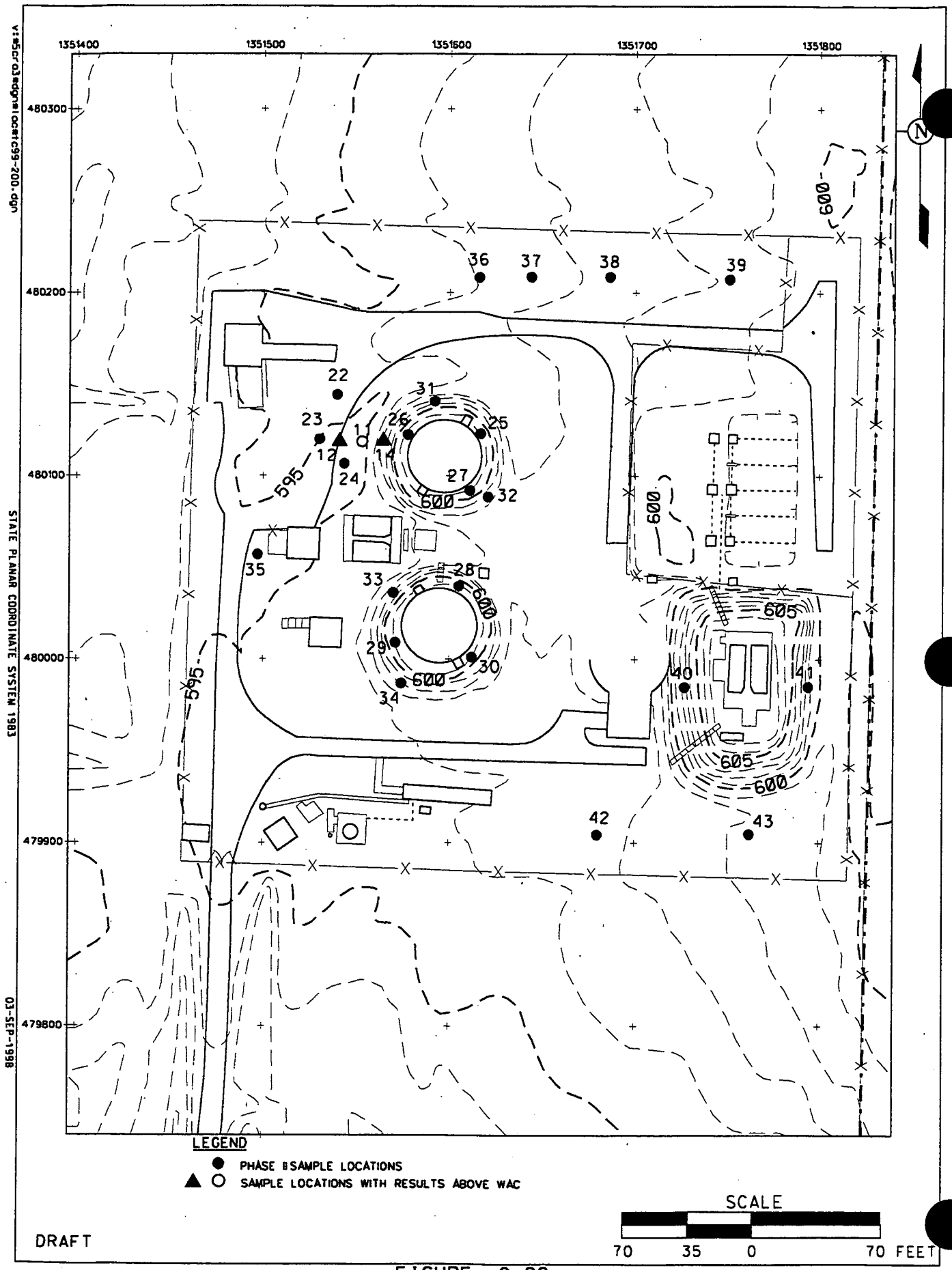
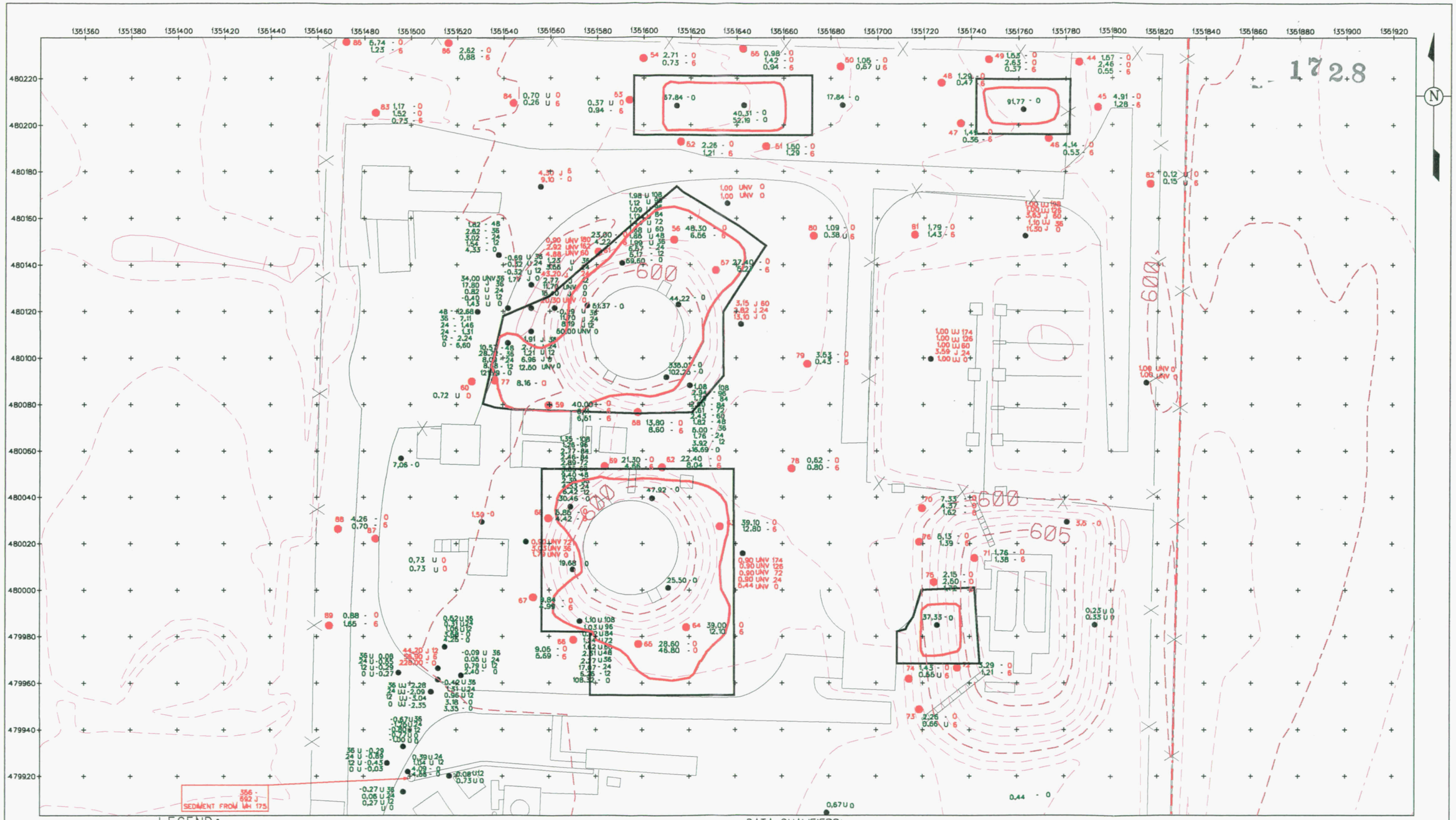


FIGURE 2-22.
PHASE II SAMPLE LOCATIONS IN THE STP AREA FOR TECHNETIUM-99



LEGEND:

- EXCAVATION LIMITS
- CONCEPTUAL EXTENT OF CONTAMINATION
- FEMP BOUNDARY
- 0.67 RESULT (pCi/g)
- U QUALIFIER
- 0 BEGINNING DEPTH IN INCHES

- PSP/RI SAMPLE LOCATIONS
- 0.67 U 0 PRE-DESIGN INVESTIGATION DATA
- 0.67 U 0 RI/FS DATA
- PROPOSED SAMPLE LOCATIONS

DATA QUALIFIERS:

- U UNDETECTED ABOVE METHOD
- - VALIDATED, NO DATA QUALIFIER
- J ESTIMATED VALUE
- NV NOT VALIDATED

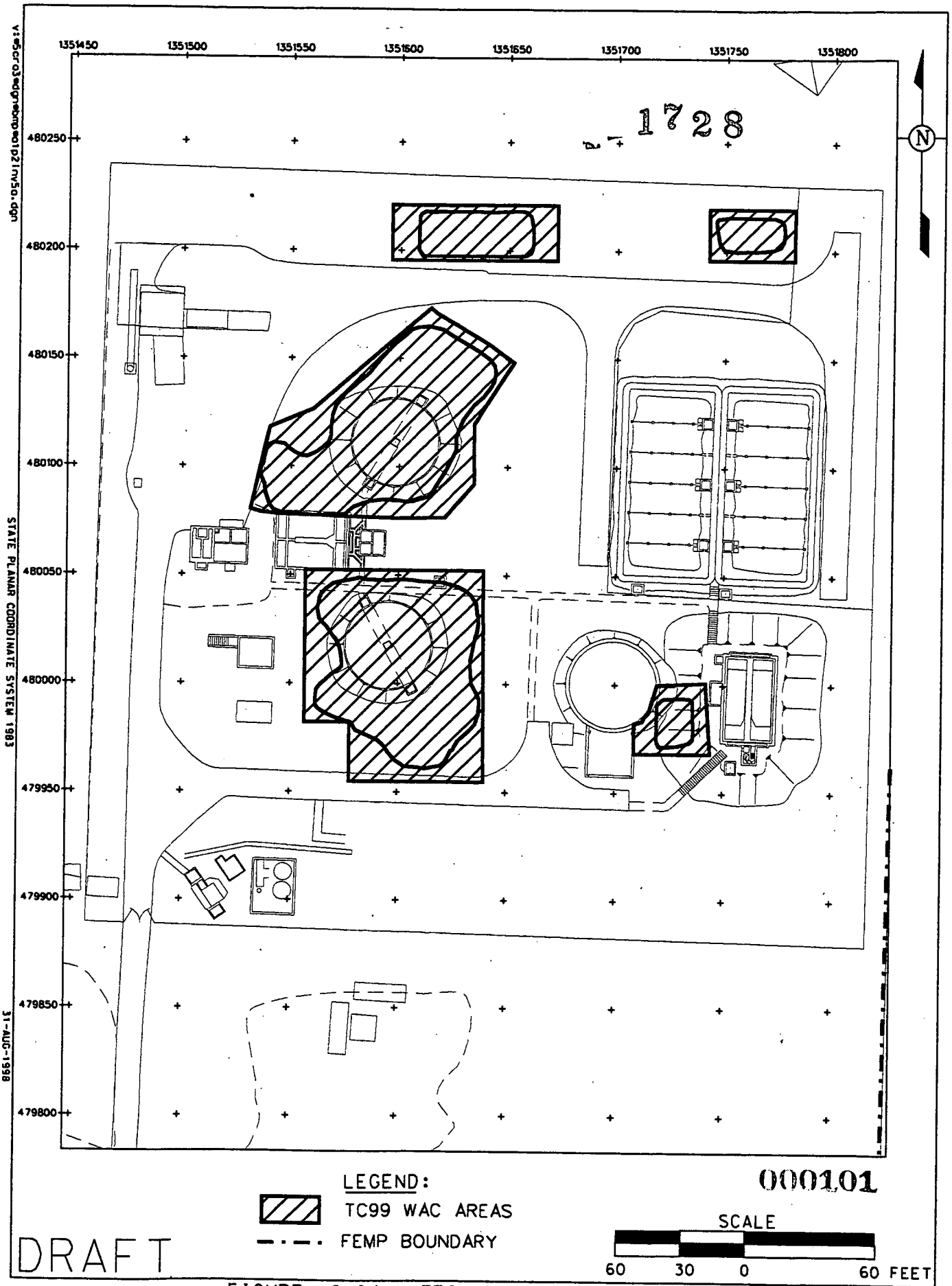
SCALE

10 5 0 10 FEET

DRAFT

V:\5csk4\dgn\bmp\tc99stp1.dgn STATE PLANAR COORDINATE SYSTEM 1983 31-AUG-1998

FIGURE 2-23. TC-99 SAMPLE LOCATIONS AND RESULTS



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000101

FIGURE 2-24. TECHNETIUM-99 ABOVE WAC AREAS

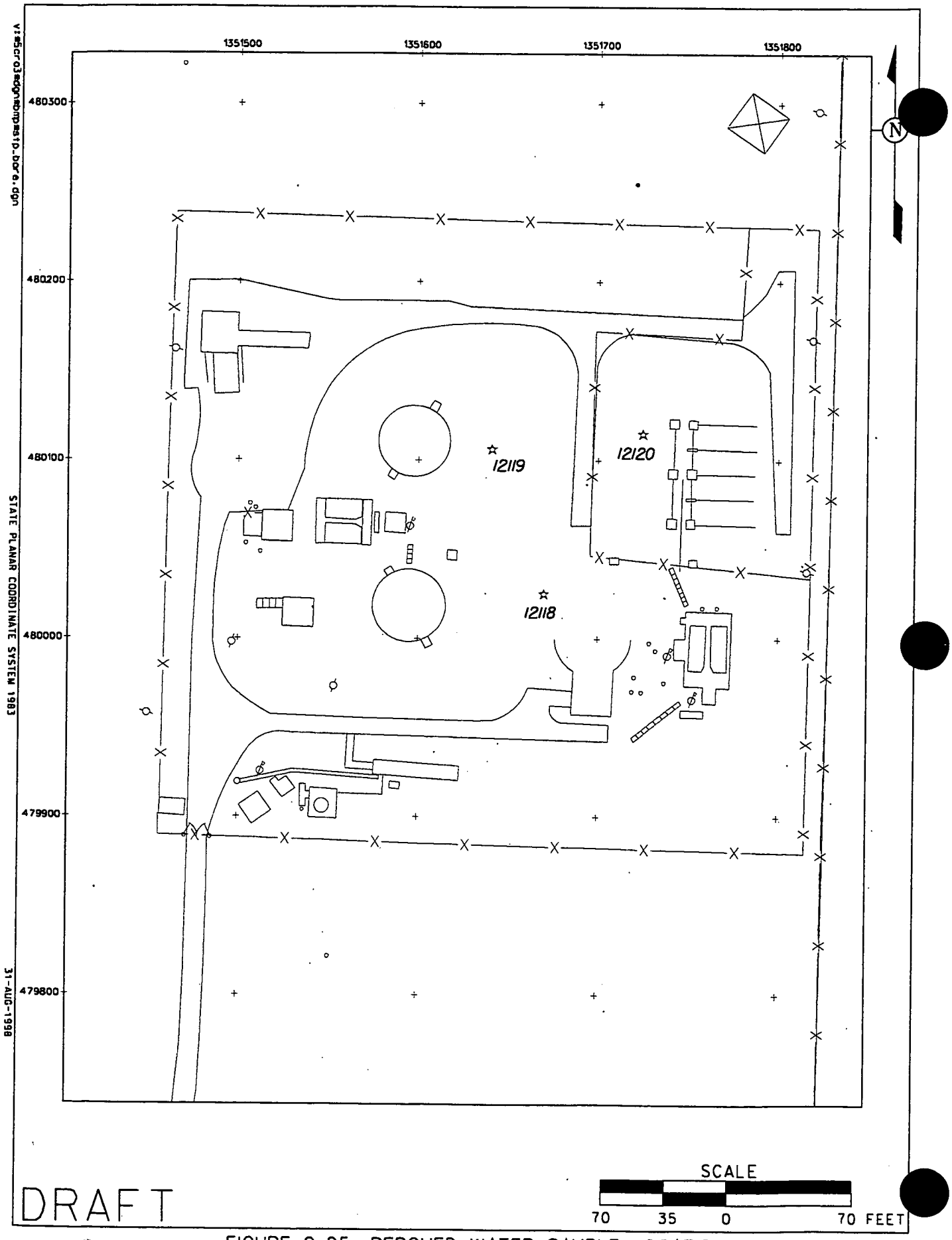


FIGURE 2-25. PERCHED WATER SAMPLE LOCATIONS

000102

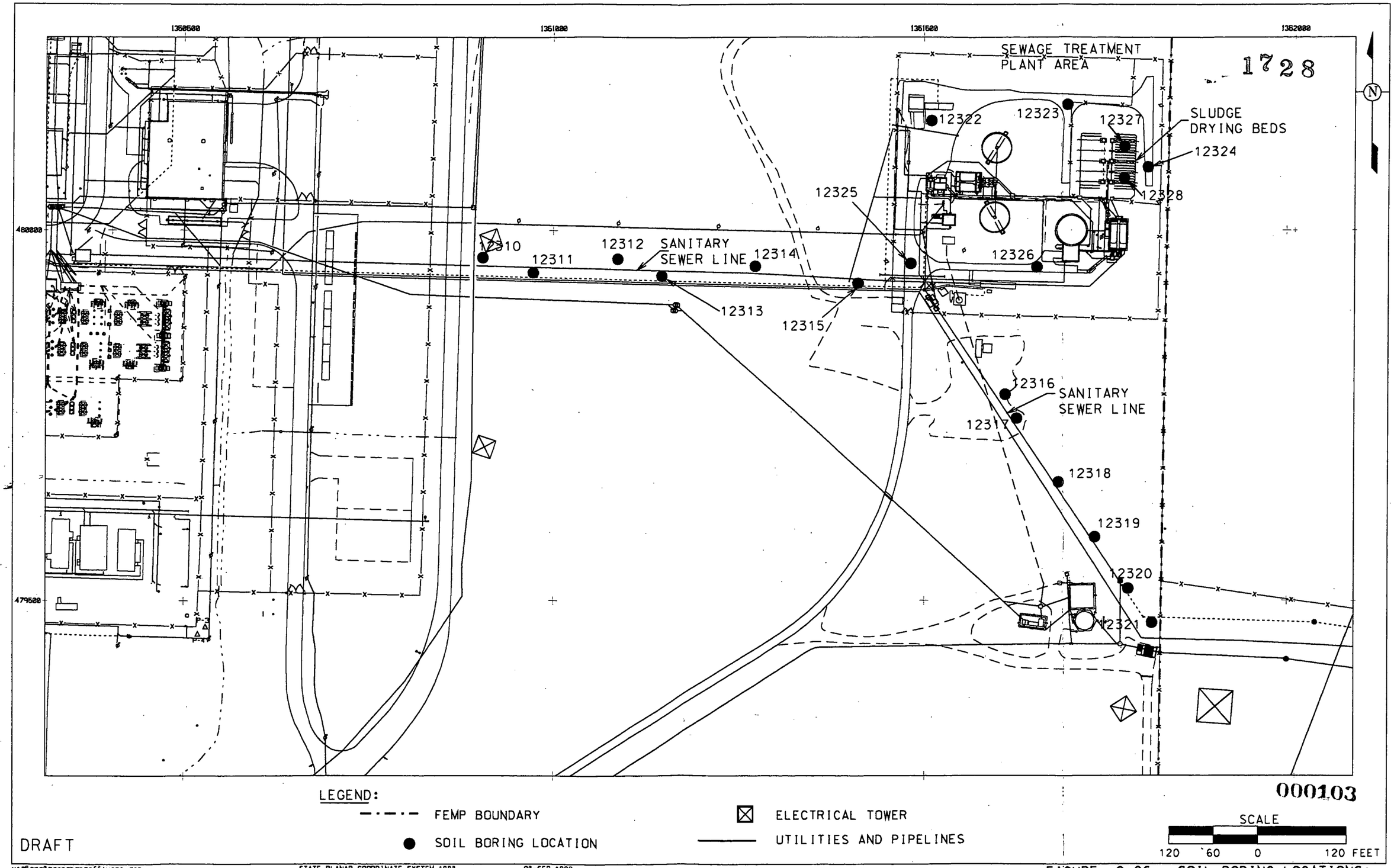


FIGURE 2-26. SOIL BORING LOCATIONS: PIPELINE AND STP AREA

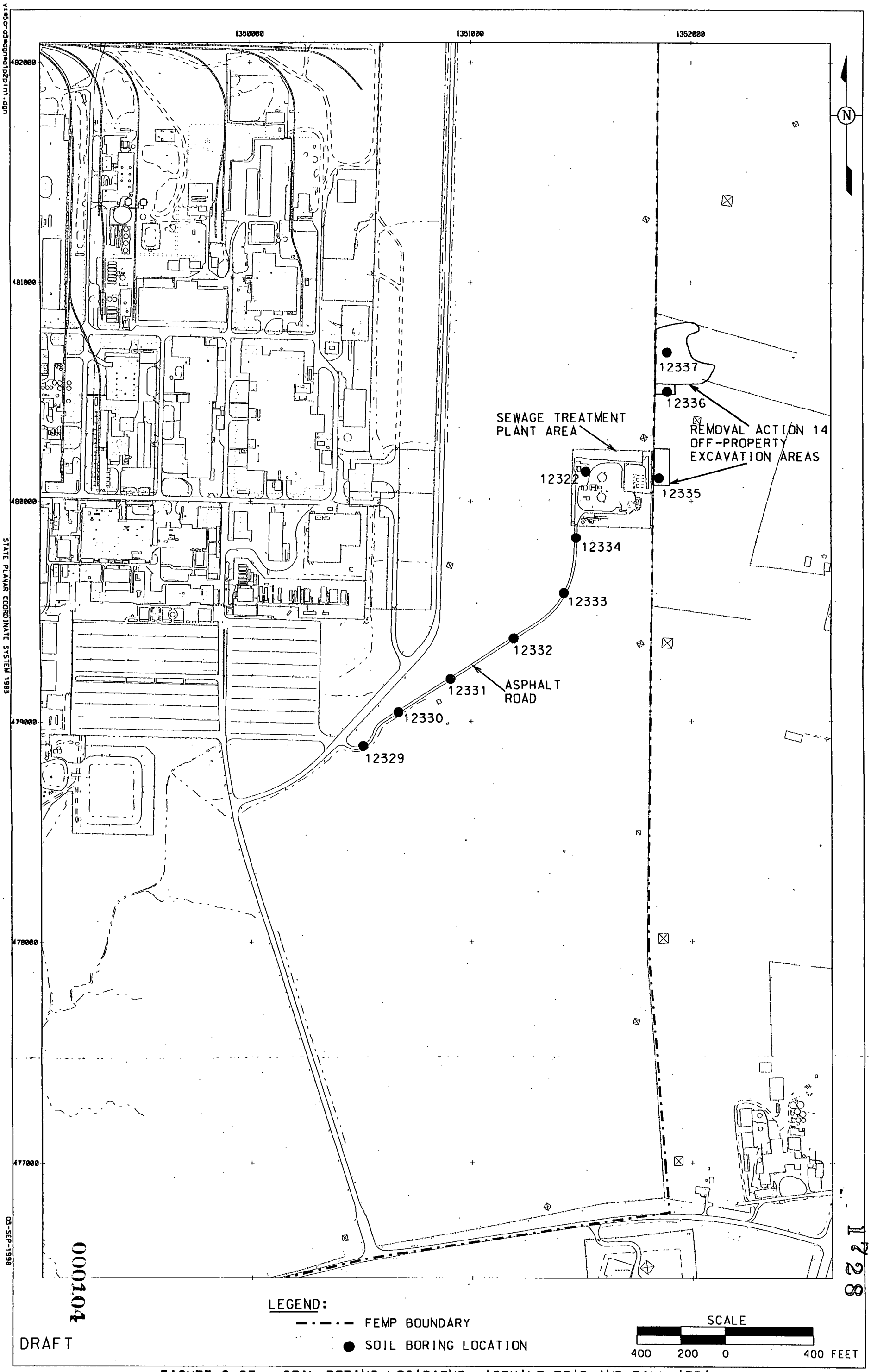
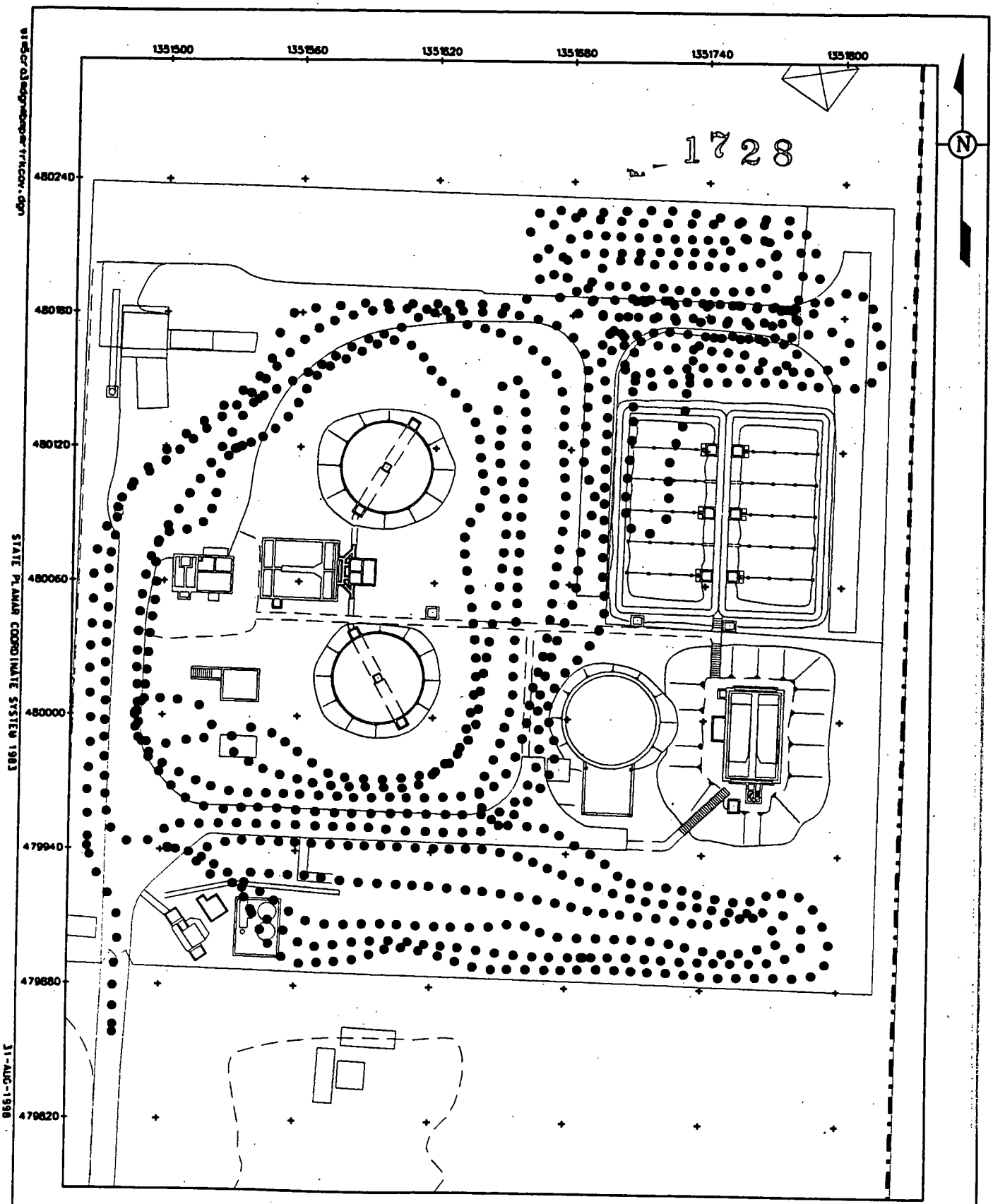


FIGURE 2-27. SOIL BORING LOCATIONS: ASPHALT ROAD AND FILL AREA



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LEGEND:

FEMP BOUNDARY

SCALE

60 30 0 60 FEET

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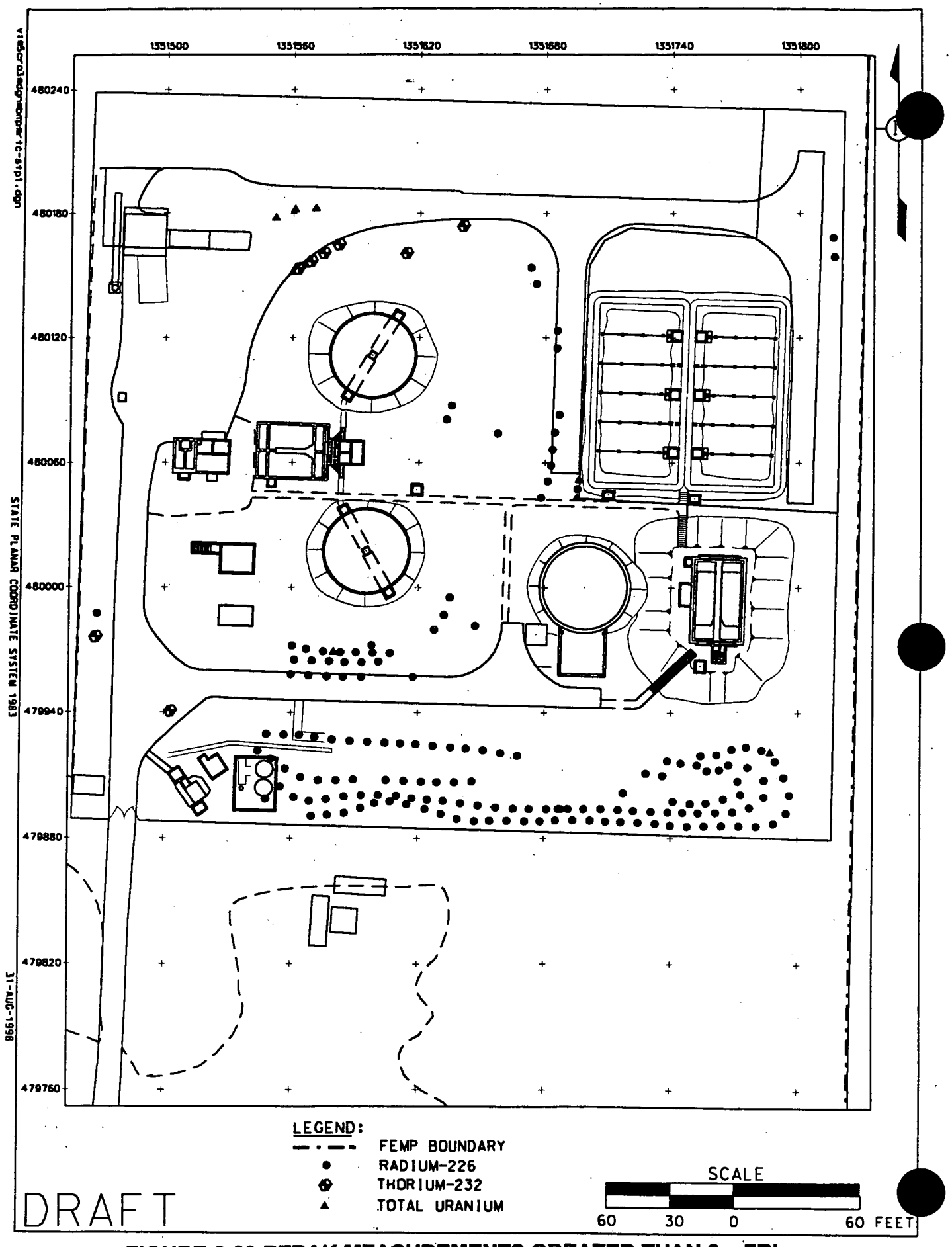
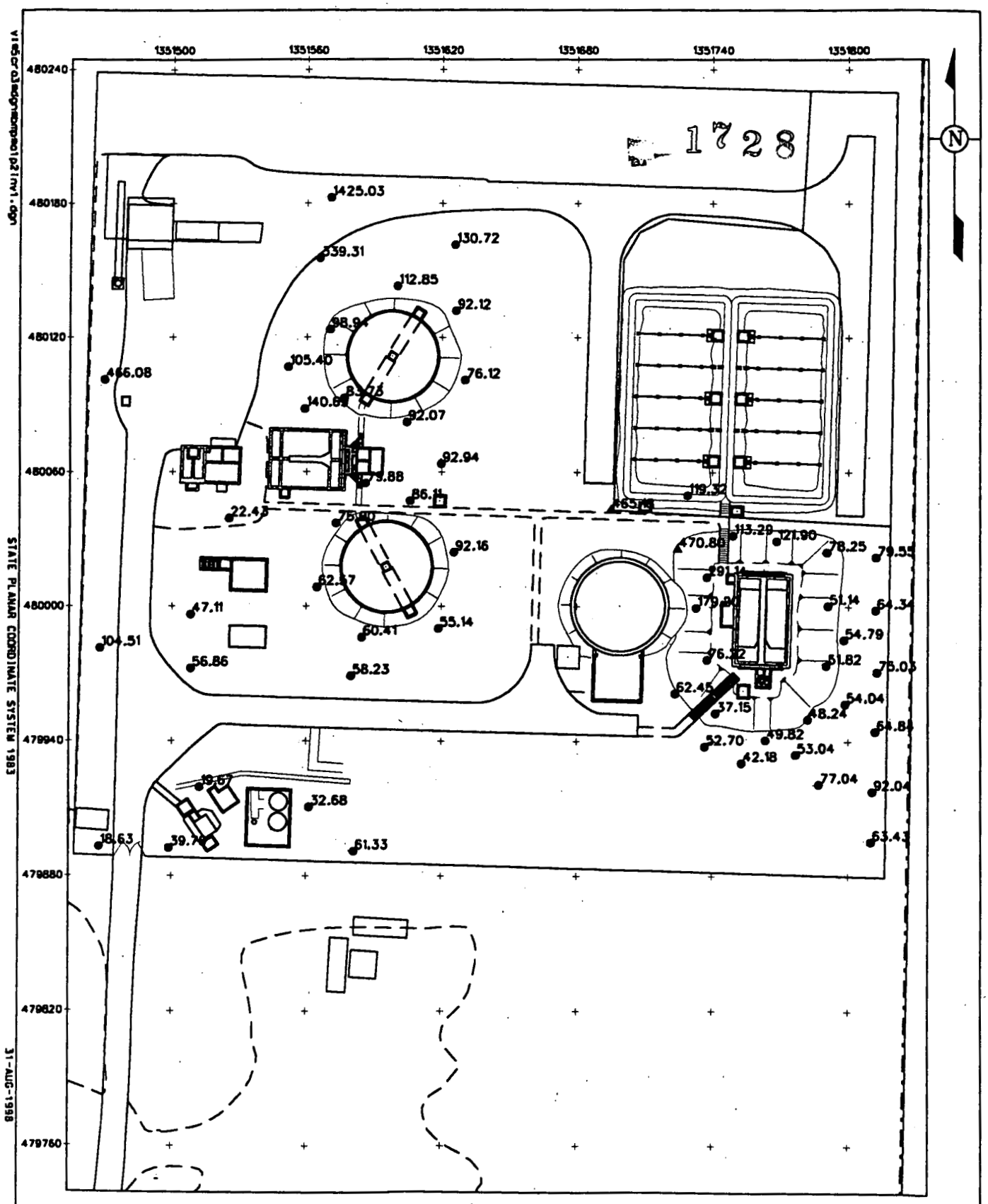
FIGURE 2-28. RTRAK COVERAGE IN STP AREA



000106 FIGURE 2-29 RTRAK MEASUREMENTS GREATER THAN 2 x FRL



LEGEND:

FEMP BOUNDARY

● TOTAL URANIUM BELOW 400

▲ TOTAL URANIUM ABOVE 400

SCALE

60 30 0 60 FEET

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FIGURE 2-30. HPGe TOTAL URANIUM DATA ug/g

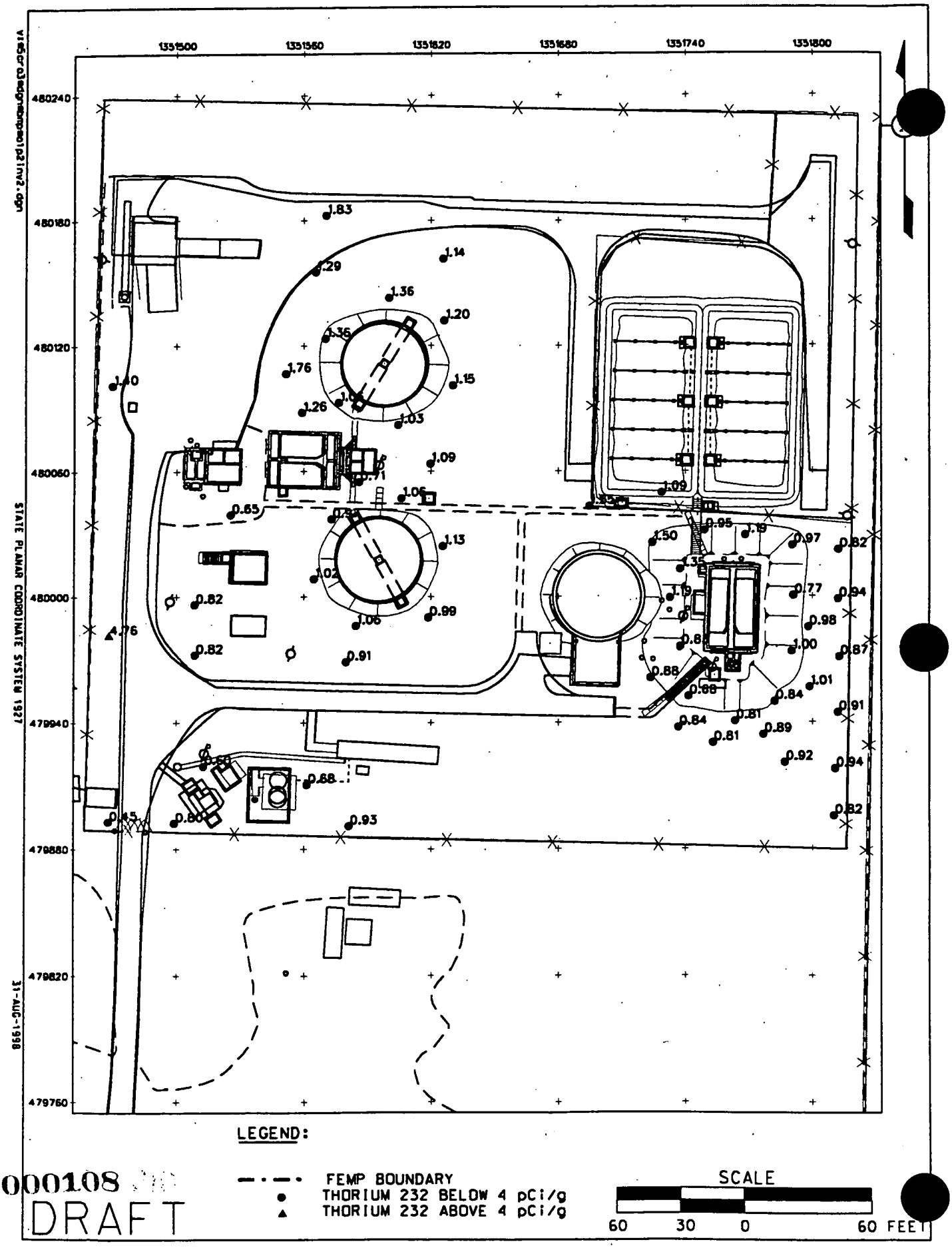

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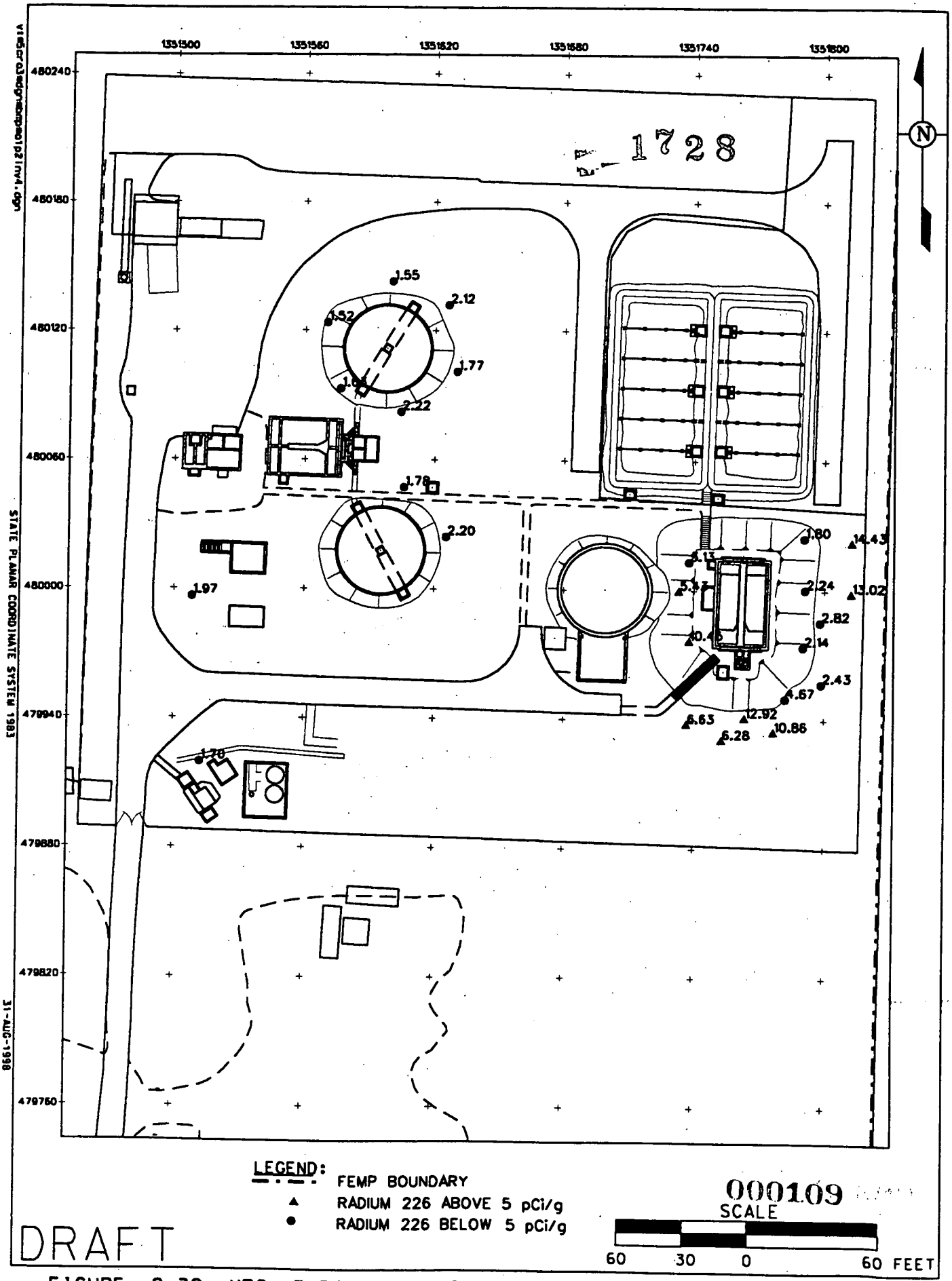
FIGURE 2-31. HPGe THORIUM 232 pCi/g



LEGEND:

- FEMP BOUNDARY
- ▲ RADIUM 226 ABOVE 5 pCi/g
- ● RADIUM 226 BELOW 5 pCi/g

SCALE

60 30 0 60 FEET

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FIGURE 2-32. HPGe RADIUM 226 MOISTURE AND RADON CORRECTED pCi/g

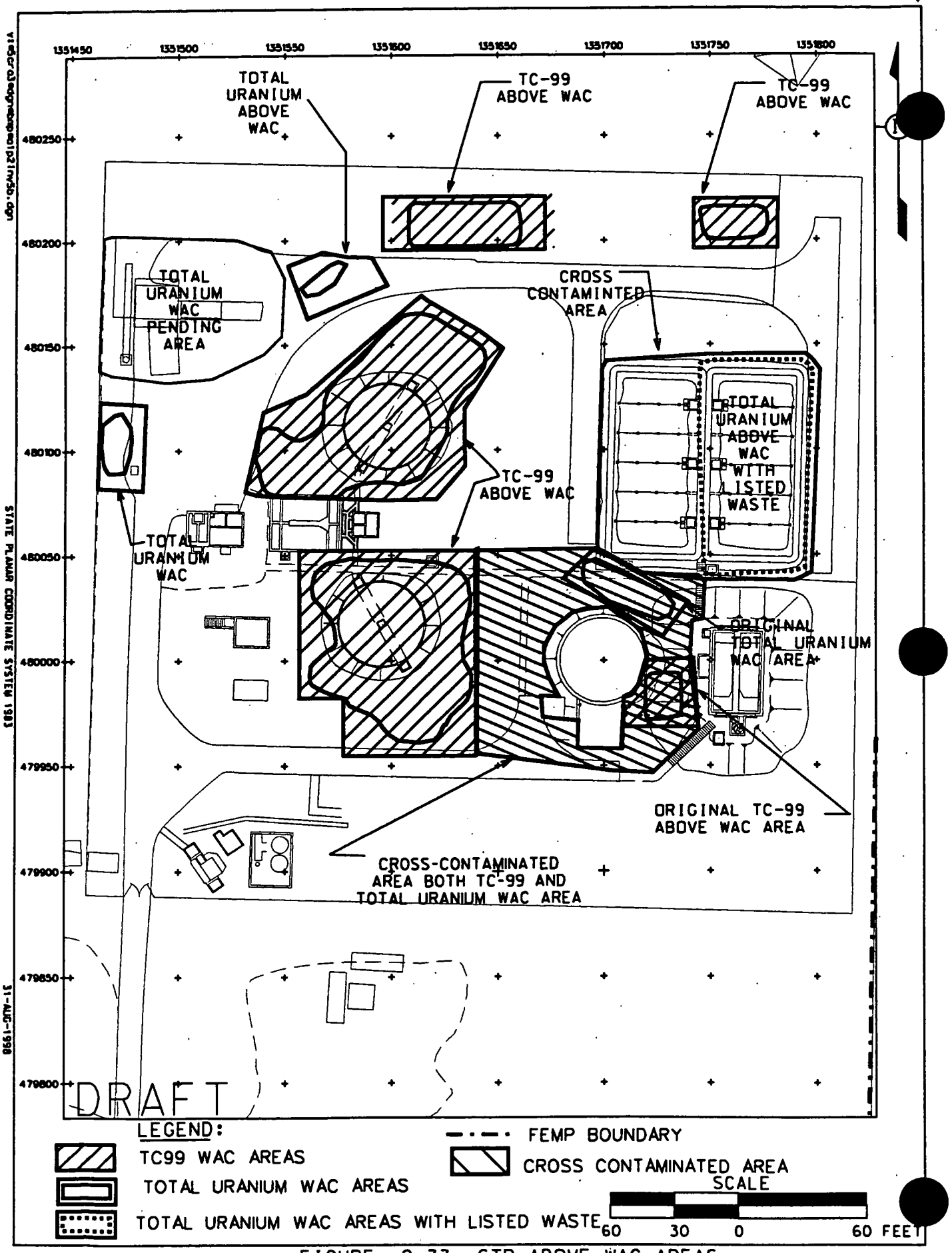


FIGURE 2-33. STP ABOVE WAC AREAS

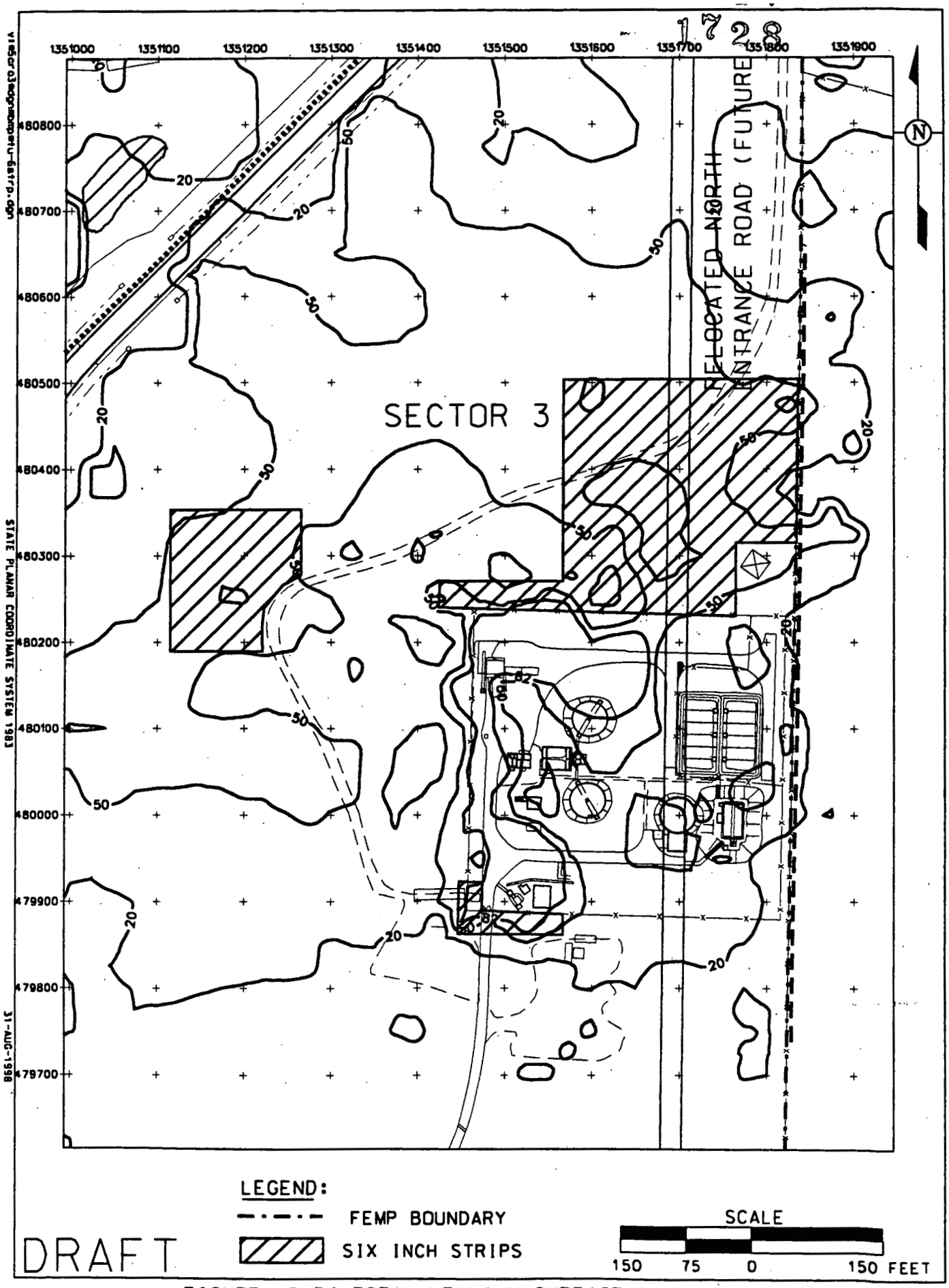
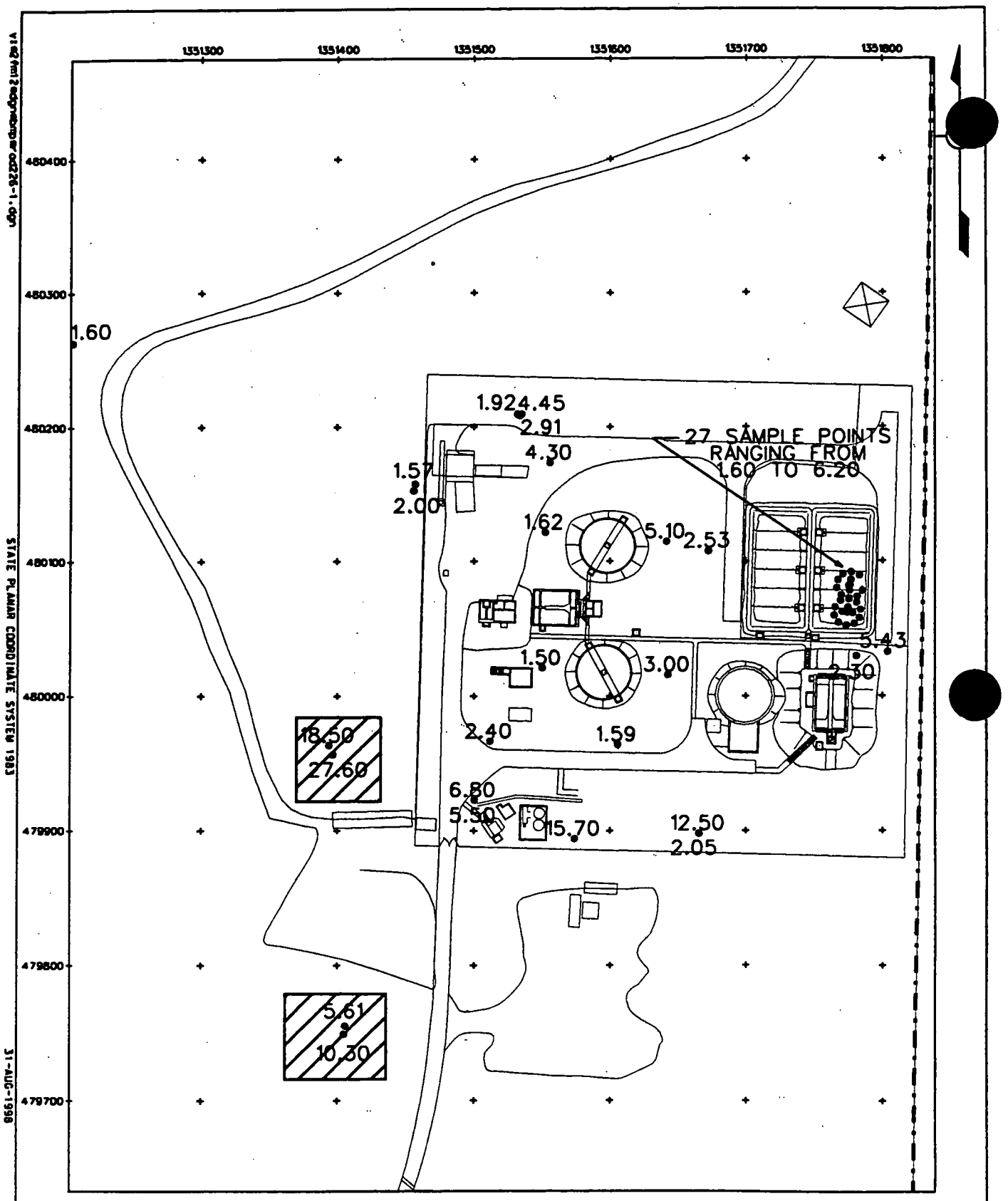


FIGURE 2-34. TOTAL URANIUM SURFACE EXCAVATIONS



LEGEND:

- • RADIUM-226 SAMPLE LOCATION
- FEMP BOUNDARY
- SIX INCH STRIPPING AREA

SCALE

100 50 0 100 FEET

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000112

FIGURE 2-35. RADIUM-226 SURFACE DATA GREATER THAN 1.5 (pCi/g)

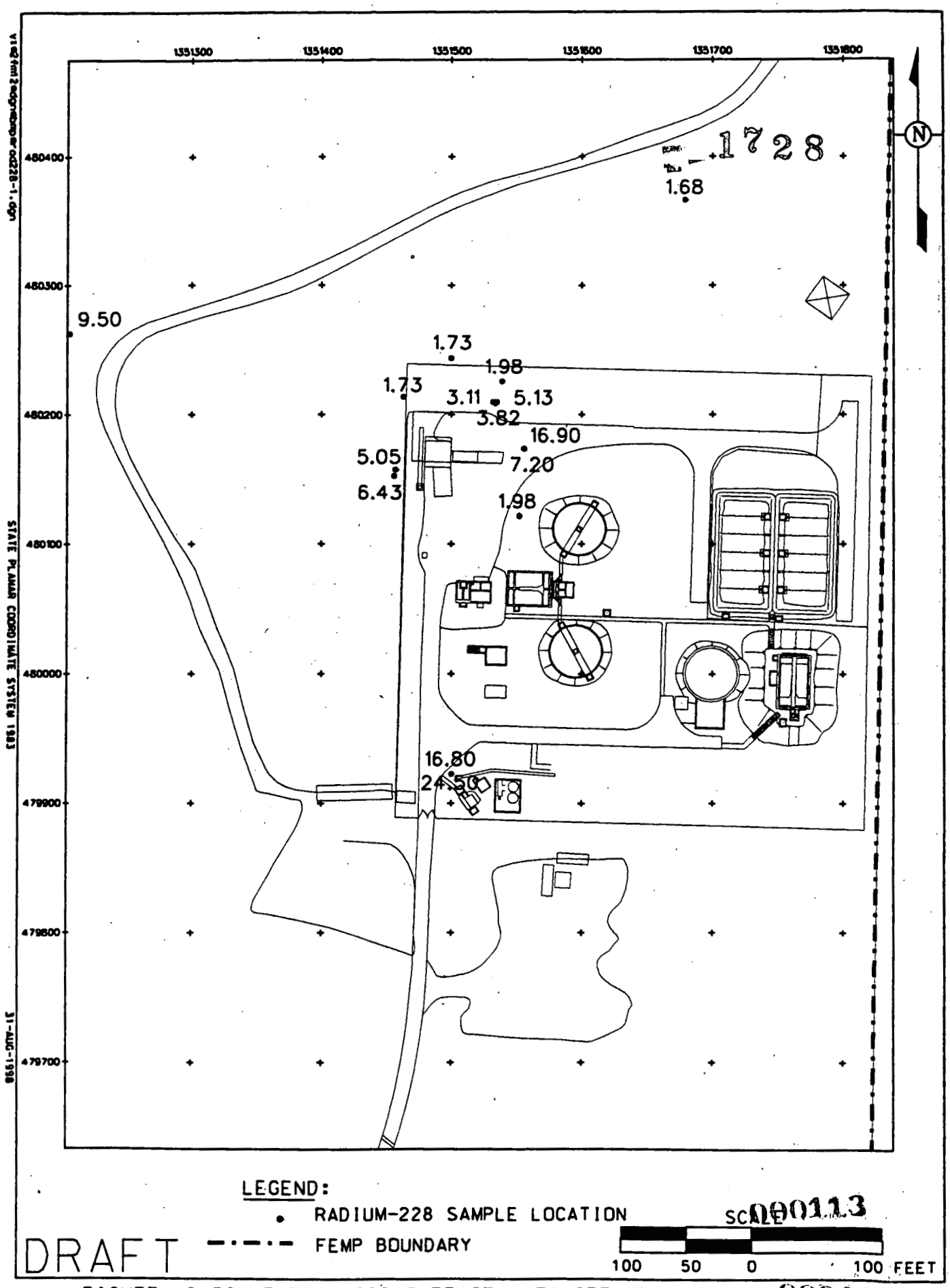

FIGURE 2-36. RADIUM-228 SURFACE DATA GREATER THAN 1.6 pCi/g

000113

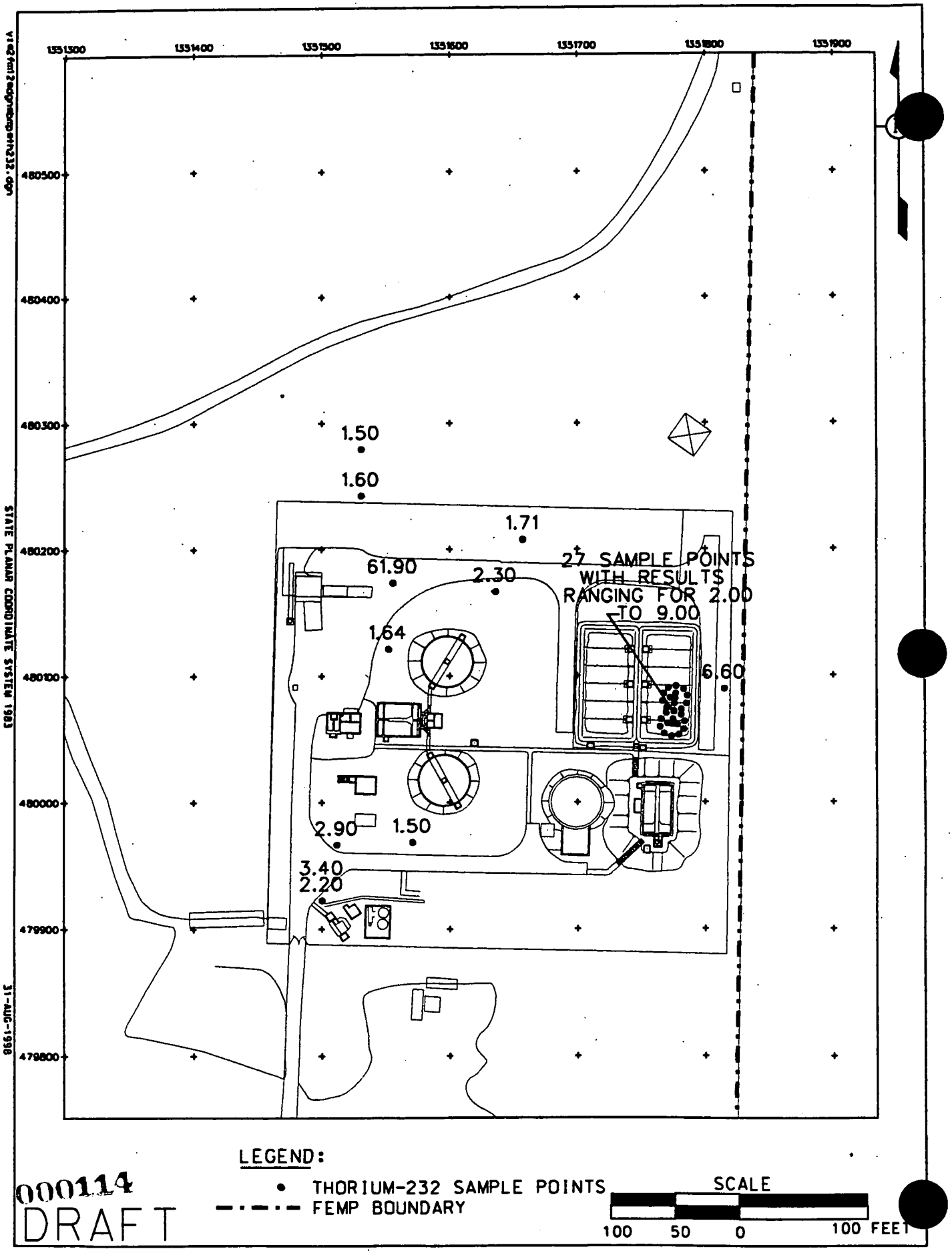

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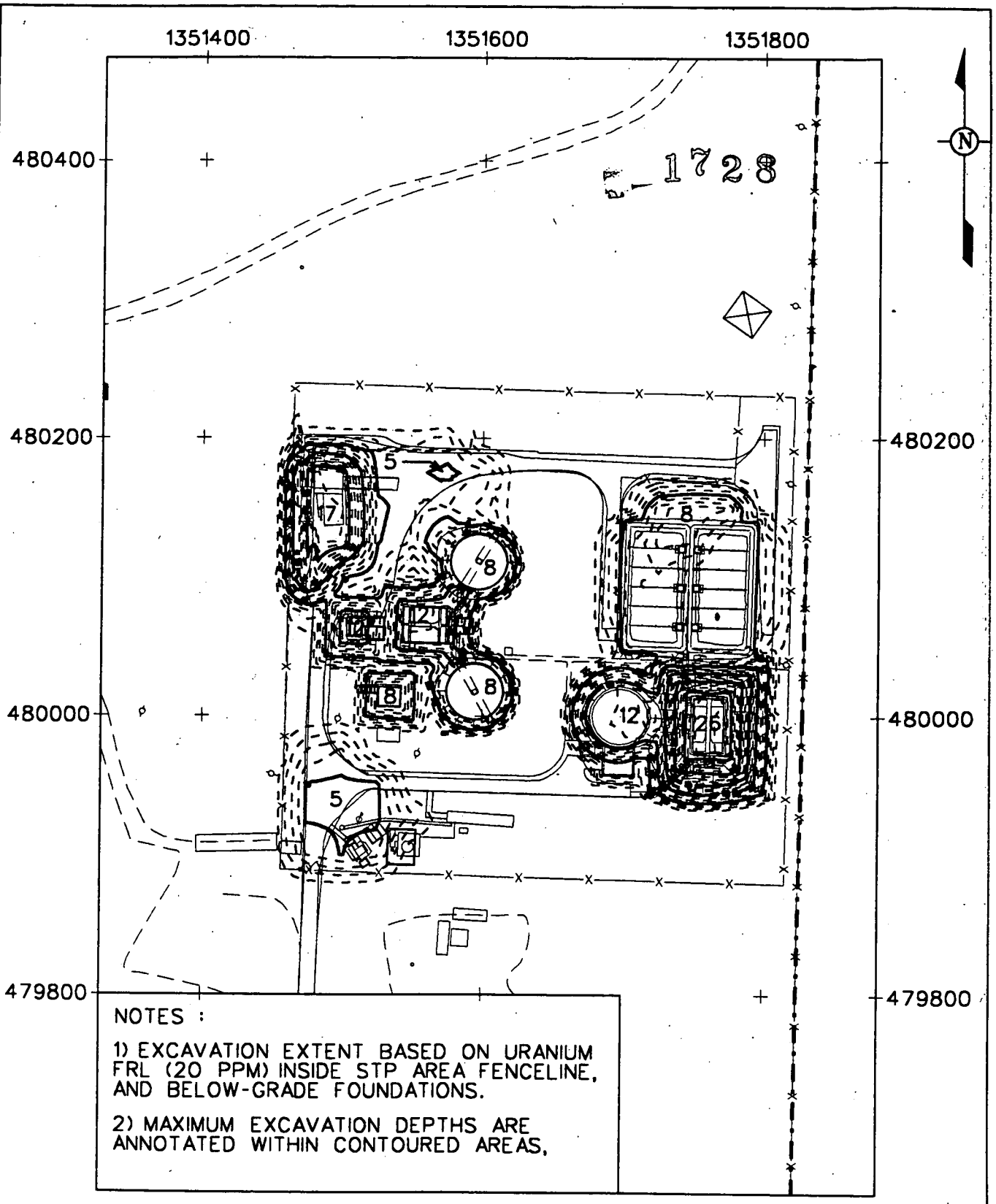
FIGURE 2-37. THORIUM-232 SURFACE DATA GREATER THAN 1.5 (pCi/g)



NOTES :

1) EXCAVATION EXTENT BASED ON URANIUM FRL (20 PPM) INSIDE STP AREA FENCELINE, AND BELOW-GRADE FOUNDATIONS.

2) MAXIMUM EXCAVATION DEPTHS ARE ANNOTATED WITHIN CONTOURED AREAS.

NOT FOR CONSTRUCTION

LEGEND:

NOTE: FOR EXCAVATIONS OUTSIDE STP FENCE. SEE FIGURE 2-12.

- FEMP BOUNDARY
- EXCAVATION, MAJOR CONTOURS (5')
- EXCAVATION, MINOR CONTOURS (1')

SCALE

100 50 0 100 FEET

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FIGURE 2-38. STP AREA EXCAVATION DEPTHS

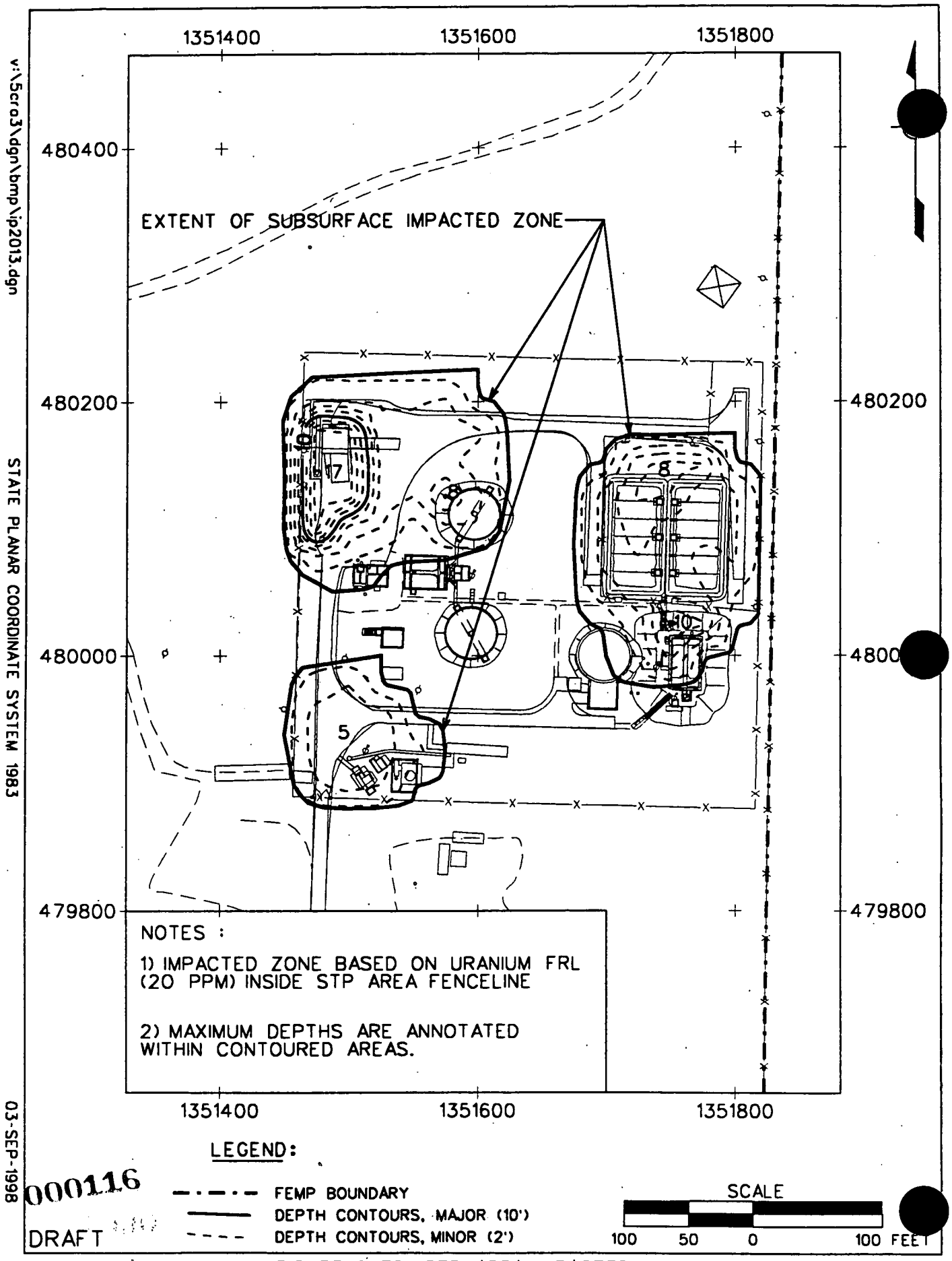
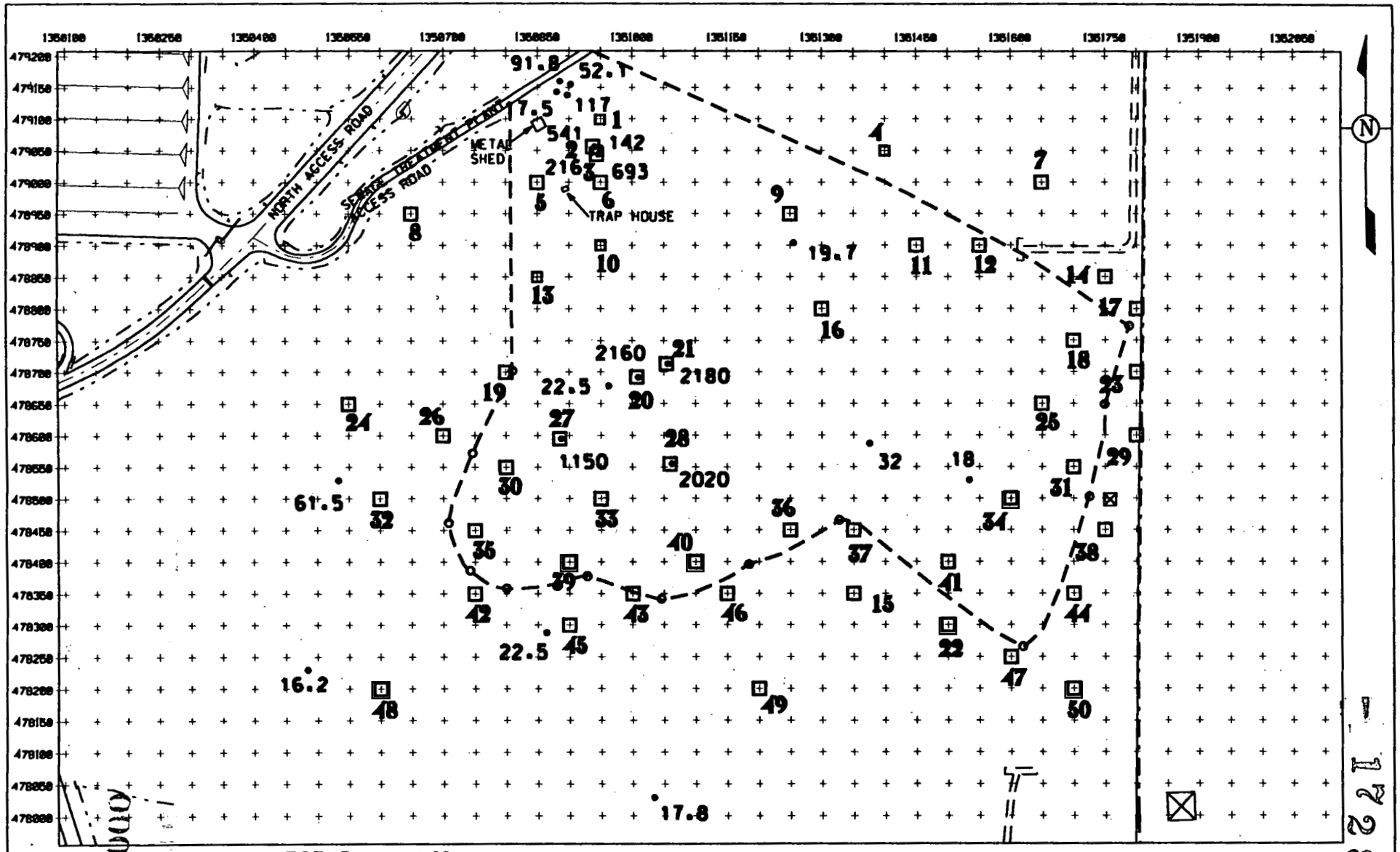


FIGURE 2-39. STP AREA IMPACTED ZONE



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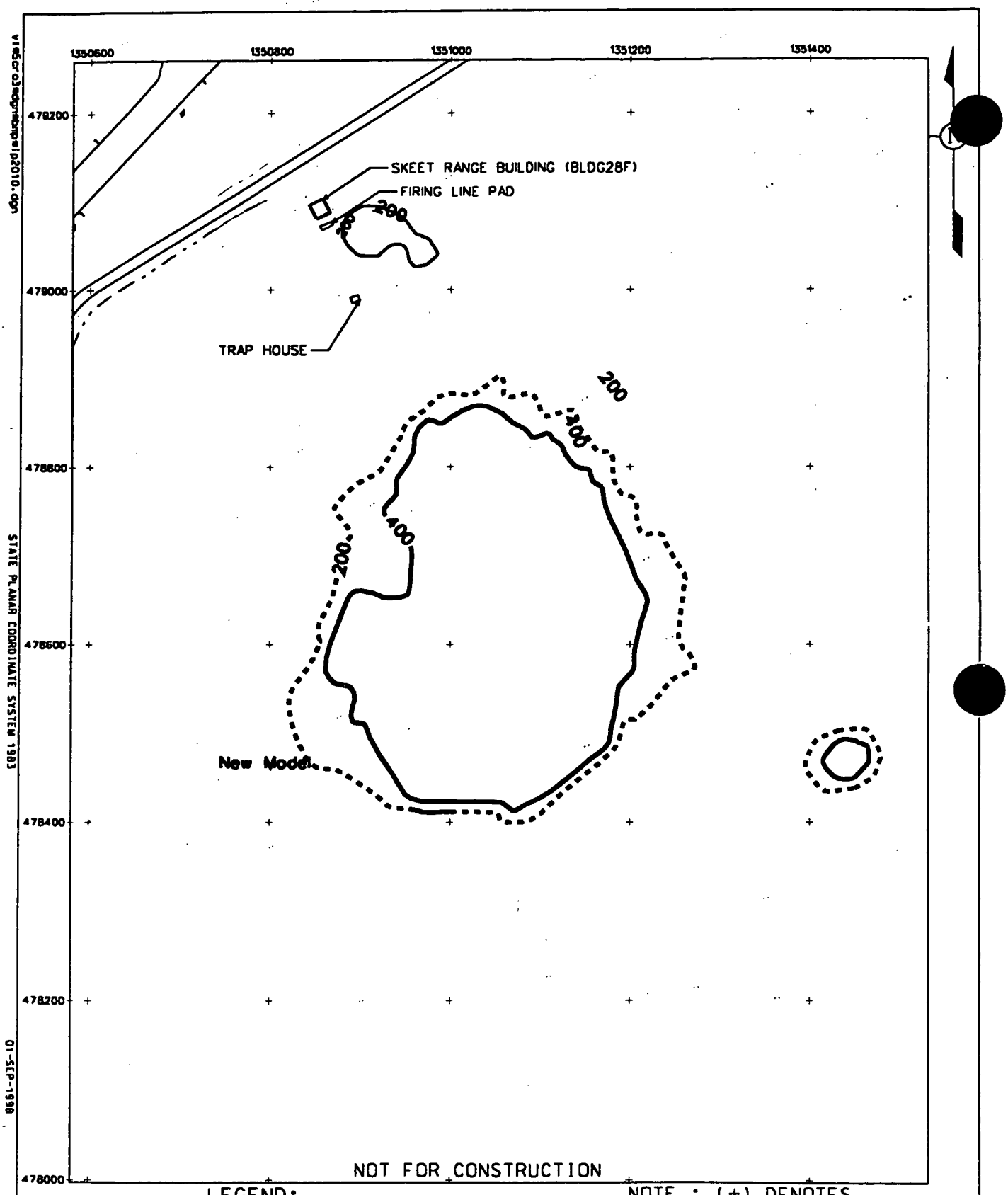
v1#5cr w2#dgn#map#nor#dp1#work030.dgn
STATE PLANAR COORDINATE SYSTEM 1983

FIGURE 2-40. TRAP RANGE SAMPLE LOCATIONS

31-AUG-1998



LEGEND:

200 LEAD CONCENTRATION (mg/kg)

NOTE : (+) DENOTES MAXIMUM RESULT AT LOCATION

SCALE

150 75 0 150 FEET

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FIGURE 2-41. EXTENT OF EXCAVATION IN TRAP RANGE AREA

3.0 REMEDIAL ACTION APPROACH

This section describes the technical approach that will be used to remediate A1PII. As discussed in Section 1.2, A1PII has been divided into three geographic sectors that will be sequentially remediated through three separate design packages. In many cases, the scopes of these design packages overlap sector boundaries. Design packages are:

- Site Preparation
- STP Excavation
- Trap Range Remediation

Remedial activities will be generally carried out in accordance with the guidance provided in Sections 3.0 and 4.0 and Appendix F of the SEP. This section discusses implementation of those guidelines through the execution of specific design packages. Separate construction drawings and technical specifications will be prepared for each design package and will serve as part of the contract documents governing contractor activities. Each contractor will prepare and submit a Safe Work Plan describing the specific procedures and methods that the contractor will utilize to perform the work.

A1PII remedial contracts will be integrated with each other, the certification process, OSDF construction activities, and construction of Phase II of the new North Entrance Road.

3.1 SITE PREPARATION DESIGN PACKAGE

Site Preparation work will be performed in both Sectors 1 and 3. The primary purpose of the Site Preparation work is to construct and install a surface water management system for A1PII and the OSDF. This section of the Implementation Plan provides background information about the area, describes other Sector 1 activities, and summarizes proposed Site Preparation activities. Additional detail on scope and implementation of the design package is provided in the A1PII Site Preparation Work Plan (DOE 1998h).

3.1.1 Site Prep/Sector 1 Background

Sector 1 is generally undeveloped; existing utilities will be protected during Site Preparation construction. In order to expedite remedial construction, some areas of A1PII have been certified. Sector 1B is already certified and is being used for OSDF borrow operations. Sub-sector 2A is also certified for OSDF construction activities.

3.1.2 Utilities and Groundwater Monitoring Wells

No utilities will be removed by the Site Preparation contractor. Major below-grade pipelines in Sector 1 include the Mid-Valley crude oil pipeline and the AWWT Facility effluent line (GW-24"). The oil pipeline is remote from planned excavation activities. The AWWT facility discharge line is close to the areas to be excavated at the Trap Range; however, it will be well marked and easily avoided. The remaining utilities include air monitoring station power supplies and utilities for the DO Facility, Flume Building and related appurtenances. Utility protection provisions will be included in the contractor's Safe Work Plan.

Construction of A1PII Site Preparation components will not require removal of pipelines/utility lines west of the STP. They will be excavated as part of the STP Excavation contract (Section 3.2).

Site Preparation will include protecting groundwater monitoring wells that are to remain in use.. The wells are primarily located in the eastern and southern portions of Sector 1. The contractor will also be responsible for protecting air monitoring stations (e.g., AMS-4, AMS-29 and associated power supplies) and benchmarks (N-5, OSDF-3) in areas potentially affected by construction activities. Such protection will include installing construction fencing around all specified monitoring wells, air monitoring stations, and benchmarks. Other protective measures will be implemented as appropriate. Specific protective measures will be presented as part of the contractor's Safe Work Plan. The gravel access roads to the groundwater monitoring wells, air monitoring stations, and OSDF construction well will be certified and remain in place.

3.1.3 Expedited Certification

Certification of Sub-sector 1B was expedited to allow the area to be used as a borrow area for construction of the OSDF. Material can be obtained from this sub-sector to construct part of the OSDF Borrow Area Haul Road.

Certification of select portions of Sector 2 (Sub-sector 2A) was also performed to allow construction of OSDF Cell III and the remainder of the OSDF Borrow Area Haul Road. Characterization for reuse of the A1PII Conveyance Channel and Outfall will allow "clean" construction of these facilities and reuse of excavated material. Since the facilities will then receive runoff from uncertified areas, they will have to be certified at a later date.

3.1.4 Other Sector 1 Activities

Other activities will occur in Sector 1 that are not directly associated with A1PII Site Preparation. These activities include:

- Installation of access controls
- Aesthetic barrier placement
- Excavation of Lead "Hot Spots"
- OSDF Contractor Activities

3.1.4.1 Access Controls

Certification rope fencing and signs have been installed around the area of Sector 1 (Sub-sector 1B) that is certified. Personnel and equipment must access the area in accordance with FEMP procedures. Any additional fencing, signs, barriers, or equipment access points beyond those already established for the certified area will be installed as shown on the Site Preparation construction drawings or as directed by the FDF Construction Manager.

3.1.4.2 Aesthetic Barrier Placement

To reduce the visual impact of soil excavation activities, an aesthetic barrier will be placed along Willey Road, the southern edge of Sector 1. Placement of the barrier will be conducted under the Draft Aesthetic Barrier Work Plan (DOE 1998i), submitted to the EPA and OEPA on March 24, 1998. The barrier location is depicted on Site Preparation Package drawing #92X-5900-G-00428. Construction of the barrier is scheduled to be performed in FY 99.

3.1.4.3 Excavation of Lead "Hot Spots"

Per agreement with OEPA, FDF Construction will excavate the top 6 inches of soil within a circular area surrounding a sample point which indicated above-FRL lead contamination (see Section 2.2.1). Total excavation will yield approximately 15 yd^3 of lead-contaminated material from within the proposed footprint of Trap Range Ditch 1 before the Site Preparation contractor begins work in that area. The excavated soil will then be spread on the ground within a designated area inside the Trap Range for future treatment under the Trap Range remediation design package. The locations of both the lead stripping and spreading areas are illustrated on Site Preparation Package drawing #92X-5900-G-00436 and in Figure 2-10.

3.1.4.4 OSDF Phase II Borrow Activities

The OSDF Phase II contractor began borrow area operations within the certified Sub-sector 1B in Summer 1998. As part of borrow activities, the OSDF Phase II contractor began excavation in the A1PII Sediment Basin footprint. A haul road was also constructed from the A1PII Sector 1 OSDF Borrow Area to the OSDF across uncertified areas in Sectors 2 and 3. This haul road was constructed on top of uncertified areas using material from the certified Sector 1 borrow area. In this manner, haul vehicles can haul certified material from the borrow area to the OSDF on certified material without decontamination. The OSDF Phase II contractor established working piles and a screening area in Sector 1 to support the borrow operation. The OSDF contractor will rough grade the area of the A1PII Sediment Basin; the A1PII Site Preparation Contractor will perform final grading of the basin and install outlet control components (pipe).

3.1.5 Site Preparation Contract - Preliminary Activities

Preliminary activities that will be part of the Site Preparation contract include:

- Surveying and site layout
- Clearing

3.1.5.1 Surveying and Site Layout

Surveying and site layout will include locating and marking the pertinent control boundaries, underground utilities and features to be protected or removed, verifying existing conditions, establishing excavation limits, and noting features to be installed. Vertical and horizontal controls will be established using existing benchmarks.

3.1.5.2 Clearing

Relatively limited clearing is necessary for Site Preparation activities. A significant portion of this work will occur between the clearing limits at the twin 48-inch culvert crossing of the South Access Road. Tree sampling program results (SEP Appendix D) indicate the upper sections of FEMP trees are below FRLs. Any trees, shrubs or woody undergrowth that must be cleared to accommodate Site Preparation activities will be cut off approximately 1 foot above the ground surface, cut into manageable size, chipped directly into trucks, and transported to the woodchip stockpile near the meteorological tower for use as on site mulch during remediation or restoration. Removal of any tree greater than 4 inches in diameter will require prior approval from the Construction Manager. Remaining roots and stumps in certified areas will be ground in place, or grubbed and stockpiled with

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surface soil for eventual use in the OSDF vegetative cover layer. Trees greater than 12 inches in diameter will have their branches removed and chipped, and the remaining logs will be stored at the wood chip stockpile for any future bioengineering needs. Resulting tree stumps will be ground in place, excavated, and transported to the OSDF Grubbing Pile, designated as OSD-005. FDF will turn the woodchip stockpile as necessary to prevent combustion.

3.1.6 Site Preparation Contract - Surface Water Management

A comprehensive surface water management system for A1PII, including erosion and sediment controls, will be implemented to control surface water run-on/runoff, minimize potential recontamination of remediated areas, and minimize discharges of potentially contaminated surface water during remedial activities. Major system components will be constructed by the Site Preparation contractor. A detailed description of the A1PII surface water management system is presented in Appendix C. The system is designed in accordance with applicable State, Federal, DOE, and FEMP requirements, including the following principal criteria for indicated functional components:

- Erosion and sediment control: Ohio Department of Natural Resources (ODNR) standards for construction and materials
- Vegetative stabilization, silt fencing, and ditch protection: Ohio Department of Transportation (ODOT) Construction and Material Specifications and Location and Design Manual, Volume 2 (Drainage) (ODOT 1996) and ODNR Rainwater and Land Development Manual
- Sediment basins, drainage ditches, and related structures: ODNR Rainwater and Land Development Manual

All storm water control structures are designed to control, at a minimum, surface water runoff resulting from a 10-year, 24-hour storm event of 4.1 inches as defined by the ODNR Rainwater and Land Development Manual (ODNR 1996). Notable components of the surface water management system from downstream to upstream include:

- Outfall Area Ditch
- Twin 48-inch Culverts
- A1PII Sediment Basin and Principal Spillway
- Culvert 2 - Three 36-inch culverts
- Conveyance Channel 2
- Trap Range Ditch 2
- Trap Range Ditch 1

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- Conveyance Channel 1

Material excavated to construct the northern section of the Conveyance Channel (Conveyance Channel 1) will be used to construct the surface of the STP haul road. The STP haul road will consist of approximately 6 inches of certified soil over a geotextile. It will connect the OSDF borrow area haul road to the STP area in an east-west direction. It will be used to transport material from the STP during the STP excavation, as described in Section 3.2.

Additionally, a sediment trap will be constructed within the outfall area ditch certified area. The sediment trap will help reduce sediment loads to the existing tributary to Paddys Run (SSOD) due to outfall area excavations until the A1PII Sediment Basin is completed and operational. The sediment trap will then be removed by regrading in the certified outfall area.

The design criteria for each of the surface water management system components is presented in the Design Criteria Package. Design specifics are presented in the Site Preparation Package Technical Specifications and Design Drawings.

3.1.6.1 Pavement and Culvert Removal

A portion of the South Access Road pavement will be removed to allow installation of the twin 48-inch culvert, as described in the A1PII Site Preparation design documents. Additionally, the STP Access Road pavement and aggregate base will be removed and three 36-inch culverts will be installed. Pavement, culverts (and associated headwalls), and encountered agricultural drainage tiles will be removed and size-reduced to meet OSDF WAC. Soil underlying the pavement aggregate base is certified. The resulting construction rubble will either be hauled directly to the OSDF or stockpiled north of the STP, depending on coordination with the OSDF contractor. These issues are addressed in greater detail in the A1PII Site Preparation Work Plan.

3.1.6.2 Traffic Control

The contractor will be required to prepare and submit a Traffic Plan to maintain or control traffic at the South Access Road crossing and the STP Access Road relocation. The contractor will be required to install twin 48-inch culverts and restore the South Access Road to traffic within one weekend.

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3.1.7 Site Preparation Contract - Other Construction Activities

The A1PII Site Preparation contractor will use the previously established OSDF contractor support area. Sanitary facilities will be provided in the Sector 1 OSDF Borrow Area. Water needed for equipment wash and dust control during Site Preparation will be available from the OSDF Water Supply Well located south of the DO Facility. Other Site Preparation construction activities include:

- Topsoil Excavation and Stockpiling
- Material Handling
- Seeding

3.1.7.1 Topsoil Excavation and Stockpiling

Six inches of topsoil will be removed within certified areas to be excavated (where OSDF borrowing activity has not yet disturbed) and stockpiled at the OSDF Soil Pile OSD-004.

3.1.7.2 Material Handling

As stated in the Construction Drawings, the Contractor will provide the Construction Manager daily with the quantity, material type, source location material tracking location (MTL) and destination MTL of all materials moved between MTLs. Soil moved within a MTL does not need to be tracked. This information will be transmitted daily from the Construction Manager to the field representation of Waste Acceptance Organization (WAO) for documentation on the Field Tracking Log.

3.1.7.3 Seeding

Seeding activities include soil preparation, interim seeding, fertilizer, mulch and binder, and use of a crusting agent (Specification 02900). The channel and sedimentation basin are expected to be excavated and recertified within two years, hence interim seeding is appropriate in these areas.

3.1.8 Certification and Characterization for Reuse

As described in Section 3.1.1, Sector 1, excluding the Trap Range, and two portions of Sector 2 have been certified. Also, the A1PII Conveyance Channel, Sediment Basin, and outfall have been characterized for reuse. The Trap Range will be certified following stabilization and excavation of the above-BTV lead contamination and precertification of the area. In all cases, pre-design investigation information will be used to design the boundaries of the CUs (or characterization units). The delineation of CUs, the CU-specific certification COCs, and the certification sampling approach will be described in the CDLs (Section 7.2 of the SEP).

3.1.9 Interim Grading and Restoration

Areas subject to remedial excavation at the Trap Range and other areas of Sector 1 that are disturbed during installation of the surface water management system or incidental activities will be graded as necessary to provide positive drainage. Seeding will be in accordance with Appendix F of the SEP (Spec 02900). Final grading and site restoration will be done by the OSDF contractor at a later time, after borrow material is excavated from this area for OSDF construction.

3.2 STP EXCAVATION DESIGN PACKAGE

The STP and adjacent area will be remediated in accordance with the requirements of the STP Excavation Remedial Design Package as described herein. Prior to actual STP Excavation construction, the following activities will be completed:

- Construction and start-up of the new STP
- Shutdown of the former STP located in A1PII
- D&D of above-grade structures in the STP
- Shut-off and plugging of utilities to the former STP located in A1PII

The above tasks will be completed before beginning procurement of the STP Excavation contractor in September 1998. STP Excavation remediation must be completed to allow completion of the Phase II rerouted North Entrance Road in 2000 and continued OSDF construction in the A1PII area.

All utilities to be excavated or removed as part of STP Excavation will be safely shut down and abandoned (e.g., de-energized, isolated/plugged, purged) in accordance with FEMP Safe Shutdown procedures before STP Excavation begins. Known utilities in this category consist of segments of the CG&E fuel gas line, STP influent and effluent line, AWWT wastewater effluent line, potable and fire water lines, overhead and underground electrical lines, piping and electrical lines within the STP area.

The underground electric line that provides power to the DO facility will be replaced by an overhead line prior to the start of STP excavation. Overhead lines will also provide power to the OSDF construction well. A CG&E high voltage transmission line on steel lattice towers currently loops in diagonally from the east across Sector 3 to the FEMP Main Substation, then back west to the north-south easement near the eastern FEMP boundary. The STP Excavation contractor will remove underground utilities connecting the STP with the Former Production Area to within 25 feet of the

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CG&E tower. Remaining underground utilities within the 25-foot buffer of the CG&E tower will be removed, with a portion of the tower remaining after it has been removed to 3 feet below grade. Three new wood poles will be added to support the conductor in the southern easement to facilitate removal of the northern tower, and will remain until the Main Substation is no longer needed. Potential disruption of in-service utilities will be minimized to the extent possible. Utilities to remain beyond STP Excavation include CG&E electric transmission and distribution lines, overhead power and communication lines to the DO Facility Substation, the AWWT facility discharge pipeline, power feeds to the warning siren, the OSDF water supply well, air monitors along the east FEMP boundary, and pole lighting at the DO facility and along the east side of the access roads. Construction fences and signs, or similar measures to control work in the vicinity of these utilities, will be installed as needed.

The STP Excavation contractor will be procured via an Invitation For Bid (IFB), as described in Section 6.0. Remedial action activities required for the STP Excavation consist of:

- Site Development
- Above-WAC Soil and Debris Excavation
- Utility Removal
- Structure and Foundation Demolition and Removal
- Below-WAC Soil and Debris Excavation
- Special Materials Handling
- Material Handling and Treatment
- Precertification Evaluation and Certification
- Interim Grading

3.2.1 Site Development

Site development activities for STP Excavation consist of the following:

- Setup of Support Area
- Establishing Site Boundaries and Controls
- Surveying and Site Layout
- Clearing
- Establishing Special Materials Transfer Area (SMTA)
- Installing Water Management System Components
- Borrow Area Development
- Preparation of Equipment Wash Operation

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3.2.1.1 Setup of Support Area

The STP Excavation Support Area will be established at the existing gravel area just south of the STP. Support Area setup will consist mainly of placing additional gravel (as needed) for parking and laydown areas, setup of a construction trailer (contractor facilities), setup of the radiological control point facility (RCPF) trailer, and installing power to the site.

The RCPF trailer will consist of a double trailer with radiological personnel monitoring equipment, change-out rooms, and a break room. All personnel will enter and exit the controlled area through this facility. The RCPF trailer will be procured and set up by FDF prior to excavation by the STP Excavation contractor.

Electric power to the STP Excavation Construction Support Area and Transfer Line pumps will be extended from the DO facility overhead line. No other utility installations are planned. Water and toilet facilities at the Support Area will be supplied by the contractor. Water for dust control during STP Excavation will be available to the contractor at the OSDF Construction Water Well located south of the DO facility.

3.2.1.2 Establishing Site Boundaries and Controls

Work area access control will be established by installing construction fencing and signs per STP Excavation Package construction drawings. Although the radiological classification of the work may change based on actual monitoring, it is anticipated that the STP Area will be classified as a Contamination Area, and the rest of the work area will be classified as a "Soil Contamination Area" prior to initiating excavation activities. Work area controls include radiological control fencing and postings, a RCPF trailer with Personnel Contamination Monitors (PCMs) or portable equipment for personnel exiting the STP Contamination Area (through the trailer, Section 3.2.1.1), and a radiological control buffer area for vehicles and equipment exiting the STP Contamination Area (Equipment Wash Operation, Section 3.2.1.8). Any changes in fencing and radiological postings at the STP, as dictated by FDF Radiological Control, will be made during STP Excavation site development activities.

3.2.1.3 Surveying and Site Layout

Surveying and site layout activities will include locating and marking pertinent control boundaries, locating and marking subsurface utilities, establishing excavation limits, and locating and staking

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facilities and appurtenances. Features, facilities and appurtenances to be located and staked in the field include, but are not limited to:

- Boundaries: A1PII boundary and areas to be certified. Additional construction zone boundaries and control point locations will be surveyed and staked where necessary.
- Subsurface Utilities: AWWT Facility effluent pipeline to Flume Building, telecommunication lines and electric conduits for pole lights along the east side of the North Entrance Road will remain. All other subsurface pipelines/utility lines will be located for removal.
- Site Preparation Facilities and Appurtenances: STP Haul Road, Transfer Line, Radiological Control Point Facility Trailer, STP Run-on Control Ditch.
- Remedial Excavation Areas: STP excavation; surface soil excavation areas; pipelines and DO Facility Transformer electrical duct, Special Material Transfer Area.

3.2.1.4 Clearing

The general approach for clearing is described in Section 3.1.5.2 for the Site Preparation Design Package. However, STP Excavation will require clearing, and chipping of trees and brush (removed to 1 foot above the ground). Tree stumps and roots will be handled as impacted material, as detailed in the STP Excavation technical specifications.

3.2.1.5 Establishing the SMTA

The SMTA will be used to stage special material encountered during STP Excavation activities. The SMTA will be located as shown on construction drawings to accommodate transfer of special materials to FDF Waste Management or the appropriate organization. The SMTA will consist of a gravel pad with pans and boxes in which to place special materials for evaluation and determination of disposition.

3.2.1.6 Installing Water Management System Components

As described in Appendix C, some components of the surface water management system for A1PII, including erosion and sediment controls, will be installed during A1PII Site Preparation. Other components will be installed by the STP Excavation Contractor. Major components of the surface water management system as they relate to STP Excavation include the following.

A1PII Conveyance Channel/Sediment Basin/Outfall - Surface drainage from Sector 3 (outside the STP area) will be directed to the A1PII Conveyance Channel, into the OSDF Borrow Area Sediment Basin,

and through the outfall area (Section 3.1.6). These components will be installed by the Site Preparation contractor.

Diversion Ditches - Diversion ditches/berms will be constructed by the STP Excavation contractor to divert surface drainage from upgradient areas around deep excavations in the STP Area and, where needed, upgradient of trenches excavated to remove upgradient utilities and other areas of extensive surface soil excavation. Small ditches or berms may also be constructed to control drainage in localized areas. Temporary measures (e.g., application of crusting agents, mulching, seeding) will be taken as needed to stabilize areas in accordance with provisions of the Surface Water Management Plan.

Transfer Line System - A transfer line system will be installed by the STP Excavation Contractor to convey surface water and perched groundwater from the STP excavation sump dewatering pump to an OSDF Leachate Conveyance System cleanout. The transfer line system will be comprised of ancillary pumps, flexible hose and piping, fittings and valves (STP Excavation Spec 02668). The location and layout of the system is shown on the STP excavation drawings. Temporary excavation sumps and pumps will be constructed in the excavated areas to collect and deliver perched water that seeps into the excavations and storm water that falls on or runs into the excavations to the transfer system. In addition, water from mobile equipment wash operations (Section 3.2.1.8) will also be directed to flow to the STP excavation sump for pumping via the Transfer Line. See Section 3.4.4 for further discussion of management of remediation-generated wastewater.

Other Erosion and Sediment Control Measures - Silt fencing will be installed, as necessary, down gradient of areas to be excavated or otherwise disturbed to intercept sheet flow, retain sediments, and disperse flow before runoff reaches collection ditches.

3.2.1.7 STP Backfill Borrow Area Development

The STP Excavation contractor will prepare and submit the STP Backfill Borrow Area Development Plan. The STP Backfill Borrow Area will be used by the STP Excavation contractor to obtain material to backfill utility trenches outside of the STP area. The STP Backfill Borrow Area Development Plan will include:

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- Construction of diversion ditches
- Installation of silt fences
- Removal and stockpiling of topsoil
- Borrow operations
- Restoration

3.2.1.8 Preparation of Equipment Wash Operation

Before excavation activities take place within the STP, an equipment wash operation and related administrative controls will be established within the STP fence. The operation will use existing STP roads as radiological buffer areas between the controlled area excavations and the non-controlled area. The contractor will be required to maintain this clean path from the excavation being worked to the STP haul road and OSDF Borrow Area haul road. This will permit restricted release of the haul trucks for travel on certified haul roads. Haul trucks will be positioned within the buffer area adjacent to the excavation being worked. To prevent spillage and minimize the potential for external contamination to the trucks, haul trucks will not be loaded above the top of the bed. Once loaded, the contractor will wash haul trucks using portable wash equipment to remove any material which may have been transferred to the truck's exterior during loading. Wash waters will be directed back into the excavation and ultimately into the STP excavation sump for transfer into OSDF Leachate Conveyance System. FDF radiological technicians will then perform a gross cloth wipe of the haul truck's exterior which may have been contaminated during loading. The cloth wipe will then be radiologically surveyed for the presence of contamination using a beta/gamma hand frisker. If contamination is detected, an additional survey of the truck will be performed to pinpoint and decontaminate the affected area. The truck be permitted to leave the buffer area only if it meets restricted release limits. At that point, the truck will travel on the STP buffer area roads, exit the STP, and enter the STP haul road. Details of the loading and washing operation are contained in the STP excavation technical specifications.

The STP Excavation contractor will be responsible for keeping STP buffer area roads and haul roads clean of mud, debris, and potentially impacted materials per requirements of FDF Radiological Engineering. Plastic sheeting may be placed over degrading pavement to serve as a radiologically clean pad, thus maintaining the buffer area.

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3.2.2 Above-WAC Soil and Debris Excavation

Above-WAC material will be excavated after site development is complete and the area is ready for excavation. Initial above-WAC material to be excavated includes:

- Digester sludge
- Sludge cake in the Sludge Drying Beds
- Surface soil with technetium-99 concentrations above WAC
- Surface soil with uranium concentrations above WAC

Above-WAC boundaries will be clearly marked in the field with fencing or rope based on STP excavation drawings. The above-WAC material is discussed in the following paragraphs, as well as the contractor's responsibility regarding management of excavated soils and associated debris. The extent of these excavations are illustrated on construction drawings.

3.2.2.1 Digester Sludge

Sludge from the STP digester was moved by the FC&DP project from the digester to the East Sludge Drying Bed and the west primary settling basin, while a quantity of the sludge remains in the digester. This material has been determined to exceed the OSDF WAC for both uranium and technetium-99. The STP Excavation contractor will create an area in Soil Pile 7 (SP-7) to stockpile stabilized digester sludge and other technetium-99 contaminated soil separate from the other uranium-contaminated soil.

After the area is created, the contractor will transport stabilized digester sludge to SP-7. The digester sludge will be stabilized in the STP area with lime and/or technetium-99 contaminated soil as necessary and appropriate. The stabilization process will be finalized based on testing of the digester sludge and may consist of initially mixing lime with the digester sludge in the digester and in the primary settling basins. Lime will kill potential bacteria in the sludge and also reduce moisture levels. Technetium-99 contaminated soil may then be added to the sludge to reduce overall water levels. The stabilized sludge will be loaded and transported to SP-7 in water-tight containers and/or in a manner which prevents spillage. If necessary, additional stabilization measures may be performed in SP-7. Digester sludge handling requirements are contained in the STP Excavation Design Package technical specifications.

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3.2.2.2 Sludge Cake

Approximately 35 yd^3 of sludge cake, determined to be a RCRA hazardous waste, remains in the East Sludge Drying Bed, beneath the digester sludge and a layer of geotextile. The thickness of the sludge cake layer varies from 0 to 6 inches and can be visually identified. Since this material is considered a RCRA-listed waste (Section 1.2.1.1), it will be excavated on a priority basis and handled as a mixed waste. As this area is excavated, the material will be segregated and handled separately and excavation control monitoring (Section 3.2.5.3) will be performed to ensure all above-WAC material has been removed. When the digester sludge was placed in the east Sludge Drying Beds, some cross contamination may have occurred in the west beds (Section 2.3.1.4). Any sludge or sludge contaminated debris will be removed and handled as mixed waste. When the sludge cake is removed, RSS and/or HPGe measurements will be taken over the entire surface of the Sludge Drying Beds to quantify total uranium in excess of the WAC. All real-time measurements will be conducted in accordance with FEMP guidelines (DOE 1998g).

This excavation will be in accordance with the STP Excavation Design Package. Construction methods and procedures will be detailed in the contractor's Safe Work Plan. The sludge cake will be removed and loaded into white metal boxes. Excavation and haul equipment, as well as the containers, will remain outside of the Sludge Drying Beds during removal of the sludge cake to minimize health and safety concerns. Radiological field survey measurements will then be taken to demonstrate that all above-WAC material has been removed. The containers will be decontaminated and staged at the Special Materials Transfer Area pending off site treatment and disposal.

Closure of HWMU No. 41, the Sludge Drying Beds, must be demonstrated as part of Sector 3 certification. As described in Section 2.2.5 of the SEP, this will be accomplished by collecting eight samples from within the footprint of the Sludge Drying Beds and analyzing them for tetrachloroethene, the HWMU COC, in addition to the other ASCOCs. Closure will be demonstrated in accordance with Sections 2.2.5 of the SEP.

3.2.2.3 Surface Soil with Technetium-99 Concentrations Above OSDF WAC

There are a number of surface soil samples that exhibited technetium-99 contamination above the OSDF WAC. These areas are delineated in the construction drawings. Six inches of surface soil will be excavated and removed from these areas before other excavations are performed. This material will

be delineated by pre-excavation sampling; it will either be loaded directly onto trucks and transported to SP-7 for temporary stockpiling or mixed with digester sludge in the STP as described in Section 3.2.2.1.

3.2.2.4 Surface Material with Uranium Concentrations Above OSDF WAC

There are two known locations in the STP Area with uranium concentrations above the OSDF WAC. One location is in a soil area; it will be handled as described in Section 3.2.2.3.

The other area of surface material with above-WAC uranium concentrations is located on a paved area. It is fixed contamination and will remain in place as much as possible throughout STP excavation.

3.2.3 Utility Removal

All utilities to be excavated or removed as part of STP Excavation activities will be safely shut down and abandoned (e.g., de-energized, isolated/plugged, purged) in accordance with FEMP procedures by the FC&DP project before STP Excavation begins. Removal of below-grade pipelines and utility lines associated with STP Excavation will be in accordance with Appendix F of the SEP, as described in the technical specifications. For the purposes of this section, utilities are separated into those outside the STP boundary area and those inside the STP boundary.

3.2.3.1 Utilities Outside the STP

Underground pipelines and utility lines outside of the STP fence will be excavated by trenching. The majority of these lines run east to west between the STP and the Former Production Area. These include the following:

- Storm sewers
- Electric duct
- Potable water line
- Fuel gas line (asbestos-impregnated, bitumen-wrapped)
- Fire water line
- Agricultural drain tile

Agricultural drain tiles encountered during excavation will be excavated; however, they will not be pursued beyond the footprint of proposed excavation.

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All material excavated as part of utility removal will be considered impacted. This includes the backfill, bedding and the utility line itself. The utility line will be removed and size-reduced to meet OSDF WAC. Remaining bedding material will then be removed and staged with the other backfill and bedding material.

All lines have been purged and no material is expected to be encountered during utility removal. If material is encountered and if this liquid is primarily water, it will be transferred to the STP Water Transfer System. If the liquid is not primarily water, it will be containerized for sampling to determine the disposition. Following removal, all utility lines will be inspected. If the line appears to contain deposits of above-WAC contamination, it will be taken to the SMTA for evaluation. If the pipe does not contain deposits of above-WAC contamination, it will be treated and size reduced, as necessary, to meet OSDF physical WAC. The remaining pipe bedding will then be removed, along with approximately 6 inches of over-excavation on either side of and below the bedding, and dispositioned to the OSDF, or to the SP-7 Stockpile if it exceeds OSDF WAC.

At this point, the trenches will be from 5 to 12 feet deep. To minimize cost and expedite excavation, every attempt will be made to maintain vertical sides on the trench when worker access to the trench is not required. When access to the trench is required, the excavation will conform to Occupational Safety and Health Administration (OSHA) requirements (29 CFR 1926). FRL concentrations of the excavated pipe and bedding material will be confirmed as follows:

- Generally, each trench will be treated as a separate CU. Sixteen sampling locations will be evenly spaced along the trenches.
- After the over-excavation is complete, certification soil samples will be collected from specified locations at the bottom of the trench using the bucket of construction equipment. In addition to these samples, some of this material will be placed alongside the trench and scanned by real-time equipment. If no above-FRL contamination is found, then the certification samples will be sent for analysis. Otherwise, the trench will be excavated further and new certification samples will be collected.
- The trench will be backfilled with material from the STP backfill borrow area when sampling is complete.

Details of this sampling approach will be presented in a separate CDL for trenching certification.

The AWWT Facility discharge line and fiber optic line are to remain in place.

3.2.3.2 Utilities Inside the STP

Pipelines/utility lines within the STP fence will be excavated as part of the overall STP excavation to attain FRLs. As these pipelines/utility lines are encountered, they will be excavated, inspected for above-WAC material, and properly dispositioned.

Potential above-WAC material in the pipelines will be collected and controlled as they are excavated. If this liquid is primarily water, it will be transferred to the transfer line. If the liquid is not primarily water, it will be containerized prior to disposition. Following removal, all contaminated pipelines will be inspected. If the pipe contains deposits of above-WAC contamination, it will be taken to the SMTA for evaluation. If the pipe does not contain deposits of above-WAC contamination, the pipe will be treated, as necessary, to meet OSDF physical WAC. The remaining pipe bedding will then be removed, along with approximately 6 inches of over-excavation on either side of and below the bedding, and dispositioned to the OSDF, or to the SP-7 stockpile if it exceeds OSDF WAC.

In most cases, these pipelines/utility lines within the STP will be encountered when excavating the STP to the lines and grades shown on the construction drawings.

3.2.4 Structure and Foundation Demolition and Removal

In general, FC&DP performed D&D on the above-grade portion of the structures to approximately ground level. The STP Excavation contractor will demolish the remaining portions, the vast majority of which are at- and below-grade. However, some above-grade structures (i.e., part of the UV Building and a portion of the digester) remain for demolition by the STP Excavation contractor. Demolition of these remaining structures and foundations will be in accordance with the SEP and STP excavation technical specifications. The at-grade portion(s) will be removed and processed to meet OSDF physical WAC. In the case of structures, the at-grade portion(s) may include covers and floors. In the case of foundations, such as slabs, curbs and footings, this will generally include the entire foundation. As necessary, backfill and bedding adjacent to the structure will be removed and stockpiled in a designated area for characterization. If contamination levels are below FRLs, it will be used as backfill; otherwise, it will be sent to the OSDF.

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Where applicable, the below-grade portion(s) of the structure will then be removed and processed to meet OSDF physical WAC. Excavation to achieve FRLs will then be performed. After all remediation is complete, the surface will be certified (Section 3.2.8). Deep excavations will be backfilled and graded in the future by the Phase II North Access Road contractor.

The northern portion of the STP Access Road remaining from Site Preparation will be removed during STP Excavation. In general, the roads will be excavated to remove shallow contamination prior to precertification and certification.

3.2.5 Below-WAC Soil and Debris Excavation

As described in Section 2.3.1.3, the estimated extent of contamination above the WAC and FRLs was determined by incorporating pre-design and historical data into a geostatistical model.

There are two FRLs for total uranium in A1PII, 82 mg/kg for most of the area and 20 mg/kg for a small area in the STP vicinity. Where contamination above the FRL of 82 mg/kg is expected, a total uranium concentration of 50 mg/kg was modeled to account for ALARA considerations. These factors resulted in a design depth of excavation for contamination, which is the minimum excavation depth. Additional excavation may be required in certain areas for foundation removal. The actual extent of excavation will depend on field conditions identified during construction and may exceed the design depth (Section 2.3.3.3). Excavation control monitoring, precertification sampling, and certification sampling and analysis (Section 3.4 of the SEP) will establish the actual excavation depth.

STP Excavation activities will involve the removal of soil and debris which is below WAC but above-FRL. There are two FRLs for total uranium in A1PII, 82 mg/kg for most of the area and 20 mg/kg for a small area in the STP vicinity. Where contamination above the FRL of 82 mg/kg is expected, a total uranium concentration of 50 mg/kg was modeled to account for ALARA considerations. These factors resulted in a design depth of excavation for contamination, which is the minimum excavation depth. Additional excavation may be required in certain areas for foundation removal. The actual extent of excavation will depend on field conditions identified during construction and may exceed the design depth (Section 2.3). Excavation control monitoring, precertification sampling, and certification sampling and analysis (Section 3.4 of the SEP) will establish the actual excavation depth.

Contamination to be encountered during STP Excavation occurred in several ways, including air deposition, pipe leaks, and seepage through the Sludge Drying Beds. Therefore, two types and extents of contamination are expected: shallow/homogenous and at-depth/discontinuous.

Upon reaching the below-FRL design floor of the excavation, the floor will be precertified. If above-WAC material or special materials are encountered during the excavation, excavation will be stopped to assess the extent of above-WAC material with HPGe or physical samples, and gross activity of the special material will be assayed with a Geiger-Mueller counter. If HPGe is used, a detector height of 1.0 ft with a read time of 15 seconds will be employed.

3.2.5.1 Shallow/Homogenous Contamination

Contamination outside of the STP area is expected to be shallow and homogenous since air deposition was the primary pathway. The sampling results described in Section 2.3.3.2 confirmed four locations of above-FRL contamination in Sector 3 outside of the STP. This contamination is shallow (0 to 6 inches) and homogeneous and covers an area of approximately one acre. The above-FRL material will be excavated, as outlined in the SEP, using Excavation Approach A - Shallow Excavation of Impacted On-Property Areas Outside the Former Production Area and Other Waste Storage/Management Units.

In addition, there are two soil stockpiles (OSD-007 and NAR-007) that will be removed by the STP Excavation contractor. The OSDF contractor will also strip 6 inches of soil (considered impacted material) after the stockpiles are removed.

This excavation will be in accordance with the STP Excavation Design Package technical specifications. Specific construction methods and procedures will be detailed in the contractor's Safe Work Plan. The above-FRL soil will scraped off to a depth of 6 inches, excavated, and loaded into trucks for disposition to the OSDF. Precertification radiological scanning (Section 3.3.3.2) will then be performed, followed by supplemental excavation, if required. The area will be then be ready for certification.

3.2.5.2 At-Depth/Discontinuous Contamination

Contaminants at the STP are expected to be distributed both on the surface and at-depth since the pathways included air deposition, pipe leaks, and seepage through the Sludge Drying Beds. However,

as described in Section 2.1, the highest contaminant levels were removed by a previous removal action. Therefore, material with above-WAC contamination levels is not expected. In addition, the above-grade structures at the STP will be removed by FC&DP. The remaining structures and foundations will be removed as part of the A1PII remediation (Section 3.2.4). Therefore, the above-FRL material in the STP Area will be excavated using the general approach outlined in Approach D - Excavation Following D&D in the Former Production Area, STP and FTF in the SEP.

The actual construction/excavation sequences will be determined by the STP Excavation Contractor. It is anticipated that at- and below-grade structures and foundations, including associated pipelines and utility lines, will be removed first. The remaining above-FRL material, as defined by the construction drawings, will be excavated in bulk according to the excavation design depth and dispositioned to the OSDF. An estimated 29,500 yd^3 of impacted soil is expected to be excavated to a maximum depth of approximately 20 feet in the STP in conjunction with removal of at- and below-grade structures, foundations, and pipelines, and above-FRL soil. Following demonstration that the design depth of excavation has been achieved, precertification activities will take place (Section 3.3.3.2). The area will then be ready for certification.

Debris such as reinforced concrete and structural steel that is encountered will be excavated and processed, as needed, to comply with OSDF physical WAC. It will then be sent to the OSDF.

3.2.5.3 Excavation Control Monitoring

All excavations in uncertified areas will be radiologically monitored, posted, and controlled by FDF Radiological Control Technicians (RCTs). Real-time, field-deployable instruments were used during the pre-design investigation and will be used during the excavation and precertification phases to characterize soil for select COCs. Data resulting from pre-design investigations demonstrate that HPGe data is comparable to laboratory data in A1PII, and there is no need for area-specific calibration factors.

The presence of soil saturated with free-phase organic product will be determined by visual inspection during excavation. Such soils are considered to be above-WAC and will be segregated. Additionally, the organic content of the atmosphere in all excavations at the STP will be monitored for health and safety purposes using a photoionization detector (PID). If the health and safety organic vapor

monitoring indicates an organic vapor concentration of 5 mg/kg or greater in the breathing zone during excavation, the soil associated with the reading will be segregated for follow-up evaluation. This evaluation will be another visual inspection supplemented with organic vapor readings closer to the segregated soil in question. If determined, by additional visual inspection, to be saturated with a free organic phase, then the segregated soil will be considered to be above WAC. Otherwise, it will be dispositioned to the OSDF. Suspect soil will continue to be excavated and segregated until the breathing zone concentrations at the excavation site return to below 5 mg/kg, at which point normal excavation activities will resume. Segregated soil determined to contain saturated levels of free organic product will be held for subsequent for treatment and/or off site disposal. Upon completion of excavation activities, the area will be ready for precertification.

Excavation of the above-WAC sludge cake at the Sludge Drying Beds will be monitored using radiological field survey measurements. The RI/FS data, results from the pre-design investigation, and visual observations have delineated the extent of the sludge, all of which has total uranium above the WAC of 1,030 mg/kg (Section 2.3.1.4). Above-WAC material will be excavated within these established limits and RSS or HPGe equipment will be used to scan the perimeter and floor of the excavation to confirm that above-WAC material exceeding the WAC is not present. If potential above-WAC uranium activity is identified with the RSS or HPGe, additional material will be excavated until results indicate all above-WAC material has been removed.

The surface of above-WAC uranium excavations will be scanned using RSS or HPGe equipment to determine the presence of above-WAC material. If any is indicated, it will be excavated and hauled to the SP-7 stockpile. The remaining above-FRL material in the STP will be excavated to the limits shown on the construction drawings. As piping is uncovered, it will be examined for potential above-WAC deposits and handled accordingly.

The remedial actions carried out at A1PII will be supported by a variety of data collection activities that involve the use of RTRAK, RSS, and HPGe instruments for the assessment of primary radionuclide activities, and a Geiger-Mueller counter to screen gross-gamma activity of any encountered special materials. The primary benefits offered by the use of these instruments includes assessment of average total uranium and thorium-232 activity in heterogeneous media and the ability to direct excavation. 000140

The integrated measurement approach proposed for A1PII can be generalized as follows:

- Use RTRAK/RSS or HPGe to determine the distribution of above-WAC uranium and also to determine the above-FRL contamination patterns of total uranium and thorium-232 on the surfaces being monitored.
- Use a Geiger-Mueller counter to assess gross-gamma activity of any encountered special materials.
- Collect confirmation samples for laboratory analysis at base of RCRA excavation.
- Use visual monitoring for special materials during excavation activities and assess special materials, if exhumed.

3.2.6 Special Materials Handling

As described in the SEP, and used in this document, special materials include:

- Asbestos
- Transformers
- Lead acid batteries
- Medical/infectious waste
- Process piping and pumps
- Pressurized containers
- Nonpressurized containers
- Tires
- Non-soil residues
- Uranium metal
- Miscellaneous debris
- Acid brick

Except for the asbestos-impregnated, bitumen-wrapped gas line, piping with deposits that contain above-WAC levels of contaminants, and possible transite conduit associated with the buried electric duct, no special materials are anticipated in A1PII. However, if such materials are encountered, the radiological level will first be determined by FDF RCTs (Section 6.4.4) for occupational health and safety considerations. Special material that cannot be handled by the contractor due to health and safety concerns will be handled by FDF. Portions of these waste streams will be eligible for OSDF disposition after physical processing, sampling and analysis, or interim containerization. Under normal circumstances, these special materials will be identified, excavated, handled, and documented in accordance with Table 3-1, SEP guidelines, and technical specifications. The STP Excavation contractor will prepare methods for special material handling and include these as part of the Safe

Work Plan. In general, special materials will be placed in a safe configuration (i.e., container, plastic, etc.), as required, and temporarily staged in a SMTA for later disposition by FDF Waste Management.

WAO will provide a field representative to visually observe during all excavation activities. The WAO representative will assist with the identification and handling of special materials.

3.2.7 Material Handling and Treatment

Five general types of material are expected to be encountered during STP Excavation:

- Material exceeding OSDF radiological or chemical WAC that is also RCRA hazardous (mixed waste)
- Material exceeding OSDF radiological or chemical WAC
- Material exceeding OSDF physical WAC
- Material meeting all OSDF WAC which contains a RCRA hazardous waste (mixed waste)
- Material meeting OSDF physical, chemical, and radiological WAC.

3.2.7.1 Material Not Meeting On Site WAC

Mixed waste (sludge cake) from the Sludge Drying Beds that exceeds OSDF WAC will require treatment to meet LDRs before off site disposal. The current plan is to ship this material to a PCDF for required treatment and disposal. Note that other mixed waste with below-WAC levels of contamination encountered during STP Excavation will be dispositioned in the OSDF. Pipe with deposits that contain above-WAC contamination levels will be considered above-WAC and containerized for off site disposal.

Management of any other material that does not meet OSDF WAC will be coordinated with FDF Waste Management. The following generator information will be provided to the Integrated Information Management System (IIMS) (Section 6.5) by the excavation contractor for material not meeting OSDF WAC:

- Estimated volume
- Project area/sub-area or CU grid of origin
- Visual description of material

FDF Waste Management will be responsible for ensuring off site WAC are met prior to transportation. Responsibilities for materials that fail the chemical/radiological OSDF WAC are:

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- Completion of waste profile
- Evaluation for treatment
- Identification of appropriate off site disposition
- Receipt of approval from the receiving facility
- Packaging for shipment
- Certification for U.S. Department of Transportation requirements
- Coordinating off site shipment.

3.2.7.2 Attainment of OSDF WAC

A key component of the OSDF WAC attainment program is the IIMS tracking system (Section 6.5), which traces excavated impacted material to RI/FS, pre-design, precertification, and supplementary WAC data.

The following actions will be performed to demonstrate compliance with the OSDF WAC:

- Assign OSDF-bound materials to material profiles, as described in the SEP
- Implement IIMS tracking requirements
- Segregate impacted materials according to OSDF Impacted Materials Placement Plan (DOE 1996d) Categories 1 through 5
- Reduce size, fill void spaces, package (if required), and otherwise comply with physical OSDF WAC requirements
- Inspect the material visually to verify it meets physical OSDF WAC requirements
- Inspect the material visually to verify it does not include prohibited items
- Perform IIMS WAC attainment query in conjunction with manifest preparation, to verify material meets OSDF chemical/radionuclide WAC.

Material that does not meet the OSDF physical WAC will be processed at or near the excavation area, as necessary, then sent to the OSDF. Anticipated processing includes size reduction of concrete, pipe, and debris. Pipe will first be inspected to ensure that it contains no above-WAC deposits.

Debris processing will occur with appropriate controls based on the processing method and area/material conditions. Such controls, if required, may include water sprays, dust suppressants, or foam to reduce the generation of fugitive dust.

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3.2.8 Precertification Evaluation and Additional Excavation

After the STP is excavated to the limits shown on the construction drawings, RSS or HPGe measurements will be taken to precertify the floor and periphery of the excavation for gamma-emitting radionuclides. If RSS or HPGe measurements detect above-FRL, gamma-discernable radionuclides, additional excavation will take place to remove the material. When the excavation floor and periphery meet the precertification protocol for gamma-emitting radionuclides, the excavation surface will be ready for certification.

3.2.9 Interim Grading

Interim grading and restoration of STP excavations will be performed by the contractor responsible for construction of the Phase II Rerouted North Entrance Road following certification. Excavations will be backfilled using material from the STP Backfill Borrow Area to match surrounding contours.

The STP Backfill Borrow Area will be certified and soils to be excavated will have been tested for geotechnical properties to ensure suitability prior to use and will be graded and revegetated following removal of borrow. Sediment and erosion control methods will be employed as appropriate in the development of this area (Appendix C). The backfill will be installed in controlled lifts and compacted as necessary to meet foundation specifications for the OSDF. Upon completion of grading, the disturbed areas will be stabilized in accordance with Appendix F of the SEP (Spec 02900). Final vegetation cover will be established by others following OSDF construction activities in the area and in accordance with applicable provisions.

3.3 TRAP RANGE REMEDIATION DESIGN PACKAGE

The A1PII Trap Range makes up Sub-sector 1A. The Trap Range contains soil that exceeds the FRL for lead of 400 mg/kg. Some of this soil also contains arsenic contamination above the FRL of 12 mg/kg; arsenic is a commonly used alloying agent to control hardness in the lead. All of the above-FRL arsenic contamination is bounded by the above-FRL lead contamination. Pre-design sampling (Section 2.4.2) indicated the limits of the above-FRL lead contamination as an approximately 2.4-acre area, and within the top 6 inches of soil. The estimated volume of soil with above-FRL lead contamination is 1960 yd^3, all of which is considered to exhibit the toxicity characteristic for lead. An additional 1060 yd^3 of soil with lead concentrations above the BTV (200 mg/kg) is also present, which could potentially exhibit the toxicity characteristic for lead.

Soil with above-BTV lead contamination will be treated on site (at the FEMP) to stabilize the lead and render it non-hazardous. The stabilized soil will then be dispositioned in the OSDF. As described in Section 6.0, the stabilization contractor will be procured by a Request for Proposal (RFP). However, all three A1PII RA contractors (Site Preparation, STP Excavation and Trap Range Remediation) will assist with the remediation of lead contaminated soil. The major work activities are as follows:

- Site Preparation - by Site Preparation contractor
- Stabilization activities - by Trap Range Remediation contractor
  - Treatability Study
  - Full scale stabilization
  - Stockpiling
- Sampling and Analysis - by FDF
- Loading and hauling to OSDF - by STP Excavation contractor
- Interim grading and restoration - by STP Excavation contractor

3.3.1 Site Preparation

Site preparation activities will be performed to prepare the work area for remediation. This will primarily consist of installing surface water management facilities such as diversion ditches and a silt fence. This work will be performed by the A1PII Site Preparation contractor. The diversion ditches will be constructed around the Trap Range (Sub-sector 1A), within the adjacent certified area (Sub-sector 1B), to minimize run-on to the Trap Range remediation area and to ensure that runoff is isolated from the adjacent certified area. These ditches will convey flow into the OSDF borrow area sediment basin. Erosion at the discharge ends of the ditches will be controlled with riprap. Material excavated during construction of the ditches will be staged in Certified Soil Stockpiled Areas (CSSAs). A silt fence will be installed at the downgradient location to control runoff from the Trap Range area. A rope fence has been installed to delineate Sub-sector 1A from 1B.

3.3.2 Remediation Activities

As described in Section 6.3, a Trap Range Remediation contractor will be procured via FEMP construction contractor procurement procedures. This will be accomplished via a Request for Proposal (RFP). FDF will prepare and issue the RFP to the previously qualified companies to give them the opportunity to submit proposals. FDF will then select a contractor to perform the work based on evaluation of the proposals.

The RFP will follow the FEMP construction contract format. It will require prospective bidders to provide both technical and cost proposals that address the following:

- Base Contract - Treatability Study
- Option 1 - Full Scale Remediation
- Option 2 - Stockpiling
- Option 3 - Loading and Hauling to OSDF

The RFP will require submission of sufficient details to describe the Trap Range remediation concept. The technical proposals will be evaluated against the criteria and requirements contained in the RFP. The cost proposals will be evaluated against the other contractors and the FDF cost estimate. FDF will then perform an evaluation and select the proposer that provides the best value to FDF and DOE.

3.3.2.1 Treatability Study

After a contractor is selected, initial submittals will be received and the contractor will be authorized to begin work on the Treatability Study, which will involve obtaining lead contaminated soil samples and performing lab studies to determine an optimum stabilization approach. Different admixtures, mixing techniques and quantities may be tried to determine the optimum mixture; optimization will be based on factors such as actual stabilization effectiveness, volume increase and the type of material produced. At the conclusion of the Treatability Study, the contractor will submit a Treatability Study Report for review by FDF. A copy will be provided to the regulatory agencies for their information. The Treatability Study Report will include details of the stabilization method, analytical methods and results, quality control details and other pertinent information on the Treatability Study. FDF will review and approve the report to verify that the process will stabilize the lead before authorizing Option 1.

3.3.2.2 Full Scale Stabilization

If the Treatability Study is successful, the contractor will be authorized to perform Option 1 - Full Scale Stabilization. Full scale stabilization will consist of either in-situ or ex-situ treatment methods.

The stabilization contractor's proposal will describe the approach for full scale remediation. This approach will be confirmed and/or modified based on the results of the Treatability Study. The stabilization contractor will be required to treat the above-BTV lead contaminated soil to meet specified performance criteria for disposal in the OSDF. These criteria include removing the toxicity

characteristic (i.e., leach less than 5 mg/L of lead in the TCLP test) of the material within the limits shown in the construction drawings. The Trap Range Remediation contractor will confirm and finalize stabilization requirements, including types and quantities of agents and admixtures (e.g., phosphates, sulfides, portland cement, lime, flyash, etc.) based on Treatability Study results. This information will be presented in a Stabilization Work Plan, which will be submitted after completion of the Treatability Study.

3.3.2.3 Stockpiling

The Trap Range Remediation contractor may be given an option to stockpile the stabilized lead contaminated soil in Sector 1A. This stockpiling may be part of the process if stabilization is performed ex-situ, or a separate step if work is performed in-situ.

3.3.3 Sampling and Analysis

Sampling and analysis will include verification, precertification and certification. Precertification and certification sampling will be used to ensure that all above-BTV material has been removed. If the sampling results indicate the presence of soil containing above-BTV lead concentrations, additional stabilization/excavation will take place and the sampling will be repeated. This step will be repeated until screening indicates the BTV has been attained. The area will then undergo certification. Once the area is certified, it may become part of the borrow area.

3.3.3.1 Verification

Verification will be performed to confirm stabilization was successful. TCLP analysis will be performed to certify that the lead contaminated soil is stabilized and is no longer considered hazardous under RCRA. Sample density and demonstration criteria will be in accordance with SW-846 (EPA 1986), using a upper confidence level on the mean of 90 percent. If TCLP analyses of the stabilized soil indicate the lead toxicity characteristic is still present, additional stabilizing measures will be applied and further testing will be performed. This process will be continued until TCLP analyses of the stabilized soil indicate that the lead-contaminated soil has been adequately stabilized.

3.3.3.2 Precertification

After X-Ray Fluorescence (XRF) screening indicates that all above-BTV soil has been removed from the former Trap Range, approximately 30 discrete samples will be collected from the base and

periphery of the lead excavation and sent to a laboratory for lead analysis. This sampling density will provide assurance that the area can be certified. If laboratory results indicate that above-BTV lead concentrations remain, additional material will be stabilized and removed, and the base of the footprint will be resampled. Activities that could disturb the area will be delayed until laboratory results indicate that BTVs have been attained. The area will then be ready for certification.

3.3.3.3 Certification

The Trap Range will be certified following stabilization and excavation of the above-BTV lead contamination and precertification of the area. In all cases, pre-design investigation information will be used to design the CU boundaries. The delineation of CUs, the CU-specific certification COCs, and the certification sampling approach will be described in the CDLs (Section 7.2 of the SEP).

3.3.4 Loading and Hauling to OSDF

After TCLP analysis indicates that the lead contaminated soil is stabilized and no longer hazardous, this material will be loaded onto haul vehicles and hauled to the OSDF. Depending on the timing, this activity will either be performed by the Trap Range Remediation or STP Excavation contractor.

3.3.5 Interim Grading and Restoration

Interim grading and restoration of the Trap Range will be initiated following certification. The area will be graded to drain and seeded with interim seeding.

3.4 IMPACTED MATERIAL HANDLING AND TREATMENT

Impacted material waste streams that are generated during A1PII excavation activities will be managed in accordance with FEMP procedures EW-1021, "Preparation of the Project Waste Identification and Disposition (PWID) Report," and EW-1022, "On Site Tracking and Manifesting of Bulk Impacted Material." These procedures provide for programmatic segregation and characterization of waste streams to ensure that only materials that meet the OSDF WAC are disposed on site, in accordance with the requirements set forth in the SEP, OSDF WAC Attainment Plan, and the OSDF Impacted Materials Placement Plan.

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3.4.1 Waste Planning

The material waste streams expected during A1PII remediation, including their source location and disposition, are shown in Table 3-2. This information will be incorporated into a Project Waste Identification and Disposition (PWID) form prior to field implementation of each project phase. Each waste stream will be associated in the PWID with at least one source MTL. A material documentation drawing which identifies MTLs will be included in the design package.

The PWID will govern disposition of waste streams throughout project execution. Compliance with the PWID during project activities will be documented by completing field tracking logs (FTLs) for interim movements (e.g., stockpiling, backfilling, transfer to containers), and by completing manifests for OSDF disposition. Requirements for documentation of waste streams using FTLs and manifests will be included in contract technical specifications and/or construction drawings. Waste stream information, including but not limited to PWIDs, MTLs, FTLs, manifests, and supporting data, will be tracked in the IIMS database.

3.4.2 Waste Stream Generation

Waste streams within each MTL will be segregated as they are excavated in accordance with the specific waste stream designations identified on the PWID. Specific management requirements are identified in the Waste Management Plan for Soil Characterization and Excavation Project (DOE 1997e) and EW-1022. WAO will support construction during excavation activities by:

- Providing technical direction and oversight for identifying, segregating, and managing impacted material waste streams
- Preparing FTLs/manifests for transfer of material between MTLs, including but not limited to, stockpiles and the OSDF
- Preparing waste stream profiles for material dispositioned to stockpiles or the OSDF
- Tracking waste streams in IIMS
- Preparing weekly inventory reports for staged material
- Conducting weekly audits of staged material for inventory security and erosion controls.

3.4.3 Waste Stream Storage, Treatment and Disposal

Each of the anticipated waste streams will require interim management as well as final disposition. In some cases, interim management will be limited to integration between field and office to ensure that manifests are prepared and sufficiently backed by electronic data in IIMS to support direct disposition to the OSDF upon excavation of impacted material. In other cases, interim management will be more complex, requiring staging the material in a stockpile or container for sampling and analysis, or simply to await scheduling for on site or off site disposition.

Typically, only planned interim staging and final disposition can be clearly defined for a waste stream during project design. Other interim management requirements are subject to project conditions such as availability of OSDF capacity for a specific waste matrix (e.g., soil versus debris) and the quality of excavated material for construction purposes. Consequently, only anticipated stockpile and container staging, and the anticipated final disposition of waste streams, are recorded in the original PWID. Any additional management approaches that are identified during project development are documented by updating the PWID. Changes made in the field during project implementation are documented through tracking mechanisms.

The following outline identifies all possible interim and final disposition options that may be used during a project. Requirements identified in the Waste Management Plan, EW-1021, EW-1022, EW-1023, "Management of Stockpiles," and EW-1024, "Management of Containers During Soil Excavations," will be met in all cases.

- Bulk waste stream management for on site disposition: Waste streams that meet the OSDF chemical, radiological, and physical WAC.
  - OSDF - from project area
  - OSDF - from a stockpile
  - Project-specific stockpiles
  - Sitewide stockpiles, including the Woodchip Stockpile
  - Cut-and-fill working stockpiles
  - Backfill

- Bulk waste stream management for off site disposition: Waste streams that exceed the OSDF chemical or radiological WAC, and can be managed bulk.
  - Project-specific stockpiles
  - SP7 Stockpile

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- Containerized waste streams that are dispositioned on site:
  - Interim container storage pending characterization
  - Bulked prior to OSDF disposition

- Containerized waste streams that are dispositioned off site
  - Materials that exceed the OSDF WAC and cannot be managed in bulk
  - Transferred to WPM for off site disposition in container system

FTLs/manifests will be used in all cases for tracking of material that will be dispositioned to the OSDF. Information that supports WAC determinations will be retrievable through IIMS using either the FTL (interim staging) or manifest (OSDF disposition) form numbers. This information will be available for review by WAO Compliance Assurance.

FTLs also will be used to track above-WAC containerized materials from the project area. However, subsequent material management will be conducted under existing site waste management procedures (Functional Area 17), with tracking conducted in the Sitewide Information Forecasting and Tracking System (SWIFTS) database.

Management protocols for stockpiles will include administrative controls (posting and boundary delineation) to ensure only suitable material is staged at the stockpile location. Silt fencing and either vegetative or crusting agent covers will be installed to control run-off and erosion. When stockpiles are in use, dust controls will include compaction and application of water mist for visible dust. Rope fencing and signs will be used to control ingress and egress.

3.4.4 Remediation-Generated Wastewater Management

Wastewater will be produced during A1PII remediation activities from the perched water seepage into remediation excavations, including trenches resulting from underground utility removals, STP excavations, precipitation/storm water that falls or runs into the open excavations, residual waters from pipelines and STP operational units, and from equipment decontamination/wash. These waters have potential for containing uranium and, for waters within the Sludge Drying Beds/STP excavation area, tetrachloroethene. The following summarizes how these remediation-generated wastewaters will be managed and dispositioned:

Activity	Management	Disposition
A1PII Site Preparation work and other excavations outside the STP area not enumerated below	Perched water, storm water (including residual water in any agricultural drainage tiles encountered), equipment decontamination/wash waters, and other remediation-generated wastewater will be collected in the excavation	Transfer to the nearest surface water course (ditch or channel) discharging to a sediment trap/basin
Excavations to remove agricultural drainage tiles outside the STP excavation area *and not traversing* the STP excavation area or an underground utility	Perched water and storm water (including residual water in the tiles) will be collected in the excavation	Transfer to the nearest surface water course discharging to a sediment trap/basin
Excavations to remove agricultural drainage tiles outside the STP excavation area *and traversing* the STP excavation area or an underground utility	Perched water and storm water (including residual water in the tiles) will be collected in the excavation	Transfer to the STP excavation sump
Excavations to remove underground utilities outside the STP excavation area	Perched water, storm water, residual water in the utilities, and other remediation-generated wastewater will be collected in the excavation	Transfer to the STP excavation sump
Excavation in the STP area	Perched water, storm water, residual water in underground utilities, equipment decontamination/wash water, and other remediation-generated wastewater will be collected in the STP excavation sump(s)	Transfer to OSDF Leachate Conveyance System for conveyance to AWWT Phase II system

The STP Sludge Drying Beds were designated a HWMU because they managed sludge potentially containing the F-listed spent solvent tetrachloroethene (see Section 1.2.1.1). The highest detected concentration of tetrachloroethene in perched water in the Sludge Drying Beds/STP excavation area is 39 μg/L; however, pre-design investigation of STP area perched water did not detect tetrachloroethene or other VOCs (see Section 2.3.2.3).

The Hazardous Waste Mixture Rule Exclusion [OAC 3745-51-03(a)(2)(e) and 40 CFR 261.3(a)(2)(iv)] provides criteria useful for determining treatment (or alternatively, pretreatment) criteria for such water. Under the Exclusion, wastewater mixed with a RCRA F-listed spent solvent waste, whose constituent-specific concentration is less then its *de minimis* level (see below) <u>before</u> *or* <u>at</u> introduction to the headworks of a Clean Water Act-regulated system, is not a hazardous waste. Sludges generated from a wastewater that meets the Mixture Rule Exclusion criteria are also exempted from the

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hazardous waste listing because the mixture became exempt upon introduction to the wastewater system.

Constituent	*De minimis* level, μg/L	Amenable to Removal by Activated Carbon
Tetrachloroethene	1,000	✔

Because the highest detected concentration (39 μg/L) of tetrachloroethene in perched water in the Sludge Drying Beds/STP excavation area is well below the *de minimis* level even before introduction to the wastewater treatment system, the perched water in this area meets the Hazardous Waste Mixture Rule Exclusion criteria. Water collected in the STP Excavation (perched water, precipitation/storm water from the excavation sumps, equipment decontamination/wash waters, and other remediation-generated wastewater) will be collected in a STP excavation sump. It will be discharged into the FEMP's Clean Water Act-permitted water treatment scheme via the OSDF Leachate Collection System for conveyance to the AWWT Phase II (activated carbon adsorption) facility. Resultant sludges generated from this treatment scheme are also exempted from the hazardous waste listing. In this manner, the small quantities of tetrachloroethene that might be present in the exempted wastewater mixture will be present in such low concentrations that they do not pose a substantial hazard to human health or the environment, either by intended or unintended (e.g., subsurface leakage) release, and will be treated in the FEMP's wastewater treatment system in a practical, reasonable and efficient manner.

3.5 INSTITUTIONAL CONTROLS

Institutional controls and monitoring of A1PII will continue after remediation activities are completed, beyond that afforded by DOE's sitewide security program, through the use of construction fences or equivalent barriers and certified area warning signs that will be placed along accessible boundary segments of areas as they are certified. Access to these areas will be further controlled by procedure to minimize the potential for introducing contamination from unremediated areas of the site. Similarly, DOE will continue to monitor A1PII conditions in accordance with the IEMP (DOE 1997b). Monitoring activities are expected to be similar to those currently performed in the area, including air pathway parameters, including fugitive emissions (visible dust), airborne radiological particulates and radon; surface water quality in accordance with the NPDES compliance program; and groundwater monitoring at wells located on the periphery of A1PII for RCRA compliance and related purposes.

Long-term institutional controls necessary for restoration under the site's selected remedy are presented in the NRRP (DOE 1997b).

3.6 FINAL RESTORATION

The final restoration of A1PII will occur after borrow material activities in A1PII for the OSDF are complete, so that the restoration design will be based on the post-excavation topography. The design for final restoration will be included in a separate submittal and is planned for 2004, for implementation in 2005. The final restoration schedule was proposed to the Fernald Natural Resource Trustees in December 1997.

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TABLE 3-1
PROTOCOLS FOR SPECIAL MATERIAL

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SPECIAL MATERIAL	EXAMPLES	PROTOCOLS
Friable Asbestos	Piping insulation	General: ACM may not be staged in the excavation area. If delays are expected prior to OSDF disposition, transport to temporary staging area. Friable ACM-wrapped pipe: Size reduce to maximum 10 (±1) ft. length, wrap, double bag or equivalent, label, and disposition to OSDF as Category 5. Pipe 12 inches or greater in diameter must be split axially or radially. Other friable ACM that meets OSDF Category 5: Wrap, double bag or equivalent, label, and disposition to OSDF. ACM that does not meet OSDF WAC: Size reduce, wrap or double bag as above, label, then containerize and transport to temporatry staging area for evaluation for off site disposition.
Non-pressurized Containers	Intact drums, metal and wood boxes, cans	Intact containers: Visually inspect for leaks and indication of contents. Overpack or repack leaking containers prior to movement from area of discovery. If safety considerations allow, open container and record description of contents on Visual Inspection Form. Transport to temporatry staging area for further evaluation. Empty containers: Crush or size reduce and manage as OSDF Category 2.
Pressurized Containers	Aerosol cans, Freon containers, gas cylinders, propane tanks, fire extinguishers	General: Handle intact containers as though they contain material. Evaluate container integrity. Breached containers: Evaluate for OSDF Categories 2, 3 and 5. Category 5 is evaluated on a case-by-case basis and requires a request for disposal (RFD). Intact containers: Overpack and move to FEMP temporatry staging area area for evaluation. If container is to be dispositioned in OSDF, it must be punctured, crushed or cut so that the interior is open to the atmosphere.
Piping and Pumps	Drain lines, sewer lines, process piping, pumps	General: Drain contaminated and potentially contaminated free liquids using trays, buckets, or pipe/hose inserted into pipeline/appurtenance. Dependent on nature of liquid: if viscous, containerize in drum(s) or white metal box(es), sample for disposition evaluation, and disposition accordingly; if free-flowing, transport to the transfer line, sample and disposition at AWWT according to protocols in Section 3.4.4. Piping with process residues: Cap and remove pipe after emptying free liquids. Containerize for off site disposition. Piping with above-WAC deposits: Cap and remove pipe after emptying free liquids. Containerize for off site disposition. Other piping: Manage as OSDF Category 2. Pumps: Remove after emptying free liquids. Evaluate for OSDF Categories 2, 3 and 5. Category 5 is evaluated on a case-by-case basis and requires a request for disposal (RFD). Note: MEF/SWIFTS research is required prior to trenching activities for contaminated piping.
Non-soil Residues	Green salt, black oxide, sump cake, fly ash	Field screen to determine radionuclide content. Segregate uranium-bearing residues, containerize, and transport to temporatry staging area for evaluation. Stockpile non-uranium residues and evaluate for OSDF Category 1 or 5. Category 5 requires a RFD.

TABLE 3-1
(continued)

SPECIAL MATERIAL	EXAMPLES	PROTOCOLS
Transformers	Electrical equipment	General: Segregate and evaluate to determine if contains fluids. Empty transformers: Manage as OSDF Category 2, 3, or 5. Fill void spaces greater than 1 cf. with flowable, cohesionless material or a quick set grout. Category 5 requires a RFD. Transformers containing fluids: Drain fluids into a container and transport container to temporatry staging area. Evaluate fluids for off site disposition. Manage emptied transformer as described above.
Lead Acid Batteries	Vehicle or equipment batteries	Segregate, containerize and transport to temporatry staging area for disposition evaluation.
Uranium Metal	Derbies, ingots, billets, irregularly shaped scrap uranium	Segregate, containerize, and transport to temporary staging area area for evaluation for off site disposition. Will either be classified as nuclear material and sold, or classified as a waste and disposed off site.
Medical/Infectious Waste	Syringes, vials	Evaluate on case-by-case basis for OSDF Category 5 (requires a RFD). Containerize and move to temporary staging area if field operations do not allow timely completion of this evaluation. Medical/infectious waste not meeting OSDF requirements will be containerized and transported to temporary staging area for evaluation for off site disposition.
Miscellaneous Debris	Oil/air filters, radiators, cable/wire, tools, heavy equipment, office materials, documents	Evaluate on case-by-case basis for OSDF Category 5 (requires a RFD). Containerize and move to temporary staging area if field operations do not allow timely completion of this evaluation. Miscellaneous debris not meeting OSDF requirements will be containerized and transported to temporary staging area for evaluation for off site disposition.
Tires	Scrap tires from miscellaneous equipment (Note: OEPA definition)	Containerize and transport to temporary staging area for evaluation for off site disposition.

ACM = Asbestos Containing Material
MEF = Material Evaluation Form
OEPA = Ohio Environmental Protection Agency
OSDF = On Site Disposal Facility
RFD = Request for Disposal
SWIFTS = Sitewide Information Forecasting and Tracking System

TABLE 3-2
WASTE STREAM DISPOSITION

Waste Stream	Expected Source Location	OSDF WAC Status	Pre-Disposition Options	Final Disposition Options	Est. Vol. (Yd^3)
Impacted Material					
Lead-contaminated Soil	Trap Range	Toxicity characteristic for lead	In-situ or ex situ stabilization	OSDF	3,000
F-listed AWAC Sludge	Sludge Drying Beds	AWAC	Containerize	PCDF	
OSDF Category 1 F-listed Soil & Gravel	Sludge Drying Beds	BWAC	1. Stockpile 2. Containerize	OSDF	
All other OSDF Category 1 Soil	All Areas	BWAC	Stockpile	OSDF	
OSDF Category 2 Debris	All areas	BWAC	Stockpile	OSDF	
OSDF Category 3 Debris	All areas	BWAC	Stockpile	OSDF	
OSDF Category 4 Compressible/High Organic Material	All areas	BWAC	Stockpile	OSDF	
OSDF Category 5 Ancillary Material	All areas	BWAC	1. Stockpile 2. Containerize	OSDF	
Prohibited Items (see Attachment 1, Part 3 of EW-1022)	All areas	Prohibited Item	Containerize	1. NTS 2. PCDF	
Special contingency materials (see Attachment 1, Part 2 of EW-1022)	All areas	AWAC	Containerize	1. NTS 2. PCDF	
Special contingency materials (see Attachment 1, Part 2 of EW-1022)	All areas	BWAC	1. Stockpile 2. Containerize	OSDF	
Remediation-Generated Wastewater					
Remediation-generated wastewater	See Section 3.4.4				

AWAC = Above OSDF Waste Acceptance Criteria (WAC)
BWAC = Below OSDF Waste Acceptance Criteria
AWWT = Advanced Waste Water Treatment facility
N/A = Not Applicable
NTS = Nevada Test Site
OSDF = On Site Disposal Facility
PCDF = Permitted commercial disposal facility

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Section 4

4.0 PROJECT-SPECIFIC ENVIRONMENTAL CONTROLS AND MONITORING

This section defines the project-specific environmental controls and monitoring that will be performed as part of A1PII remediation, how the resulting information will be used, and how it will be integrated with sitewide monitoring and reporting requirements. Control mechanisms and monitoring/inspection requirements are provided for impacts to natural resources, as well as environmental impacts through air, surface water, and groundwater pathways.

The IEMP (DOE 1997b) provides a summary reporting link and a cumulative feedback function for the project-specific monitoring conducted by individual remediation projects. This link will assist with interpretation of project-specific results from a sitewide perspective. It should be noted, however, that routine "process-adjustment" decisions, which will be made by the SCEP to react and respond to project-specific operating conditions and process-control objectives, will not be reported as part of the IEMP reporting cycles. Rather, these types of routine decisions will be maintained as part of the project organization's daily operations logs and are considered to be normal practice to achieve project-specific operating objectives. Figure 5-1 of the SEP summarizes the FEMP sitewide and project-specific environmental monitoring and control mechanisms.

4.1 NATURAL RESOURCE IMPACTS

On-property natural resource impacts include those associated with threatened and endangered species, cultural resources, and wetlands/floodplains. As stated in Section 1.3.3.2, approximately 0.7 acres of wetland are expected to be impacted during the remediation of A1PII. As also stated in Section 1.3.3.2, compensatory wetland mitigation for A1PII wetland impacts will be addressed on a sitewide basis in accordance with the NRRP. The following paragraphs describe the control mechanisms that will be implemented in A1PII with regard to natural resource impacts.

4.1.1 Control Mechanisms

The SEP establishes a three-component strategic control mechanism for natural resource impacts. The first component, identification of unavoidable impacts to natural resources anticipated to result from remediation activities, has been addressed in the OU2 and OU5 RODs (DOE 1995d, 1996b). These RODs identified the unavoidable potential natural resource impacts anticipated because of remediation activities relevant to A1PII to be initiated under the SEP.

The second component, avoidance of impacts to FEMP natural resources as practicable, has been controlled through planning and design. Sensitive natural resource areas have been designated at the FEMP. These "Priority Natural Resource Areas" are illustrated in Figure 5-2 of the SEP. No Priority Natural Resource Areas are located within A1PII area. All access points, laydown areas, etc., for the A1PII soil remediation project are outside Priority Natural Resource Areas. Potential impacts to other FEMP natural resources will be minimized through the incorporation of appropriate environmental control mechanisms. These are addressed in the following media-specific discussions.

The third component, natural resource restoration, is briefly described in Section 1.3.3 and is the subject of the NRRP.

4.2 AIR PATHWAY

This subsection presents the air pathway control and monitoring requirements for noise, fugitive emissions (visible dust), airborne radiological particulates and radon, and direct radiation during A1PII soil remediation activities. Air pathway monitoring activities, to the maximum extent possible, will make use of both the existing FEMP occupational air monitoring program and the sitewide environmental monitoring program (described in Section 6.0 of the IEMP). Using existing monitoring programs will help ensure that project-specific data are of comparable quality and are beneficial in evaluating and reporting project-specific air pathway releases under associated regulatory drivers. Administrative and engineering control techniques, in accordance with "Fugitive Dust Control Requirements" (RM-0047; DOE 1997f) developed from the FEMP fugitive dust control best available technology (BAT) determination, will be implemented during A1PII remediation activities to mitigate potential emissions of fugitive dust and airborne radiological particulates.

4.2.1 Noise

4.2.1.1 Control Mechanisms

Noise control and abatement during the A1PII remediation will include noise control devices (mufflers) on vehicles and machinery, proper maintenance of vehicles and machinery, and may also include rescheduling heavy equipment use times in the field. Currently, only minimal remediation activities are anticipated to be performed after sunset.

To ensure that OSHA and American Conference of Governmental and Industrial Hygienists (ACGIH) noise limits are met, an administrative action level below these limits will be specified in the project-specific health and safety requirements (Section 5.0). This administrative action level will be used to assess the need for hearing protection for field personnel in the remediation areas, the need for maintenance of vehicles and machinery, and the need for additional noise control and abatement.

4.2.1.2 Monitoring

Noise monitoring will be conducted as part of A1PII project-specific health and safety requirements. Noise measurements will be made in the field by FDF safety and health personnel, using safety and health protocols for noise monitoring, to assess whether administrative action levels are exceeded, the need for hearing protection, the need for maintenance of vehicles and machinery, the need for additional noise control or abatement, and compliance with OSHA and ACGIH occupational noise limits.

Components of noise monitoring will include establishing remediation area-specific background levels prior to the start of excavation activities, and occasional monitoring during implementation of remedial activities. If background noise levels are within 5 dBA (decibels on the A-weighted scale) of the administrative action level (85 dBA, as specified in the safety and health requirements), safety and health personnel will contact the project manager to begin appropriate corrective actions.

Field personnel will be responsible for documenting noise monitoring in the field in accordance with records management guidelines presented in Section 6.7, as well as for initiating noise abatement measures.

4.2.2 Fugitive Emissions

4.2.2.1 Control Mechanisms

Water, commercially available dust suppression agents, or other appropriate methods and work practices will be used proactively to reasonably minimize dust generation from A1PII soil remediation activities including soil excavation, handling, hauling, and placement. In general, the opportunity for dust generation will be minimized using work practices, including removing material from the undercarriage of equipment, cleaning paved haul roads, or applying water (or other dust suppressant agents) to unpaved haul roads. Beyond that, water or other dust suppression agents will be applied in

quantity sufficient to reasonably minimize dust generation, but limited so that they do not result in migration of the agent beyond work area boundaries, ponding, or disruption of other portions of work.

For excavation activities, dust control will be, by progressive increments, focused on making the material less dusty. The base mechanism is anticipated to be reliance on inherent moisture in the soil and soil-like material; in dry conditions, dust control will be initiated prior to excavation. If visible dust emissions occur during excavation, one or a combination of the following dust control methods are anticipated to be used:

- Apply more water mist
- Add surfactant or other agents to the water mist
- Apply resins, crusting agents, or foams in lieu of water mist.

For soil handling, hauling, and placement activities, dust control will be focused on making the material to be transported unlikely to become airborne. The base mechanism is anticipated to be reliance on inherent moisture in the soil or soil-like materials, coupled with a 15 mph speed limit during hauling. If visible dust emissions occur during handling, hauling, or placement, one or a combination of the following dust control methods are anticipated to be used:

- Change configuration of material (e.g., place less in the trucks)
- Apply water mist
- Add surfactant or other agents to the water mist
- Apply resins, crusting agents, or foams in lieu of water mist (atypical load bed covers)
- Reduce equipment speed
- Cover equipment load bed.

As discussed in Section 3.2.1.8, an equipment wash or equipment decontamination facility will be used to remove visible deposits of soil or other materials retained on the wheels or undercarriages of haul equipment that could readily become visible fugitive emissions if deposited on paved or treated unpaved roadways or parking areas. Clods, clumps, or visible deposits of soil or other material that could readily become visible fugitive emissions will be promptly removed from paved or treated unpaved roadways/parking areas. Appropriate dust control mechanisms will be applied to reasonably minimize the generation of visible dust that may result from the removal process.

The numbers or types of dust suppression equipment in operation will not preclude stopping work if there is visible dust or excessive visible dust. Visible dust indicates a need to increase dust control

efforts. Increasing levels of visible dust indicate a need to increase dust control effort, including possible alteration, slowdown, or temporary suspension of the work activities generating the visible dust. The work activities observed to be generating the visible dust will be temporarily suspended if the visible dust exceeds the site-specific limit or Ohio standard [see "Fugitive Dust Control Requirements" (RM-0047; DOE 1997f)]. Dust controls will be increased and/or work practices will be modified to bring the fugitive emissions to a level below the limit/standard during dust-generating activities.

Personnel will be on call during non-work periods seven days per week (including holidays) to respond to an "off-hours dust alert," which is defined as whenever FDF gives notification to the contractor that visible particulate emissions exceed the site-specific limits during non-work periods. Site personnel will notify the contractor of such an alert and dust suppression will begin no more than three hours after such notification.

The contractor will develop a Dust Control Plan, as part of the Safe Work Plan, which will specify:

- A narrative description of how field personnel will implement the Dust Control Plan, monitor for visible dust, progressively implement increased dust control or alter work activities when required, and maintain appropriate records of dust control activities
- A listing of methods to be used to suppress dust, and the associated frequency that routine dust suppression is to take place
- By method, the materials to be used to suppress dust — e.g., water, dust suppression agents, etc.
- By method, the specific types and quantities of equipment to be used to suppress dust
- A description of the notification process, including designation of personnel, that the contractor intends for SCEP personnel to utilize during non-work periods to notify the contractor of an "off-hours dust alert."

The contractor's Dust Control Plan will be reviewed against these criteria by FDF for adequacy. FDF approval of that plan is a prerequisite to authorization of earthmoving activities.

4.2.2.2 Monitoring

Project personnel will tour the areas of remediation activities at the start of the day and periodically during the day. Real-time observation of visible dust, in accordance with the criteria described in

"Fugitive Dust Control Requirements" (RM-0047), will be used to assess fugitive dust emissions and progressively implement corrective measures.

Additionally, visual monitoring will be conducted in accordance with 40 CFR Part 60, Appendix A, Method 22, "Visual Determination of Fugitive Emissions from Material Sources and Smoke Emission from Flares." Furthermore, visual determination of opacity will be conducted on "project field activities" and "material handling/vehicle traffic on storage piles" [identified in the table in "Fugitive Dust Control Requirements" (RM-0047)], in accordance with 40 CFR Part 60, Appendix A, Method 9, "Visual Determination of Opacity of Emissions from Stationary Sources" (or an approved alternative method).

Field managers will be responsible for documenting visible emission monitoring records in the field, in accordance with the record keeping guidelines defined in Section 6.7, as well as for initiating fugitive dust abatement measures. Records of the following information for each work day (including off-hours dust-alert response, except as noted below) will be maintained for the A1PII soil remediation project:

- The date, weather conditions, and scheduled work activities (e.g., excavation, trenching, hauling, placement, compaction, loading, etc.)
- Records of opacity readings (if any) conducted that day in accordance with 40 CFR Part 60, Appendix A, Method 9, "Visual Determination of Opacity of Emissions from Stationary Sources" (or an approved alternative method) [NOTE: not required for off-hours dust alert responses]
- Time of dust-alert notification given to the contractor, names of the individuals involved (SCEP individual who gave the notification, contractor individual notified, and dust-alert responders), and time of initiation of dust suppression activity [NOTE: required only for days when such notification occurs]
- Identification of areas (or segments) where dust control was performed
- The manner or type of dust control activity(ies) applied by area (or segment) to which applied
- Application rate of water or other dust suppression agents — at a minimum, tank truck load capacity and number of tankloads applied per area (or segment) to which applied
- Identification of the party(ies) responsible for the dust control activity by area (or segment) — at a minimum, name of the contractor.

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4.2.3 Airborne Radiological Particulate

4.2.3.1 Control Mechanisms

All airborne radiological particulate emissions associated with A1PII remediation activities are anticipated to be from fugitive emissions. Control mechanisms for fugitive emissions are presented in Section 4.2.2.1. No airborne radiological particulate control mechanisms, beyond those provided by fugitive emission control, are anticipated for environmental or public safety concerns as a result of A1PII soil remediation activities.

4.2.3.2 Monitoring

Airborne radiological particulate emissions associated with A1PII remediation activities will be monitored via the sitewide airborne radiological particulate monitoring program presented in Section 6.0 of the IEMP. The monitoring network encompasses all the current and expected diffuse and point sources at the FEMP; airborne radiological particulate air monitoring stations in the vicinity of A1PII are presented in Figure 2-6. The data collected under the sitewide airborne radiological particulate monitoring program will be used to assess the collective effect of concurrent remediation activities at the FEMP site under various regulatory drivers described in Section 6.0 of the IEMP.

No supplement or modification to the sitewide airborne radiological particulate monitoring program is anticipated to be required as a result of A1PII soil remediation activities. Monitoring stations already exist downwind (under the prevailing wind) from A1PII, and the monitoring frequency and analyses addressed by the program adequately address the COCs in the A1PII remediation area. No airborne radiological particulate monitoring stations need relocation to facilitate A1PII soil remediation activities.

4.2.4 Radon

4.2.4.1 Control Mechanisms

Emission of radon from soil being remediated under the A1PII soil remediation project is not anticipated to be an environmental or public safety concern. Hence, no project-specific radon control mechanisms are anticipated for A1PII soil remediation activities.

4.2.4.2 Monitoring

Any potential radon emissions associated with A1PII soil remediation activities will be monitored via the sitewide radon monitoring program presented in Section 6.0 of the IEMP. No supplement or modification to that program is anticipated for A1PII soil remediation activities. No radon monitoring stations need relocation for A1PII soil remediation activities.

4.2.5 Direct Radiation

4.2.5.1 Control Mechanisms

No project-specific direct radiation control mechanisms beyond that provided by fugitive emissions control are anticipated to be required for environmental or public safety concerns for A1PII soil remediation activities.

4.2.5.2 Monitoring

Environmental radiation levels associated with A1PII soil remediation activities will be monitored via the sitewide environmental direct radiation monitoring program presented in Section 6.0 of the IEMP. No supplement or modification to that program is anticipated for A1PII soil remediation activities. No environmental direct radiation monitoring stations need relocation for A1PII soil remediation activities.

4.3 SURFACE WATER PATHWAY

4.3.1 Control Mechanisms

As a condition of its NPDES permit (Ohio EPA Permit No. 1IO00004*ED), the FEMP was required to develop and implement a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP identifies potential sources of pollution associated with construction and industrial activities that may affect storm water quality at the facility and describes the practices that will be employed to reduce pollutants within these types of discharges. The SWPPP also contains provisions on the inspection programs which are being implemented to ensure that discharges of storm water associated with construction and industrial activities comply with the requirements of the FEMP NPDES permit and of the SWPPP.

A1PII is located outside the "storm water runoff controlled" Former Production Area drainage basin. The A1PII area currently drains to NPDES-permitted storm water outfall *4003. Outside the FEMP's Former Production Area drainage basin, storm water from construction activity is regulated as an industrial activity (if a certain magnitude of earth-moving activities is involved). A1PII soil

remediation activities are a subset of construction activities. In accordance with both the SWPPP (under the FEMP's NPDES permit) and the SEP, erosion and sediment controls will be installed where appropriate to protect downgradient areas. These controls have been designed in accordance with A1PII's Surface Water Management Plan (Appendix C), and will be installed in accordance with the technical specifications to manage surface water run-on and runoff, minimize erosion, and control sedimentation on site surface waters such as Paddys Run.

Clearing and grading activities conducted in support of A1PII soil remediation will result in the generation of small quantities of downed trees and brush. The majority of such material will be encountered during the site preparation phase of A1PII soil remediation activities. As discussed in Section 3.1.1.3, that material will be handled by chipping (or shredding) and stockpiling in the Area 2 Phase I wood chip pile located near the meteorological data tower for potential use during remediation or as mulch during future site restoration activities. During the excavation phase of A1PII soil remediation activities, any stumps and roots remaining from site preparation phase activities will be managed by grinding them in place, then removing them with the soil during excavation. Such management of chipped material is in accordance with Section 5.1.3 of the SEP.

Collection and management of perched water and storm water will be required in the STP excavation area. Because of the potential contaminants within the STP area, water collected in the STP excavation area will be transferred to the AWWT Phase II facility for treatment. See Section 3.4.4 for details.

The FEMP drainage area map (Figure 2-1 of the SWPPP) has been revised to show changes in the drainage areas flowing to NPDES-permitted storm water outfall *4003 that result from A1PII soil remediation activities. Revisions to the descriptions of the watershed basins currently provided in Section 4.0 of the SWPPP will be provided with the annual SWPPP update, along with a FEMP drainage area map (updated for changes from subsequent projects).

It is anticipated that the surface water management and sediment/erosion control mechanisms for A1PII will remain largely in place until remediation of the area has been completed; however, they may be dismantled or reconfigured by task during A1PII interim grading and final restoration grading. To the extent practical, surface water runoff from the area being worked will be conveyed via pumping or other appropriate mechanism to the adjacent area where the conveyance system is still intact. In

accordance with the SWPPP and the SEP, once an A1PII area is certified clean, the flow may be diverted to Paddys Run.

4.3.2 Inspection

Construction activity inspections mandated by the SWPPP will be conducted in the A1PII remediation area. Under the FEMP's construction activity inspection program, weekly inspections will be conducted within all site construction areas and after any precipitation events totaling 0.5 inch or more within a 24-hour period. Construction activity inspections are documented and maintained as part of the NPDES and SWPPP files at the facility.

Industrial activity inspections might also be conducted in the A1PII remediation area, if required under the SWPPP. The industrial activity inspection program covers both areas within and outside the Former Production Area drainage basin. However, industrial activity inspections are not typically conducted in areas subject to the more frequent construction activity inspections. Under the FEMP's industrial activity inspection program, inspections are conducted in areas draining to the site's controlled storm sewer system (Former Production Area drainage basin) and the uncontrolled watershed basins draining through NPDES permitted storm water outfalls *4003 through *4006. Industrial activity inspections are documented and maintained as part of the NPDES and SWPPP files at the facility.

Inspections conducted in the A1PII areas will ensure that:

- Erosion and sedimentation controls required under the specifications are in place and are well maintained
- Work practices and housekeeping activities are conducted in a manner that reduces the potential discharge of pollutants in association with storm water discharges from disturbed areas
- Corrective actions related to the establishment and/or maintenance of erosion and sedimentation control structures are documented and tracked to resolution
- Excessive erosion and/or siltation to Paddys Run or other off-property waterways is not occurring as a result of construction activities initiated under the A1PII soil remediation activities.

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As previously described, the A1PII surface water management system captures all potentially contaminated surface water and directs it to either sediment traps/basins or the AWWT Phase II facility for treatment (see Section 3.4.4). Discharge from the AWWT is monitored at NPDES permitted outfall *4001 under the IEMP-conducted NPDES permit monitoring. Discharges of surface water runoff from the A1PII drainage areas will flow to NPDES-permitted storm water outfall *4003 after initial sedimentation treatment at the sediment traps/basins. Discharges at outfall *4003 are also monitored under the IEMP-conducted NPDES permit monitoring. Additional IEMP-conducted surface water monitoring occurs at SWD-02 prior to outfall *4003 (see Figure 4-9 of the IEMP).

The SEP discusses potential project-specific storm water monitoring programs for soil remediation areas located outside the storm water runoff controlled Former Production Area drainage basin. The objectives of such a program would be to monitor performance of erosion and sedimentation control structures (e.g., sediment traps and basins) against their anticipated design efficiencies, and to determine whether the runoff presents an unacceptable impact to surface water quality or presents an unacceptable cross-media impact to the GMA.

As previously described, the A1PII surface water management system captures all potentially contaminated A1PII storm water runoff. Potentially contaminated A1PII storm water receives sedimentation treatment at sediment traps/basins before discharge to the receiving surface water. Discharges of surface water runoff from the A1PII drainage areas are monitored under the IEMP-conducted surface water monitoring program at SWD-02, and discharges at NPDES-permitted storm water outfall *4003 are also monitored under the IEMP-conducted NPDES permit monitoring. Because the objectives of the SEP-contemplated storm water monitoring are met through other existing means no project-specific storm water monitoring program will be implemented for the A1PII soil remediation project.

4.4 GROUNDWATER PATHWAY

The GMA is an extensive aquifer located, in part, beneath the entire FEMP (including the A1PII area). GMA groundwater in the A1PII area flows roughly to the east at a hydraulic gradient of approximately 0.0008. As determined during the OU5 RI, the principal COC for the GMA is total uranium. The GMA FRL for total uranium is 20 μg/L, as established by the OU5 ROD (DOE 1996b). The OU5 ROD also established GMA FRLs for 49 other COCs. In the A1PII area, GMA concentrations of total

uranium are all below the FRL. Thus, the GMA beneath the A1PII area is not targeted for remediation of an uranium plume. A few isolated detections of cadmium, lead, and zinc above their respective FRLs have been detected in the GMA beneath the A1PII area. These constituents are currently being monitored under the IEMP to determine if that situation is persistent. Additional information on the GMA in the A1PII area can be found in the OU5 RI Report (DOE 1995b).

4.4.1 Control Mechanisms

Consistent with the SEP's strategic approach, the following paragraphs present the actual control mechanisms to be employed by the A1PII soil remediation project to protect the groundwater pathway. During remediation of A1PII, excavations are not anticipated to extend into the unsaturated sands and gravels of the GMA. Measures will be implemented to protect the GMA during construction of surface water control facilities and excavation of impacted materials. These measures will include minimization of run-on to exposed surfaces during excavation and the control and treatment of potentially contaminated surface waters during A1PII remedial activities. Run-on and runoff controls are discussed in Section 3.0.

4.4.2 Monitoring

The sitewide management strategy for monitoring groundwater during remedial activities is described in detail in Section 3.0 of the IEMP, which lists the objectives, regulatory drivers, monitoring, data evaluation, and reporting requirements for the program. Sitewide monitoring of groundwater will continue under the IEMP during A1PII soil remediation activities.

Nineteen existing monitoring wells were selected from the IEMP's RCRA property boundary monitoring program to monitor groundwater in the vicinity of the A1PII area in 1997 and 1998 (Table 4-1, Figure 2-6). These existing monitoring wells are located along the perimeter of A1PII; all but two (2070 and 3070) are located along the eastern perimeter of A1PII. Three additional wells in the A1PII soil remediation area are included in the IEMP's routine water-level monitoring program. Considering the spatial distribution of these existing wells and the dispersion of groundwater due to the groundwater gradient, the well configuration as it remains after preceding well abandonment activities will be adequate to identify (screen for) potential impacts to the regional aquifer during, or as a result of, A1PII remediation activities. The following paragraphs provide an overview of the IEMP's

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groundwater monitoring program for these wells. Sampling and analysis will be conducted according to IEMP requirements.

Groundwater monitoring will focus on the FRL constituents that have had an FRL exceedance in the GMA. Quarterly sampling will occur so that seasonal concentration changes can be monitored. To document GMA baseline conditions for the A1PII soil remediation project, the GMA will be sampled prior to A1PII site preparation excavation activities. Samples will be analyzed for the IEMP-designated constituents (see Table 4-2). Under the IEMP, all 50 GMA FRL constituents will be analyzed at a 5-year frequency regardless of whether an FRL exceedance has been detected.

Data from this monitoring effort will be used to assess the impact of A1PII soil remediation activities on the GMA and will be reported in the IEMP reports. During implementation of A1PII soil remediation activities, the data will be evaluated in conjunction with Aquifer Restoration and Wastewater Project personnel to spot a trend or change in trend that could indicate a potential adverse impact to groundwater quality within the GMA. The data will be carefully scrutinized to determine whether the soil remediation activities are adversely affecting the GMA groundwater (e.g., vertical migration through the glacial overburden as a result of surface water infiltration), or whether other conditions (e.g., migration of existing plume, groundwater remediation activities) are the likely impacting factors. In the event that data indicate a potential adverse impact, an appropriate future course of action will be evaluated and implemented, considering the following:

- Is this area of the GMA already planned for groundwater remediation? If not, should it be remediated (in accordance with the criteria in the OU5 ROD, DOE 1996b)?
- If the answer to either of the above is yes: Is GMA groundwater remediation of this area already ongoing? If not, should GMA groundwater remediation for the area be re-prioritized?
- What modifications to the A1PII soil remediation project, if any, can be retrofitted to mitigate the situation?
- What modifications to approach can be implemented in subsequent soil remediation projects to further minimize potential adverse impacts to the GMA from soil remediation activities?

TABLE 4-1

GROUNDWATER MONITORING WELLS FOR REMEDIATION AREA 1 PHASE II

Count	Well ID	IEMP Groundwater Monitoring Program [A]	
		RCRA Property Boundary [B]	Groundwater Elevation [C]
1	2426	✓	✓
2	3426	✓	✓
3	4426	✓	
4	2417	✓	✓
5	3417	✓	✓
6	2429	✓	✓
7	3429	✓	✓
8	2430	✓	✓
9	3067	✓	✓
10	4067	✓	
11	2431	✓	✓
12	3431	✓	✓
13	2432	✓	✓
14	3432	✓	✓
15	4432	✓	
16	2733	✓	✓
17	3733	✓	✓
18	2070	✓	✓
19	3070	✓	✓
20	2400		✓
21	2421		✓
22	3421		✓

NOTES:

(A) Source: Integrated Environmental Monitoring Plan (IEMP), Section 3.0, Groundwater Monitoring Program. Presentation sequence is north to south, and shallow to deep.

(B) Source: IEMP Section 3.5.2.2, RCRA Property Boundary Monitoring

(C) Source: IEMP Section 3.5.1.6, Routine Water-Level Monitoring Program

TABLE 4-2

LIST OF CONSTITUENTS WHICH WILL BE ANALYZED QUARTERLY IN THE RCRA BOUNDARY MONITORING WELLS

General Chemistry	Inorganic	Radionuclide	Organic
Fluoride	Antimony	Neptunium-237	Benzene
Nitrate/Nitrite	Arsenic	Strontium-90	Carbon Disulfide
	Beryllium	Technetium-99	Trichloroethene
	Boron	Thorium-228	
	Cadmium	Thorium-232	
	Total Chromium	Total Uranium	
	Cobalt		
	Lead		
	Manganese		
	Mercury		
	Molybdenum		
	Nickel		
	Selenium		
	Silver		
	Vanadium		
	Zinc		

Source: IEMP, Section 3.5.2.2, RCRA Property Boundary Monitoring

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Section 5

5.0 PROJECT SPECIFIC HEALTH AND SAFETY

All FEMP employees, visitors, vendors, and contractors are required to abide by the provisions of the applicable project-specific Environmental Safety and Health and Training Requirements Matrix (ESH&TRM), environmental safety and health/training requirements as listed in Part 8 of the contract, site work permits, and the contractor's Safe Work Plan, which is prepared by the contractor and approved by SCEP management. SCEP managers and supervisors are responsible for ensuring compliance with ESH&TRM and/or environmental safety and health/training requirements. All personnel have stop-work authority for imminent safety hazards resulting from noncompliance with the applicable health and safety practices.

All contractor activities conducted in support of A1PII remediation are governed by the safety requirements specified in the remediation contract, which addresses environmental, occupational, industrial, and construction health and safety. In addition to the contract requirements, ESH&TRMs, permits, and the requirements of this document, the contractor will comply with all federal, state, and local requirements (e.g., OSHA). Health and safety requirements and procedures for this Implementation Plan will be governed by the A1PII ESH&TRM, site work permits, contractor's Safe Work Plans and the overall strategy discussed in the SEP (Section 6.0).

A project-specific occupational monitoring strategy will be developed by the FEMP Safety and Health organization for the A1PII project. Contractors will incorporate their occupational exposure monitoring requirements into their Safe Work Plan. These strategies will address ASCOCs for the A1PII project area and will comply with all federal, state, and local requirements (e.g. OSHA, ACGIH).

In accordance with the procedure, "Developing Project-Specific Health and Safety Requirements," FEMP-SH-0001, or equivalent procedure, a ESH&TRM will be developed for A1PII construction, excavation, and impacted material placement activities.

The applicable ESH&TRMs will be included in the contract IFB solicitation packages and will provide the contractors with information related to the possible hazards and the safety requirements to execute each task from which they can develop their specific Safe Work Plans. Section 6.0 of the SEP was revised to include the environmental safety and health/training requirements and to clarify that it will be included in the IFB/RFP package rather than the IRDP. These changes are necessary to comply with the latest revision (July 28, 1997) of FEMP-SH-0001.

The contractor's Safe Work Plan may be revised, as tasks and/or associated hazards and mitigators are identified, added, or deleted. Upon specific request by the EPA, DOE would submit the Safe Work Plans or ESH&TRM for informational purposes only. The ESH&TRM, as well as the detailed Work Plans, will be maintained at the project site, with controlled copies in the project document control files.

A site occupational health and safety representative is assigned to the design team and will review all project design documents to ensure compliance with all applicable worker safety and health regulations. FDF will provide all radiological occupational monitoring for the contractor. RCTs will provide support for A1PII activities. The contractual radiological work requirements for A1PII remediation activities will be detailed in activity-specific Radiological Work Permits (RWPs). . Personnel performing work under a RWP will be briefed on the specific hazards and task requirements before work begins. Radiological control personnel will evaluate the data obtained from field surveys to determine the effectiveness of the radiological controls. Survey results will be forwarded from FDF to the contractors.

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Section 6

6.0 REMEDIAL ACTION MANAGEMENT STRATEGY

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This section describes the A1PII organizational structure, contractor selection process, impacted material management, contingency management protocols, data and records management procedures, the QA/QC process, integration of A1PII activities with other FEMP activities and the activity schedule.

6.1 ORGANIZATION AND RESPONSIBILITIES

The 1991 ACA between DOE and EPA Region V decrees that both agencies have ultimate project management responsibility, with DOE as the designated lead agency. OEPA has an oversight and advisory role, defined by regulatory agreements, for wastewater management (NPDES), hazardous waste management and HWMU closure (RCRA), dust and noise control, groundwater monitoring, and air and water pathways.

The DOE-FEMP Remedial Action Project Manager is responsible for ensuring that FEMP remedial actions meet all project goals, standards, specifications and requirements. The DOE OU5 Team Leader provides DOE-FEMP programmatic direction for A1PII remediation.

The DOE-FEMP Facility Representative will conduct field oversight of the project through Technical Leads, who will be responsible for construction, excavation/remediation, engineering, QA/QC, health and safety, environmental controls and monitoring, and other pertinent aspects of the project. The DOE-FEMP Facility Representative and Technical Leads will consult with the OU5 Team Leader or DOE Remedial Action Project Manager, as appropriate, to seek prompt resolution of any issues or problems.

Actual performance of A1PII remedial activities will be performed by the A1PII Project Team. The project team will primarily consist of FDF personnel. FDF is the company responsible for overall management and remediation at the FEMP. The A1PII Project Team consists of personnel in the Soil and Water Division, with many technical personnel from the SCEP. The A1PII Project Team will be supported by FEMP Soil and Water Division personnel, other FEMP personnel and subcontractors as necessary. Senior SCEP and Soil and Water Division personnel will provide project management and technical guidance to the Project Team. The A1PII Project Team will provide all technical, regulatory,

and administrative input required for the project. As work for the A1PII Project progresses, the project organization will change to perform each particular phase of the project most efficiently. The basic organization will stay the same throughout the project; however, leadership will be shifted from the Area Project Manager (APM) to the A1PII Construction Manager (CM) to best meet the needs of the project. During investigation, study, design, and certification phases, the project will be managed by the APM. During construction phases, the project will be managed by the A1PII CM. This organizational structure will provide clear lines of responsibility and provide leadership with the necessary experience during various phases of the project (i.e., the CM will lead the project during construction phases). The A1PII project organization is shown in Figures 6-1 and 6-2. As shown on those figures, each functional area will contribute personnel resources to support all phases of the A1PII Project.

The A1PII Project includes the following groups, as shown on Figure 6-1:

- Management
- Primary Technical Areas
- Functional Support.

The roles and responsibilities for these groups within SCEP are presented below.

6.1.1 Management

A1PII management includes the SCEP Project Director, APM, A1PII CM (during construction) and administrative support. Except for positions specific to the SCEP, some of the personnel roles and responsibilities listed below are explained in detail in FEMP procedures. Specific responsibilities will be assigned to various groups and personnel as the project is executed and needs change.

The roles and responsibilities of personnel who serve as points of interface between other FEMP projects and A1PII are discussed in Section 6.9. These points of contact with other projects are critical to the progress and success of the project.

6.1.1.1 SCEP Project Director

The SCEP Project Director will have overall responsibility for general direction, guidance, management, and oversight of the project. The SCEP Project Director reports directly to the Vice

President of the Soil and Water Projects Division. The Project Director provides guidance and a point of interface for the APM and A1PII CM and serves as the primary contact for the SCEP with DOE and the regulatory agencies.

6.1.1.2 Area Project Manager and A1PII Construction Manager

The APM oversees and manages the project and has overall responsibility to complete the project scope within budget and schedule parameters during the investigative, design, and certification phases. The A1PII CM has overall responsibility for the project during construction.

The hand off point between the design and construction phases of the project is the approval of the IRDP and Certified for Construction (CFC) drawings. During investigation, design and certification, the project is managed by the APM, who is supported by the primary technical areas (engineering, characterization and construction) and functional support. During construction, the overall project is managed by the A1PII CM is supported by the APM (who will continue to coordinate the Project Engineer and Characterization Lead) and functional support. The A1PII APM will report to the SCEP Project Director at all times. During construction, the APM will also report to the A1PII CM. The general responsibilities of the APM include:

- Overall management of investigative design and certification phases
- Managing non-construction personnel assigned to the area project
- Developing the IRDP and obtaining regulatory approval of the project
- Assuring the technical accuracy and quality of the CFC drawings and the technical specifications through the completion of construction
- Ensuring that the Design Change Notice (DCN) process is properly evaluated and efficiently managed by the Project Engineer
- Coordinating the Project Engineer, Characterization Lead, and other SCEP resources to provide timely and sufficient technical support per the Construction Manager's request during construction
- Facilitating implementation of oversight functions (e.g., QA/QC and WAO, etc.) provided by FDF independent oversight functional organizations on engineering and characterization procedures
- Developing and updating the area Project Execution Plan (PEP) when necessary

- Closing Non-Conformance Reports (NCRs) on engineering and characterization procedures and/or deliverables.

The A1PII CM will report to the APM during the investigative, design, and certification phases of the project, as shown on Figure 6-1. During construction, the A1PII CM will report to the Soil and Water Projects Division CM and the SCEP Project Director. The A1PII CM is in charge of, and accountable for, all A1PII construction activities. Other specific responsibilities include:

- Managing all the FDF Construction personnel (i.e., Construction Contract Managers, Field Construction Engineers, and Construction Coordinators) matrixed to SCEP
- Managing the construction contractor through the Construction Contract Manager
- Ensuring all contractor-initiated Change Orders are properly evaluated and managed through the Construction Contract Manager with technical input from the SCEP and Project Engineer
- Obtaining all the required FDF permits and ensuring all the FDF permit requirements are fully understood and followed by the construction contractor
- Facilitating timely and sufficient implementation of oversight functions (e.g., QA/QC, Safety and Health, WAO, etc.) provided by FDF independent oversight functional organizations on construction procedures and/or deliverables
- Closing any NCR on construction procedures and/or deliverables
- Providing all documentation/information and support required to satisfy the Standard Start-up Review (SSR) requirements for completed operational facilities
- Requesting engineering, characterization, and other administrative support during construction through the APM.

6.1.1.3 Document Preparation and Records Management

Document Preparation and Records Management coordinates and produces all A1PII documents, and manages the records for the A1PII Project in conjunction with ECDC. Project-specific responsibilities include:

- Interfacing with Engineering/Construction Document Control (ECDC)
- Managing project documents
- Coordinating project document reviews, including the review/comment/response process.

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6.1.1.4 Project Controls

The Project Controls group provides the APM and CM with cost and schedule information for all accounts within the project. Specific responsibilities include:

- Ensuring cost and schedule requirements are defined, planned, and monitored against an integrated baseline so that performance can be measured and reported consistent with overall commitments, budgets and available funding
- Establishing cost, schedule, and technical baselines and maintaining them through the issuance of change proposals
- Collecting monthly status reports to identify trends which may result in forecast variances from the baselines
- Assisting A1PII Cost Account Managers (CAMs) and other project personnel in the various administrative duties associated with establishing baselines and forecasts, and ensuring that all charges are directed to the proper accounts as defined in the baselines
- Working with sitewide training coordinators to ensure that individuals assigned to the project are in compliance with established training procedures and guidelines
- Working with division and site commitment trackers to ensure that all project commitments are entered into the tracking systems and that responsible personnel are kept informed of the requirements of each commitment
- Providing adequate documentation of commitment completion to sitewide and division trackers.

6.1.2 Primary Technical Areas

The primary technical areas for A1PII are:

- Engineering
- Construction
- Characterization.

Each primary technical area will receive support from the functional support groups. Engineering and Construction will be supported by contractors.

6.1.2.1 Engineering

Engineering, led by the Project Engineer, provides technical expertise for engineering and design throughout the project. Engineering is responsible to the APM for developing project-specific designs

as well as associated documentation and design modifications. An Architect/Engineer (A/E) Subcontractor will perform design, engineering, and construction phase services (Title I/II and III) for A1PII. Engineering will serve as the primary contact and liaison with the A/E, work with the A/E on a day-to-day basis to address project technical issues, review the A/E's designs and work products, and evaluate the A/E's services. During construction, Engineering processes all Requests for Clarification of Information (RCIs) and DCNs. Specific responsibilities include:

- Reviewing all engineering documents submitted by the A/E and construction contractors for approval, as required by contract documents
- Developing responses to RCIs
- Developing, reviewing and approving DCNs
- Reviewing and approving vendor data submittals or engineering and design components
- Instructing the A/E when to revise construction drawings/technical specifications
- Reviewing and approving "As-Built Drawings" supplied by the construction contractors at the completion of field work
- Verifying that all contractual work has been performed by the A/E
- Verifying that all regulatory commitments are completed and approved.

6.1.2.2 Construction

Construction, under the lead of the CM, will be the lead organization during remedial action, including managing the construction contractors. The CM has a construction coordinator, a construction field engineer, and a construction contracts manager on staff to support these activities. During remedial design, construction will provide input and constructability reviews. Specific responsibilities include:

- Coordinating daily work activities in the field and providing technical direction to the construction contractors within the scope of the contract
- Coordinating day-to-day management of the A1PII field labor force
- Coordinating with and directing the contractor
- Performing contract administration
- Reviewing and approving any modifications or changes to the contract documents

- Approving contract submittals

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- Utilizing the primary area and functional area resources as necessary.

Separate construction contractors provide construction services during the Site Preparation, STP Excavation and Trap Range Remediation contract phases. In accordance with the contract documents, the contractors shall be registered/permitted in accordance with applicable local, state, and federal requirements and shall demonstrate significant prior related experience.

The contractors will report to the CM. They coordinate daily work activities with, and take technical direction from, the CM within the contract scope. The contractors are responsible for all equipment, materials, and activities relating to the project. The contractors are also responsible for scheduling and coordinating work with lower-tier contractors to complete the project within the schedule approved by the CM. The contractors are responsible for updating all construction drawings for any deviations from the original plans and specifications on a daily basis and will prepare as-built drawings.

The contractors are represented on site by qualified field representatives to supervise the performance of all tasks associated with A1PII activities. They are responsible for coordinating and supervising the contractors' work in A1PII. At a minimum, the contractors' field representatives will be responsible for the following:

- Implementing a safety program in accordance with the contract documents
- Discussing and interpreting all elements of the A1PII design and informing the CM of any discrepancies between the plans and specifications and the field conditions
- Distributing all documentation required by the project specifications in a timely manner
- Attending all project coordination meetings
- Scheduling all phases of the applicable A1PII activities
- Maintaining a daily log of all A1PII activities and assisting the CM in reviewing and approving submittals, as necessary
- Implementing and verifying all QC procedures required of the contractor and/or lower-tiered contractors

- Submitting proposed alternative materials or methods to the CM for approval prior to acquisition and use
- Coordinating all technical requirements with the CM.

6.1.2.3 Characterization

The Characterization Lead will coordinate field measurements, sample collection, laboratory analysis, and data management associated with the characterization of waste materials and soil in A1PII.

These responsibilities include:

- Developing project-specific plans (PSPs) and coordinating sampling and analysis to support pre-design
- Evaluating and reporting data and providing associated recommendations and documentation
- Reporting precertification and certification sampling/measurements.

The Characterization Lead will oversee and manage all sampling and analysis activities in A1PII. Sampling personnel are responsible for providing input on PSPs, collecting field data, and performing data management for all sampling activities related to A1PII, as directed by the A1PII Characterization Lead, except for environmental monitoring. The individual sampling tasks are defined in PSPs prepared by the A1PII Characterization Lead, with the technical and writing assistance of sampling personnel.

Environmental monitoring sampling is not performed by A1PII Sampling. Environmental monitoring sampling is covered under the IEMP and will be performed by Environmental Monitoring personnel.

6.1.3 Functional Support

The A1PII Project will require support from the SCEP functional areas. Personnel from these functional areas will be matrixed to the project. Generally, the lead technical group will manage the functional support staff. To the extent possible, functional support will be provided by personnel dedicated to the SCEP.

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6.1.3.1 Safety and Health

S&H support during the project will include:

- Preparing all S&H documents for the project (including a Safety Assessment and S&H matrix)
- Reviewing project documents as they are prepared for compliance with S&H requirements
- Implementing the A1PII Project-Specific Health and Safety Plan
- Assuring that contractors follow safe work practices.

The S&H representative has stop-work authority if unsafe work practices go uncorrected. Any employee of FDF or a contractor can stop work if he or she feels that the work situation is unsafe.

6.1.3.2 Radiological Control

Radiological Control support during the project will include:

- Preparing all required radiological control documents for the project (including radiological ALARA)
- Reviewing project documents as they are prepared for compliance for radiological requirements.

6.1.3.3 Environmental Compliance

Environmental Compliance (EC) support during the project will include:

- Preparing all required EC documents for the project, including the ARARs and TBC summary in the Design Criteria Package and the ARARs crosswalk
- Reviewing project documents as they are prepared for EC requirements
- Coordinating with internal and external groups, including regulatory agencies, regarding regulatory matters
- Providing oversight to ensure compliance with environmental requirements.

6.1.3.4 Quality Assurance

The Quality Assurance (QA) representative will be matrixed to the project from the FDF QA organization. The QA representative will administratively report to the APM and CM but will be

independent of the project team. The QA representative will be responsible for developing and implementing QA plans for the project. The primary responsibility of the QA representative is oversight of QA/QC activities during design, sampling, waste disposition, and construction excavation tasks. The QA representative will monitor and provide support to the project to ensure compliance with FEMP requirements and procedures. QA for A1PII will be performed in accordance with quality program elements identified in the FEMP Quality Assurance Program (RM-0012), the Sitewide CERCLA Quality Assurance Project Plan (SCQ; FD-1000), and the SEP Quality Assurance Project Plan. The QA representative has stop-work authority if quality concerns go unresolved.

6.1.3.5 Waste Management

Waste management support will be provided by a representative from the FDF WAO. Support will include preparation of PWID forms, definition of MTLs, technical direction and oversight for waste stream segregation and management, preparation of FTLs and OSDF Manifests, preparation of waste stream profiles, and coordination with the CM, SCEP Characterization, and Waste Management and Technologies for handling and disposition of waste streams.

6.1.3.6 Natural Resources

Natural Resources personnel will be responsible for assessing the natural resources within the A1PII project area and assessing potential damages for consideration during the design and planning stages of the project. Natural Resources personnel will not monitor natural resources impacts. Monitoring is covered under the IEMP and will be performed by Environmental Monitoring personnel.

Natural Resources personnel will also be responsible for planning and implementing interim and final restoration of the A1PII area as described in the NRRP.

6.1.3.7 Cultural Resources

Cultural Resources will be responsible for handling unexpected discoveries of cultural resources during site preparation and excavation in A1PII.

6.1.3.8 Procurement

FDF Procurement will assist the A1PII Project Team in obtaining services and materials for the project.

6.1.4 Coordination of Excavation Site Activities

Several non-excavation activities will be on-going at each active excavation site. Because of the potential safety hazards associated with construction, these activities must be coordinated and supervised. Such activities include:

- Visual Observation
- Sampling and Monitoring
- Radiological Occupational Monitoring
- Asbestos Monitoring
- Material Documentation
- Occupational Health & Safety Monitoring
- Construction Monitoring
- Surveying
- Visual Dust Monitoring
- Environmental Monitoring
- Safety Inspections.

The following paragraphs describe each of these activities, the personnel involved, and the time required for their tasks. In addition to these responsibilities, the contractor is expected to have one full-time equipment operator, the equivalent of one full-time truck driver, and a part-time supervisor at each active excavation area.

Visual Observation

The active face of all excavation areas will be continuously visually monitored to identify special materials encountered during excavation. This monitoring will be performed by FDF personnel, WAO personnel and the excavation contractor.

Sampling and Monitoring

Physical sampling and/or RSS/RTRAK or HPGe monitoring will be performed as necessary during excavation of A1PII. This work will be performed under the direction of the Characterization Lead.

Radiological Occupational Monitoring

Radiological Control (Section 6.1.3.2) will have one full-time RCT in the field to monitor (Section 6.4.4) for general radiological levels, RWP compliance, and changes in material affecting the classification of the area (such as elevating it from a contamination area to a high contamination area), and to scan any special materials encountered.

Asbestos Monitoring

An "asbestos competent person" will be in the field during excavation of areas where asbestos may be encountered.

Material Documentation

A FDF representative will complete paperwork to document the transfer of material from A1PII to the OSDF. This will include OSDF manifests and FTLs. All trucks hauling to the OSDF from A1PII must leave with an OSDF manifest. The FTL will include tracking by MTL. The FDF representative will use verbal information from contractor personnel to document movements between MTLs. These responsibilities may be included with "visual observation" responsibilities.

Occupational Health and Safety

The contractor will be responsible to monitor the work area for occupational health and safety concerns. This will include occupational dust, compliance with the Safe Work Plan, chemical exposure, other hazards, and changes in field conditions affecting worker safety. FDF S&H (Section 6.1.3.1) will periodically observe health and safety conditions at the active excavation area.

Construction Monitoring

FDF construction (Section 6.1.2.2) will monitor (Section 6.4.2) the work for compliance with the contract documents and direct the actual work. This will be accomplished by one full-time person in A1PII and other personnel on a periodic, part-time basis.

Surveying

The contractor will have a two- to three-person survey crew in the field to provide construction control and to monitor the excavation as the basis for progress payments. FDF may also perform limited surveying to check construction progress.

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Visual Dust Monitoring

The contractor will have the primary responsibility to monitor for dust. However, FDF will also monitor the area for compliance with the BAT dust policy requirements.

Environmental Monitoring

Environmental monitoring will be done on a regular basis by FDF. This will include weekly inspections of surface water control facilities and inspections of surface water control facilities after every major rain event to satisfy SWPPP requirements.

Safety Inspections

FDF S&H (Section 6.1.3.1) will perform weekly safety inspections (Section 6.4.3) of the work area with the contractor. This activity can be coordinated with occupational health and safety monitoring.

6.1.4.1 Typical Field Team

The typical field team at each excavation will consist of one RCT (radiological occupational monitoring), one FDF representative (visual observation and material documentation) and two construction personnel. However, it is possible that more people could be near an active excavation site at any one time. However, only personnel required for actual construction activities will be allowed within 50 feet of the active excavation.

6.1.4.2 Management of Field Personnel

Such a potentially large group of personnel at a single excavation site at any given time creates logistical and safety concerns. Therefore, the responsibility for the management and coordination of all field personnel and activities has been assigned to the CM (Section 6.1.2.2). All personnel needing access to the excavation site will sign in with the CM before entering the excavation area and sign out upon leaving the area. In this way, the CM can control the number of people in a given area, as well as know how many people are in the construction area in the event of an emergency.

6.2 CONFIGURATION MANAGEMENT

An appropriate level of configuration management will be implemented throughout the A1PII project. Configuration management includes identifying, grading, tracking, and controlling the A1PII project technical baselines in accordance with site procedure CM-0001, "Configuration Management," or

equivalent procedure, to ensure consistency among design requirements, physical configuration and technical operations throughout the design, construction and operation stages. Configuration management also ensures the systematic evaluation, coordination, disposition, documentation, implementation, and verification of all changes, and their impact on cost, schedule, and other project technical baselines.

In accordance with site procedure ED-12-4015, "Performance Grading," most of the Systems, Structures and Components (SSCs) for this project have been assigned Performance Grade (PG) 5 based on the importance of hazard mitigation and safety. Some SSCs have been assigned PG 4. PG 5 primarily requires documentation control and additional QA documentation.

6.3 CONTRACTOR PROCUREMENT AND AWARD STRATEGY

As discussed in Section 1.2 and Section 3.0, the major RA contracts for A1PII include:

- Site Preparation
- STP Excavation
- Trap Range Remediation.

The site preparation work will be performed by the Southern Waste Unit Excavation/OSDF Phase II Contractor through a contract modification if a fair and equitable price can be negotiated. This work will be procured and performed in this manner to optimize efficiency, i.e., the SWU Excavation/OSDF Phase II Contractor will be working in the area and should be able to perform the work efficiently.

Procurement and contract awards for the other A1PII RA activities will generally be performed through fixed price/fixed unit price contracts. The FEMP acquisition system follows Federal Acquisition Requirements and is designed to ensure adequate and effective competition among prospective bidders/proposers. The procurement process, which is in accordance with Appendix F of the SEP, is summarized below. The STP Excavation contractor will be procured through an IFB process. The Trap Range Remediation contractor will be procured through an RFP.

Minimum qualifications will be established in the prequalification phase in order to be considered for the competitive bid process. Those firms not meeting the minimum qualifications will not be considered. The IFB/RFP solicitation package will be prepared during the design process by the FDF Construction Engineer with input from Engineering, Safety and Health, QA/QC, Procurement

personnel, and other applicable disciplines. The solicitation package is made up of several parts, including technical specifications and construction drawings, safety and health requirements, training requirements, QA/QC requirements, and the statement of work. Sealed bids/proposals are required to be submitted by potential contractors at a specified place, date, and time.

Following the pre-award survey and the determination that the bidder/proposer is both responsive and responsible, the FDF Contract Administrator recommends and makes the final award. The IFB/RFP solicitation package dictates how many days after award or Notice to Proceed that contractor performance begins and ends.

6.3.1 IFB for STP Excavation

Because the STP excavation is well defined, the contractor will be selected based on responses to the IFB. The solicitation package will be issued as an IFB on or about September 18, 1998; a pre-bid meeting for potential bidders will be held after the solicitation is issued. Sealed bids from interested bidders will then be received and opened; the contract will be awarded to the lowest cost responsible bidder.

6.3.2 RFP for Trap Range Remediation

Interested stabilization contractors were requested to submit Statements of Qualification (SOQs) to FDF via an announcement in the Commerce Business Daily (CBD). FDF reviewed the SOQs and developed a list of qualified vendors.

A Trap Range Remediation contractor will be procured via a RFP in accordance with FEMP construction contractor procurement procedures. FDF will prepare and issue the RFP to the previously qualified companies to give them the opportunity to submit proposals. FDF will then select a contractor to perform the work based on evaluation of the proposals.

The RFP will follow the FEMP construction format. It will require prospective bidders to provide both technical and cost proposals that address the following:

- Base Contract - Treatability Study
- Option 1 - Full Scale Remediation and Stockpiling
- Option 2 - Hauling to OSDF

After the RFP is issued, there will be a pre-bid meeting. The RFP will require submission of sufficient details to describe the stabilization concept. The technical proposals will be evaluated against the criteria and requirements contained in the RFP. The cost proposals will be evaluated against the other contractors and the FDF cost estimate. FDF will then perform an evaluation and select the proposer that provides the best value to FDF and DOE.

6.3.3 Equipment and Material Procurement

The majority of the standard support equipment and materials for the A1PII project will be procured by the contractors performing RA activities. Procurement of equipment and material will be in accordance with design specification requirements consistent with the submittal schedule included in the contract, pending approval. Vendor data will be submitted by the contractor for applicable project team management (contractor's field representative, CM) review to ensure design and specification requirements are met. Responsibility for maintenance and repair of procured equipment and material lies with the contractor until final acceptance and turnover.

6.4 CONTRACTOR MANAGEMENT

FDF will directly oversee the contractor performing remediation work and will be responsible for construction management during the work. Construction management includes, but is not limited to, conducting status meetings, daily work surveillance and inspections, and daily safety tours and oversight of the project. The FDF CM will ensure that safety concerns are brought to the attention of the FDF Safety and Health Officer and the responsible contractor who will correct these concerns. FDF is responsible for implementing the A1PII remedial action project in accordance with DOE direction.

6.4.1 Status Meetings

Upon contract award, the FDF CM will conduct regularly scheduled status meetings with the APM, Engineering, Health and Safety, and QA; construction contractor field representative; and others as warranted. The meetings will address action item status, project progress, planning, schedule status, safety items, quality, environmental protection, and problem resolution.

The construction contractor will be required to submit a daily report (or log) to the CM, covering the previous day's work status and identifying any safety or quality problems encountered. This report and the CM's daily report will be maintained in the FDF project file.

6.4.2 Surveillance and Inspection

The contractor has first line responsibility to inspect work and correct any deficiencies. FDF and the contractor field representative will conduct inspections and surveillances to ensure the design is being properly implemented and contract requirements are being satisfied. QC inspection will be in accordance with the Construction QA Plan and design requirements. If a deficiency is noted, the contractor will be notified immediately in order to implement the necessary corrective action(s) as soon as possible. Failure of the contractor to satisfactorily correct a deficiency will constitute cause to either issue a cure order/notice or to stop work.

6.4.3 Safety and Health Oversight

A Safety and Health representative will be assigned to the A1PII project. While all personnel are responsible for following all safety requirements identified in the project-specific ESH&TRM and the subsequent contractor's detailed Safe Work Plans, as appropriate, the A1PII Project Team personnel will perform periodic surveillance during the A1PII remedial action project to monitor compliance. Although all project personnel have stop work authority for imminent safety hazards, the Safety and health representative will have stop-work authority (in the event of threat to worker and/or public safety) until the proper corrective follow-up actions are taken. The Health and Safety representative assigned to the field project will be the single point of contact for all safety, industrial hygiene, fire protection, and radiological issues or concerns, and will direct those concerns to the CM for resolution/implementation.

6.4.4 Radiological Monitoring and Oversight

To ensure occupational radiological compliance, FDF RCTs will be assigned to the A1PII project. The assigned RCTs will perform the necessary radiological monitoring and oversight to provide documentation demonstrating project compliance with regulatory occupational exposure control requirements. The project-specific ESH&TRM will be the basis for the required project occupational radiological monitoring and will identify action levels to ensure personnel radiological safety, as well as industrial/occupational safety, by limiting exposure.

6.5 IMPACTED MATERIAL MANAGEMENT

Impacted materials generated during A1PII remediation will be managed under the FEMP Waste Disposition Program, which is implemented as an integrated effort by WAO, waste programs, and construction organizations. Roles and responsibilities for each of these organizations are established in Procedure EW-1022, "On Site Tracking and Manifesting of Impacted Material." Programmatic controls begin with waste planning during the pre-design phase, at which time a volume estimate for each waste type (physical matrix combination) is prepared, characterization methods are specified, and tentative interim (if required) and final means of disposal are identified. During project execution, waste streams are segregated by disposition categories and managed in the context of the following characterization, storage, and disposal options:

- Bulk Waste Streams: On Site Disposition
  - Physical matrix allows bulk management
  - Meets the OSDF chemical, radiological, and physical WAC
- Bulk Waste Streams: Off site Disposition
  - Physical matrix allows bulk management
  - Exceeds the OSDF radionuclide WAC (rail transport)
  - Exceeds the OSDF chemical WAC (truck transport)
- Containerized Waste Streams: Off site Disposition
  - Exceeds OSDF chemical, radiological or physical WAC
  - Cannot be processed to meet OSDF WAC
- Containerized Waste Streams: On Site Disposition
  - Physical matrix or nature of waste does not allow bulk management
  - Requires processing in a controlled area to meet OSDF WAC
  - Requires confirmatory sampling for OSDF WAC
  - Special Material that meets the OSDF WAC, but requires special handling for health and safety concerns

Bulk waste stream information will be managed in the IIMS database. Anticipated impacted material segregation protocols are listed in Table 6-1. Relationships between IIMS and other site databases are illustrated in Figure 3-9 in the SEP. IIMS is designed to accommodate fast track, bulk waste stream characterization, OSDF WAC attainment demonstration, and OSDF manifesting by using site characterization data. It interfaces with the Site-wide Environmental Database (SED) through a grid system to retain connections to historical RI/FS and newly generated data when excavated material is moved from the source location. It also interfaces with the SWIFTS to allow electronic transfer of bulk waste inventory to the container management system, when containerization is required.

Field information for input to IIMS will be collected on FTLs and OSDF Manifests, with information subsequently entered to IIMS. Key data elements that are recorded on these forms are listed below:

- Project number and name
- Source MTL
- Interim or final disposition MTL (FTL only)
- Estimated volume of material
- Material matrix or profile number
- Generation date
- Signature

Copies of FTLs and OSDF Manifests are kept in the FEMP Operating Record.

MTLs are defined electronically in IIMS using a grid system. Prior to project start-up, SED data are reviewed, and contiguous areas with like data are identified as unique MTLs. MTLs are identified on project drawings and in the field. When data from an FTL log is entered to IIMS, SED data for the specified MTL is tied to excavated soil volumes that have been moved to either an interim (pre-remediation area, stockpile, or container) or final (OSDF disposal) location. IIMS maintains transaction histories to provide cumulative analytical data for soils that are moved more than one time. The main types of MTLs include WAC attainment areas, stockpiles and the OSDF.

A root profile is assigned to each of the five primary waste streams designated for OSDF disposal:

Profile # 91,000	OSDF Category 1	Soil and soil-like material
Profile # 92,000	OSDF Category 2	Debris for en masse placement
Profile # 93,000	OSDF Category 3	Debris for individual placement
Profile # 94,000	OSDF Category 4	High organic content (humus & vegetation)
Profile # 95,000	OSDF Category 5	Friable asbestos-containing material, sludges, materials requiring case-by-case approval

Numeric extensions (e.g., 91,001...95,999) are used for further waste stream delineation on an as-needed basis. The second digit of the profile number identifies the OSDF Category of the waste material. The waste profile number facilitates electronic information retrieval from IIMS. It also supplementary information such as material descriptions and data group identifiers for characterization data maintained in impacted waste stream characterization records and the SED.

All wastes manifested to the OSDF will be covered under a waste stream profile. The manifest number facilitates retrieval of electronic characterization information from IIMS, if required, to support a determination that the waste meets WAC.

6.6 CONTINGENCY MANAGEMENT

Conditions which are unexpected, cannot be managed through established excavation guidelines, or are not accommodated in the detailed remedial design, will be dealt with according to contingency management protocols and plans set forth in Appendix F of the SEP. These contingencies are categorized as follows:

- Unearthing of materials that require special handling
- Encountering contamination or soil conditions which may pose a risk to human health or the environment if standard excavation practices are used, or which are significantly different than expected, or which may affect other operations.
- Discovering unexpected cultural or historic resources.

6.6.1 Materials Which Require Special Handling

Plans for managing special materials encountered during A1PII remediation are addressed in Section 3.2.6. Such materials include asbestos-containing materials (e.g., asbestos-impregnated bituminous wrapped gas pipeline, transite conduit, if any, for the electrical cable to the DO Facility Transformer) which are reasonably expected to be encountered. Special materials may also be encountered that are of a type or in a location that has not been anticipated and specifically addressed elsewhere in this plan. Protocols for handling such materials are described in Table 3-1. These protocols, together with those outlined in Appendix F of the SEP, will be used for the management of unanticipated materials in the identified categories.

As indicated in Table 6-1, some special materials may meet the OSDF WAC, while others will require off site shipment. SCEP/ WAO will provide assistance to Construction for field decisions related to management and disposition of special materials and, if applicable, will arrange for movement of materials to the appropriate FEMP storage and handling areas for characterization, treatment evaluation, and final disposition arrangements.

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6.6.2 Unexpected Contamination or Soil Conditions

A1PII excavations could progress to a point where continued work would cause the remedial action to differ from the design, such as:

- Excavating outside an area of feasible storm water control, as needed
- Encountering soil types or excavation depths that are not within design parameters
- Discovering contamination in an area that impacts present or planned future land use.

In accordance with the SEP, the FEMP design change process would be used to effect design changes in cases where conditions and design changes do not differ significantly from those already acknowledged and approved for the project. If conditions are significantly different from the approved design, one of the following options would be exercised:

- Revising the design within SEP guidelines, submit a letter to regulatory agencies describing the design revision, and proceed with excavation.
- Stopping work at the boundary of the problem condition, and address the continued excavation in a subsequent IRDP.
- Discussing optional approaches with the regulatory agencies to determine if the area must be addressed as an exception to SEP guidelines.

Conditions recognized as falling in this contingency category and plans for managing these conditions are listed in Table 6-2.

6.6.3 Unexpected Discovery of Cultural or Historic Resources

If cultural resources are discovered, the contingency plan as described in Appendix F of the SEP will be implemented. Contractors will be trained to the plan and on how to recognize a potential cultural resource, as needed. Personnel will ensure safe handling of the resources by isolating the affected area until an on-call specialty contractor can perform any necessary data recovery. The specialty contractor is required to be on site within four hours. DOE will consult with the appropriate parties (e.g., OHPO), pursuant to 36 CFR Part 800, to determine a course of action, avoiding and minimizing any adverse impacts to the extent practical. If human remains, or associated funerary objects, unassociated funerary objects, sacred objects, or objects of cultural patrimony is discovered, the appropriate Native American tribe(s) will be consulted. During the consultation, DOE will cease activity in the immediate area and make a reasonable attempt to secure the remains and/or objects. Work stoppages in the

immediate area would last at least 30 days. See Appendix F of the SEP and FEMP procedure EP-0003, "Unexpected Discovery of Cultural Resources," for additional details.

6.7 DATA AND RECORDS MANAGEMENT

Data and records management for the A1PII remediation will be in general accord with the strategy and protocols as described in Section 3.6 of the SEP and quality assurance protocols for data management activities as described in Appendix E of the SEP. The primary documents that will be generated during A1PII remediation and the files in which they will be maintained are identified in Table 6-3.

6.8 QA/QC AND REGULATORY AUDIT

A1PII project activities will be assessed to verify compliance to program requirements specified in the A1PII Implementation Plan. This will include audits, surveillances and inspections commensurate to the scope of assessment and level of verification with respect to field tasks, contract execution and programmatic implementation of driver documents. Quality assurance programmatic drivers are the DOE-approved FDF QA Plan, (RM-0012), the EPA-approved Sitewide CERCLA QA Project Plan (SCQ), and Appendix E of the SEP Quality Assurance Project Plan (QAPP).

The applicable quality requirements will be specified in all planning documents defining project activities. This includes Data Quality Objectives (DQOs) and Project Specific Plans (PSPs) that serve as planning and field instructions for environmental real-time and physical sampling to support project data collection. Additionally, the engineering design packages will include the necessary QC to assure conformance to design specifications. Part 9 of the contract documents describes appropriate QA requirements. A Construction Quality Assurance Plan will be submitted by construction contractors for SCEP approval. Other documents that require QA review and concurrence are procedures, purchase requisitions and PEPs.

The SCEP QA lead will coordinate project QA/QC oversight through audits, surveillances, inspections, vendor surveys, and other internal assessments needed to verify quality related to IRDP activities. External assessments from FDF will also be coordinated with the SCEP QA lead. The contractor will be responsible for field inspections, nonconformance identification, and corrective action that is documented in a controlled manner.

The DOE-FEMP, EPA, and OEPA have ready access to IRDP field activities, planning documents, and databases as necessary to assess and verify IRDP implementation. The OEPA has FEMP oversight responsibility for NPDES, RCRA, dust and noise control, ground water monitoring, air and water pathways, and related split-sampling programs.

All FDF procurement requisitions are reviewed and signed by SCEP QA. The A1PII QA representative will identify materials receipt inspection requirements and when vendor source inspections are necessary. Nonconforming items will be tagged and dispositioned as unacceptable until corrective measures are determined.

6.9 INTEGRATION OF A1PII PROJECT WITH OTHER FEMP ACTIVITIES

A1PII remediation activities are planned and will be conducted in cooperation with other FEMP remediation projects and activities to ensure effective and efficient attainment of project-specific and sitewide remediation objectives. Interface with many FDF support groups is ensured by means of functional support representatives who are integral members of the A1PII Project team (e.g., environmental compliance, natural and cultural resource management, sampling and analysis). However, as noted in Section 6.1, the Area Project Manager and CM (during construction) are responsible for ensuring that coordination is established and maintained with other projects and support groups, and the Project and Construction Engineers are responsible for effecting this coordination on a day-to-day basis. Key interfaces with organizations not directly represented on the A1PII Project Team include the following:

- Sitewide Planning and Scheduling
  - Integrating the A1PII plan and schedule with the FEMP master schedule

- OSDF Project
  - Planning and scheduling activities in the southern (Sector 1) portion of A1PII to accommodate OSDF construction and development of the OSDF Borrow Area and OSDF Haul Road, and to provide a storm water management system for A1PII that can be readily modified to accommodate storm water management needs for OSDF operations and the OSDF Borrow Area. Key elements of coordination include area certification; construction of the A1PII Sediment Basin and Outfall Channel; Trap Range remediation and certification, and development of A1PII Borrow Area in southeast corner of A1PII

  - Planning and scheduling remediation of the northern (Sector 2) and central (Sector 3) portions of A1PII to accommodate OSDF cell construction and

related support activities, including construction of the OSDF Borrow Haul Road and the A1PII Conveyance Channel component of the storm water management system. Key elements of coordination include location and movement of stockpiles, surface and subsurface excavation in the STP Area, excavation of subsurface utilities and surface soil, removal (as necessary) of sediment from sediment basins, and area certification

- Planning and scheduling activities to ensure timely placement of A1PII impacted material into the OSDF in accordance with the Impacted Materials Placement Plan and other pertinent requirements

- Coordinating construction and certification as necessary to enable removal of the Phase I North Entrance Road segment and construction of the planned Phase II alignment after A1PII remediation activities under this plan are complete

- Southern Waste Unit Excavation and OSDF Phase II Project
  - The A1PII Site Preparation work will be performed by the SWU Excavation/OSDF Phase II Contractor.

- Facilities Closure & Demolition Project (FC&DP)
  - Coordinating above-grade demolition of STP components, STP Incinerator, Trap Range Building, etc. with at-grade and below-grade remediation of these facilities by SCEP under this IP, including delineation of breaklines, digester sludge removal and stockpiling, scheduling, stockpiling, access controls, support facilities, interim stabilization measures, facilities turnover. Includes cooperation of Aquifer Restoration & Wastewater Treatment Projects regarding scheduling of STP utility construction, STP shutdown and condition of facilities upon turnover.

- Aquifer Restoration & Wastewater Treatment Projects
  - Planning and implementing construction to accommodate continued operability of the AWWT discharge line, Outfall Line Pit (Flume Building), and DO Facility, including provisions for constructing a new access road to DO Facility/Flume Building to replace present STP/DO Facility access road, which will be removed

  - Coordinating anticipated needs for collecting, transporting and treating perched water encountered during excavation and/or storm water recovered from STP excavation and other remediation-generated water (e.g., decontamination wastewater) with current and anticipated capabilities (e.g., influent flow volume and quality requirements, removal efficiencies) of AWWT and associated conveyance system. Includes coordination to discharge water into the Leachate Conveyance System

  - Assessing potential adverse effects on the GMA from deep excavations (STP Area, STP influent/effluent lines, OSDF Sedimentation Basin) and designing and implementing measures to ensure protectiveness.

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- Site Utilities
  - Coordinating installation of electrical power supply and communications lines to A1PII Support Area and Radiological Control Point Facility
  - Coordinating as necessary to remove, replace, or relocate other utilities, including replacement of buried electric cable to DO Facility transformer with overhead line, abandonment of CG&E fuel gas line and removal of water supply lines.
- Waste Pits Remedial Action Project
  - Staging above-WAC soil designated for disposition to an off site PCDF
- Waste Acceptance Organization (WAO)
  - WAO, an FDF organization independent of both the soil- and debris-generating projects and the receiving OSDF project, has programmatic responsibility for the OSDF WAC attainment compliance assurance program presented in the WAC Attainment Plan (20100-PL-0014). WAO representatives will provide oversight of field activities from impacted material origin to OSDF receipt.
- FDF Real Estate Office
  - Coordinating to obtain cooperation of CG&E and Mid-Valley Pipeline Company on matters potentially affecting their utility facilities or areas within easements for these facilities, including excavation on or near CG&E rights-of-way (e.g., STP Area excavation) and Mid-Valley Pipeline Company right-of-way (for borrow material)
  - Coordinating to secure agreement for off-property remedial activities, if necessary (e.g., off-property impacted area sampling and excavation).

6.10 SCHEDULE

In accordance with the ACA, this Implementation Plan identifies A1PII project-specific milestones for both certification and remedial actions. These milestones are subject to enforceable deadlines by EPA.

The certification process is defined by sectors and sub-sectors. As discussed in Section 1.0 and Section 3.0, A1PII is segmented into three sectors and more defined sub-sectors (Figure 1-3). The certification schedule, consisting of submission of the CDL and the Certification Report to the regulatory agencies, is presented in Table 6-4 in terms of sector and subsector. Certification is summarized below:

- Except for soils in the Trap Range (Subsector 1A), certification of Sector 1 is complete. Sub-sector 1B was certified to serve as a source of select borrow material for OSDF construction. In addition, two small areas of Sector 2 (Sub-sector 2A) were

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certified at the same time to allow unencumbered construction of OSDF Cell III and the northernmost portion of the OSDF Borrow Area Haul Road.

- Sector 2 remediation includes removal of the A1PI East and West Stockpiles and remediation of the OSDF Sediment Basin. These actions, including removal of impacted surface soils, will be performed by the Southern Waste Units/OSDF Phase II Construction. Sector 2 certification activities are planned to commence immediately following completion of these activities.

- Sector 3 certification will be performed after construction activities for the STP Excavation Contract are completed. Certification of Sector 3 will allow backfilling of the excavated STP Area, which must be completed before construction of the southern leg (Phase II) of the rerouted North Entrance Road. The construction of the latter and subsequent removal of the Phase I North Entrance Road By-Pass is a constraint on construction of OSDF Cell V.

The RA schedule is summarized on Table 6-5. As shown on that table, the three A1PII RA projects are interrelated and will be performed in a logical and sequential manner that is integrated with the A1PII certification schedule and the overall FEMP schedule.

TABLE 6-1
SEGREGATION PROTOCOLS FOR A1PII IMPACTED MATERIAL WASTE STREAMS

WASTE STREAM	SEGREGATION PROTOCOLS
Lead-contaminated Soil	If not stabilized and disposed on site: Bulk containerize (e.g., roll-offs) or stockpile, and sample for PCDF WAC; ship off site in bulk by truck for either treatment or disposal, pending sample results.
F-listed AWAC Sludge (Sludge Cake)	Containerize and sample for PCDF WAC; ship off-site by truck for either treatment or disposal, pending sample results.
BWAC Material	Segregate in accordance with OSDF waste stream categories in Table 5 of EW-1019. Physical processing, as necessary, of debris for OSDF disposition. Confirm chemical/radiological OSDF WAC compliance per EW-1019 Tables 3 and 4. (Note that Table 3 prohibitions apply only to areas defined in the OU2 and OU5 RODs as potentially RCRA toxicity characteristic.) FTL to temporary staging area, or manifest to OSDF.
Prohibited Items	Off site containerized shipment by truck to NTS or PCDF. See Table 2 of EW-1019 for list of prohibited items.
AWAC Special Material	Off-site containerized shipment by truck to NTS or PCDF. See Table 1 of EW-1019 for list of special materials.
BWAC Special Material	Segregation of prohibited items and special materials. Physical processing, as necessary, of remaining debris for OSDF disposition. See Table 1 of EW-1019 for list of special materials. FTL to temporary staging area, or manifest to OSDF.
Remediation-generated wastewaters	See Section 3.4.4.

AWAC = Above OSDF Waste Acceptance Criteria
BWAC = Below OSDF Waste Acceptance Criteria
FTL = Field Tracking Log
NTS = Nevada Test Site
OSDF = On Site Disposal Facility
PCDF = Permitted commercial disposal facility
RCRA = Resource Conservation and Recovery Act
ROD = Record of Decision
WAC = Waste Acceptance Criteria

TABLE 6-2
CONTINGENCY PLANS FOR RECOGNIZED BUT UNEXPECTED CONDITIONS

CONDITION	CONTINGENCY PLAN
Discovery of unexpected underground utilities.	Stop work in the area. Coordinate with Site Utilities and, if appropriate, non-DOE utility owner to determine utility location information, jurisdiction, operational status, necessary safe shutdown requirements (e.g., electrical de-energizing, gas pipeline capping and purging), and remediation options. Revise the design within SEP guidelines and protocols described in this IP for known utilities. Submit a letter to regulatory agencies describing the design revision, and proceed with excavation.
Discovery that soil contamination above FRLs extends off property in STP area.	Restrict excavation to on-property portion of excavation. Seek and obtain FEMP approval to proceed with off-property activities, including any necessary investigations and excavation. Develop any necessary project-specific sampling plans and revise design, including modification of access controls and radiological control boundaries, as necessary, within the guidelines established in the SEP and corresponding on-property excavation protocols established in this IP. Submit letters describing investigation plans and design changes to the regulatory agencies, and proceed with investigations and excavation.
Discovery that excavation of contaminated soil in the STP Area potentially compromises the stability of CG&E electric transmission tower located immediately north of the STP area.	Restrict excavation as necessary to ensure tower integrity. Coordinate with Site Utilities, CG&E, and FC&DP to determine necessary safe shutdown requirements, design/construct activities for removal of existing tower and installation of replacement tower, and remediation approach, including any necessary additional investigations and excavation. Develop any necessary project-specific sampling plans and revise design, including modification of access controls and radiological control boundaries, as necessary. If the design conforms to SEP guidelines or protocols established in this IP for removal of tower, submit letter describing investigation plans, design changes, and schedule implications to the regulatory agencies, and proceed. Otherwise, discuss optional approaches with the regulatory agencies to determine if the area must be addressed as an exception to guidelines.
Discovery of AWAC material outside of areas designated for excavation in the IRDP.	Prepare options for remediation. If the design would conform to SEP guidelines, submit letter describing investigation plans, design changes, and schedule implications to the regulatory agencies, complete design, and proceed. Otherwise, discuss optional approaches with the regulatory agencies to determine if the area must be addressed as an exception to guidelines.
Perched water/storm water accumulated in the STP excavation exceeds AWWT Phase II system's available capacity to store or treat.	Retain accumulated water in the excavation until capacity available.
Perched water/storm water accumulated in the STP excavation exceeds AWWT Phase II system's acceptance guidelines for floatable oil and grease (i.e., visible sheen).	Retain accumulated water in the excavation; develop and implement field procedure to safely remove oil and grease (e.g., with absorbants) before transfer.

ARWWT = Aquifer Restoration & Waste Water Treatment Project
AWAC = Above OSDF Waste Acceptance Criteria
AWWT = Advanced Waste Water Treatment facility
CG&E = Cincinnati Gas & Electric
DOE = Department of Energy
FC&DP = Facilities Closure & Dismantlement Project
FEMP = Fernald Environmental Management Project
IP = Implementation Plan
IRDP = Integrated Remedial Design Package
SEP = Sitewide Excavation Plan
STP = Sewage Treatment Plant

TABLE 6-3
A1PII PRIMARY RECORDS AND ASSOCIATED FILES

DOCUMENT	FILE
Construction drawings and associated field logs	• IIMS GIS Component • Engineering/Construction Document Control
Miscellaneous Field Logs	• Engineering/Construction Document Control
Manifest-type Documents	• IIMS SWIFTS Component • Engineering/Construction Document Control
Containerized Impacted Material Documents	• IIMS SWIFTS Component • Site Operating Record
Analytical Data and Associated Field Logs	• IIMS SED Component • Engineering/Construction Document Control

IIMS = Integrated Information Management System
GIS = Geographic Information System
SWIFTS = Sitewide Information Forecasting and Tracking System
SED = Sitewide Environmental Database

TABLE 6-4
A1PII CERTIFICATION SCHEDULE

Sector/Subsector	Submit CDL to Regulatory Agencies	Submit Certification Report to Regulatory Agencies	Comments
Sector 1			
1A - Trap Range	June 1999	November 1999	Certification will be completed after stabilization and excavation of lead contaminated soil
1B - Borrow Areas and remainder of Sector 1 (outside Trap Range)	November 21, 1997	June 30, 1998	Certification is approved by regulators and borrow operations began in Summer 1998
Sector 2			
2A - North and East areas of Sector 2	November 21, 1997	June 30, 1998	Certification was completed and approved with Sub-sector 1B
2B - Remainder of Sector 2	December 31, 1998	April 31, 1999	Will be performed after removal of stockpiles and facilities from area
Sector 3			
3A Utility Corridors outside STP Excavation Area	March 1999	August 1999	Utility excavations will be backfilled by STP Excavation contractor
3B STP Excavation Area	June 1999	December 1999	
3C Remainder of Sector 3	June 1999	December 1999	

TABLE 6-5
A1PII REMEDIAL ACTION SCHEDULE

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RA Phase/ Contract	Complete CFC Package	Award Contract	Begin Construction	Complete Construction	Comments
Site Preparation	August 21, 1998	September 28, 1998	October 10, 1998	December 30 1998	Work will be performed by SWU Excavation/ OSDF Phase II contractor
STP Excavation (Sector 3)	September 25, 1998	December 15, 1998	April 1, 1999	November 30, 1999	IFB Procurement
Trap Range Remediation (Sub-sector 1A)	October 15, 1998	January 15, 1999	July 1, 1999	September 30, 1999	RFP Procurement. STP Excavation contractor may haul stabilized material to OSDF

STP = Sewage Treatment Plant
SWU = Southern Waste Unit
IFB = Invitation for Bid
RFP = Request for Proposal
OSDF = On Site Disposal Facility

Figure 6-1
Area 1, Phase II Project Organization
During Investigation, Design and Certification Phases

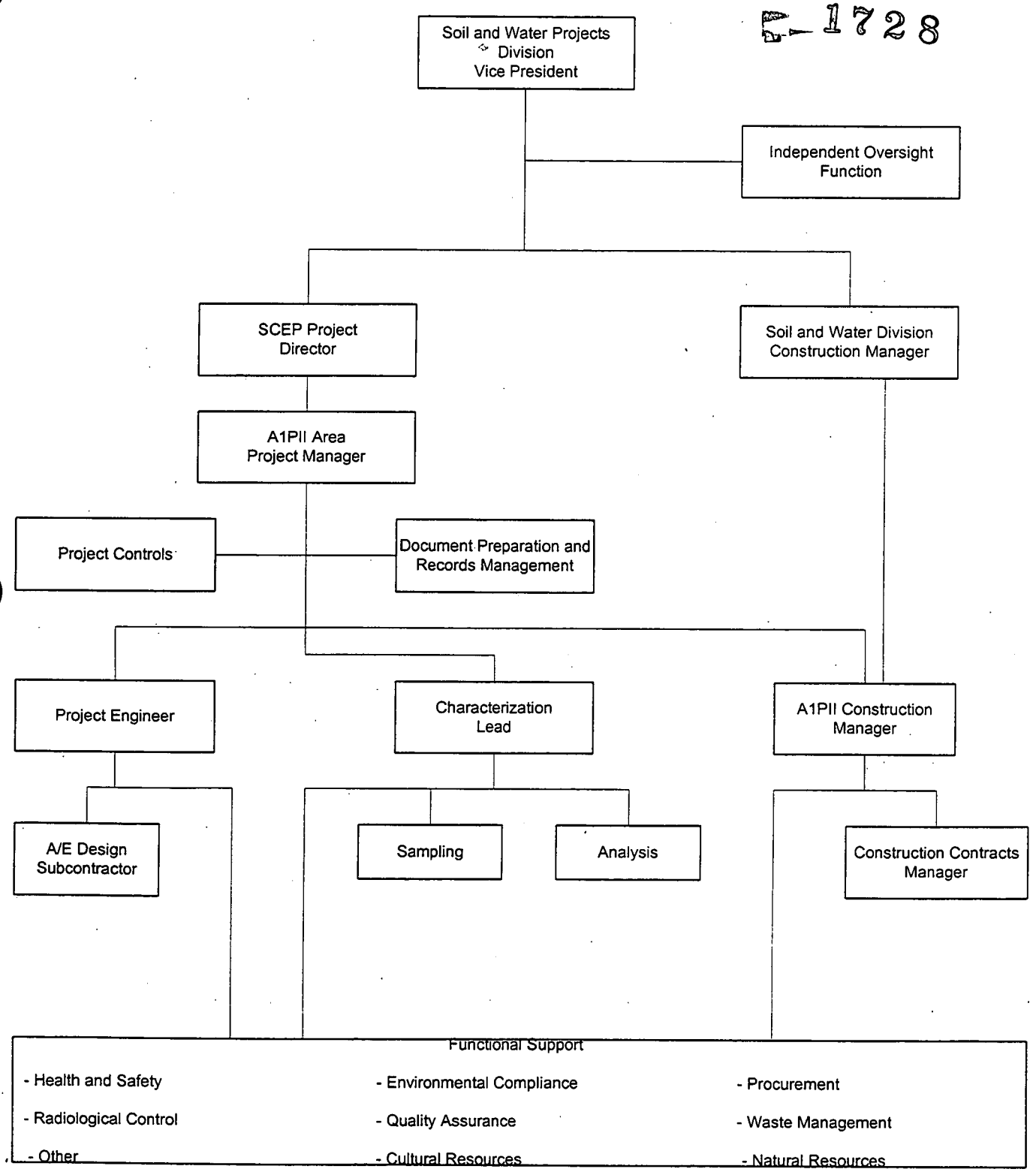
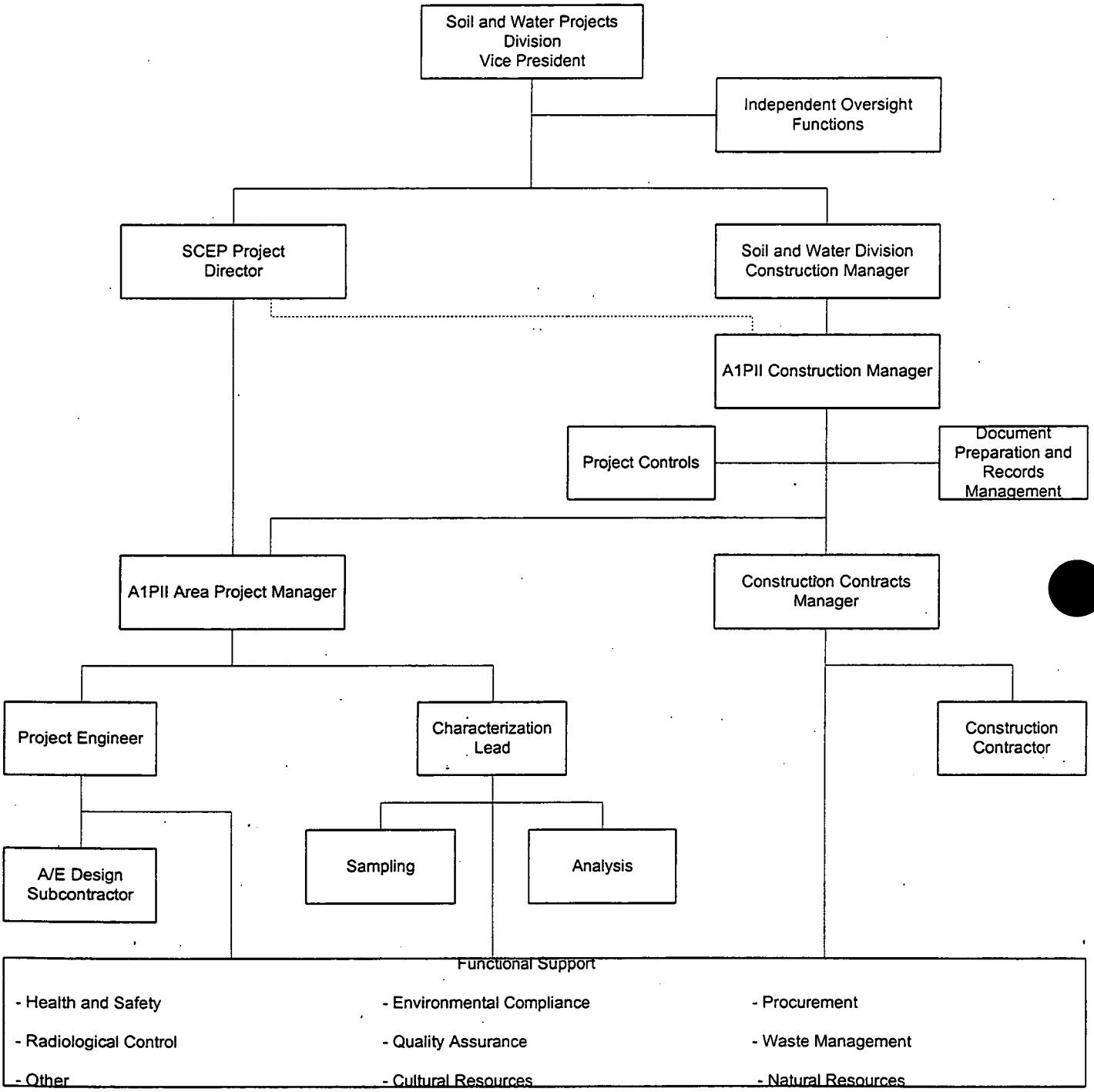


Figure 6-2
Area 1, Phase II Project Organization During Construction Phase



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Appendix A

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APPENDIX A

DESIGN CRITERIA PACKAGE

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Design Criteria Package
for
Remedial Design Services
Remediation Area 1, Phase II

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Environmental Remedial Action Project
Fernald Environmental Management Project
Fernald, Ohio
FDF Subcontract No. 2-21487
Project Order 175/Task Order P-012

PARSONS

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LIST OF ACRONYMS AND ABBREVIATIONS

A1PI	Area 1, Phase I
A1PII	Area 1, Phase II
AASHTO	American Association of State Highway and Transportation Officials
ABMA	American Bearing Manufacturers Association
ACGIH	American Conference of Governmental Industrial Hygienists
ALARA	As Low As Reasonably Achievable
ASCE	American Society of Civil Engineers
ANSI	American National Standards Institute
ARAR	Applicable or Relevant and Appropriate Requirement
ASME	American Society of Mechanical Engineers
ASNT	American Society for Non-Destructive Testing
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
AWWT	Advanced Wastewater Treatment (Facility)
BSL	Biodenitrification Surge Lagoon
CFC	Certified for Construction
CFR	Code of Federal Regulations
CG&E	Cincinnati Gas and Electric
D&D	Decontamination and Decommissioning
DCN	Design Change Notice
DCP	Design Criteria Package
DO	Dissolved Oxygen (Facility)
DOE	United States Department of Energy
EPA	Environmental Protection Agency
FC&DP	Facilities Closure and Demolition Project
FDF	Fluor Daniel Fernald, Inc.
FEMP	Fernald Environmental Management Project
FRD	Functional Requirements Document
FRL	Final Remediation Level
HDPE	High Density Polyethylene
IEEE	International Electrical and Electronics Engineers
LCS	Leachate Conveyance System
NEMA	National Electrical Manufacturers Association
OAC	Ohio Administrative Code
ODNR	Ohio Department of Natural Resources
ODOT	Ohio Department of Transportation
OSDF	On-Site Disposal Facility

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OU	Operable Unit
PLS	Permanent Lift Station
POP	Project Order Plan
PSHSP	Project-Specific Health and Safety Plan
psi	pounds per square inch
RCI	Requests for Clarification of Information
RCRA	Resource Conservation and Recovery Act
SCS	Soil Conservation Service
SFES	South Field Extraction System
S/RID	Standards/Requirements Identification Document
SWMP	Surface Water Management Plan
STP	Sewage Treatment Plant
STRA	Short Term Risk Assessment
TBC	To Be Considered
UL	Underwriters Laboratories Incorporated
μg/l	microgram/liter
VDS	Vendor Data Submittal
WAC	Waste Acceptance Criteria

SECTION 1

PROJECT DESCRIPTION

The Fernald Environmental Management Project (FEMP) is a 1,050 acre facility located in southwestern Ohio approximately 18 miles northwest of downtown Cincinnati, Ohio. The mission of the facility was to provide high-purity uranium metal products to support United States defense programs. Production operations were discontinued in 1989. Subsequently, the United States Department of Energy (DOE) decided to decontaminate and dismantle the facility and began environmental remediation of the site.

To facilitate management of the environmental remediation activities, the site was divided into seven sitewide remediation areas as shown in Figure 1-1. Several of these areas will be remediated in phases. Area 1 is subdivided into two major phases (Phase I and Phase II). Remedial design for Area 1, Phase I (A1PI) was completed in May 1996. Remediation of A1PI began in September 1996 and was completed in March 1997.

Area 1, Phase II (A1PII) encompasses approximately 153 acres and is located in the southeastern part of the FEMP (as shown in Figure 1-1). It is bordered on the east and south by the FEMP boundary; on the west by the South Access Road, an unnamed stream and former production area; and on the north by A1PI. The terrain in this area is rolling pasture.

This Design Criteria Package (DCP) will serve as the basis for the Title I, II, and III design services for the remediation of A1PII.

The DCP is developed consistent with the requirements of the Functional Requirements Document (FRD) prepared by Fluor Daniel Fernald (FDF), the Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considered (TBC) requirements prepared by FDF (Appendix A), appropriate DOE regulations, United States Environmental Protection Agency (EPA) directives, Ohio Environmental Protection Agency standards, Ohio Department of Natural Resources (ODNR) standards, and FDF Standards/Requirements Identification Documents (S/RID). The outline of the DCP is consistent with the FEMP Engineering Procedure Number 12-4003, Design Criteria Package, Revision 1.

1.1 Project Scope

PARSONS will provide necessary Title I/II design services, including reports, plans, calculations, drawings, specifications, and support FDF as necessary to obtain DOE and regulatory approval for the remediation of A1PII. The design will meet the requirements presented in the FRD, and will be in compliance with the ARARs and TBCs. During construction PARSONS will provide Title III support services to FDF as requested.

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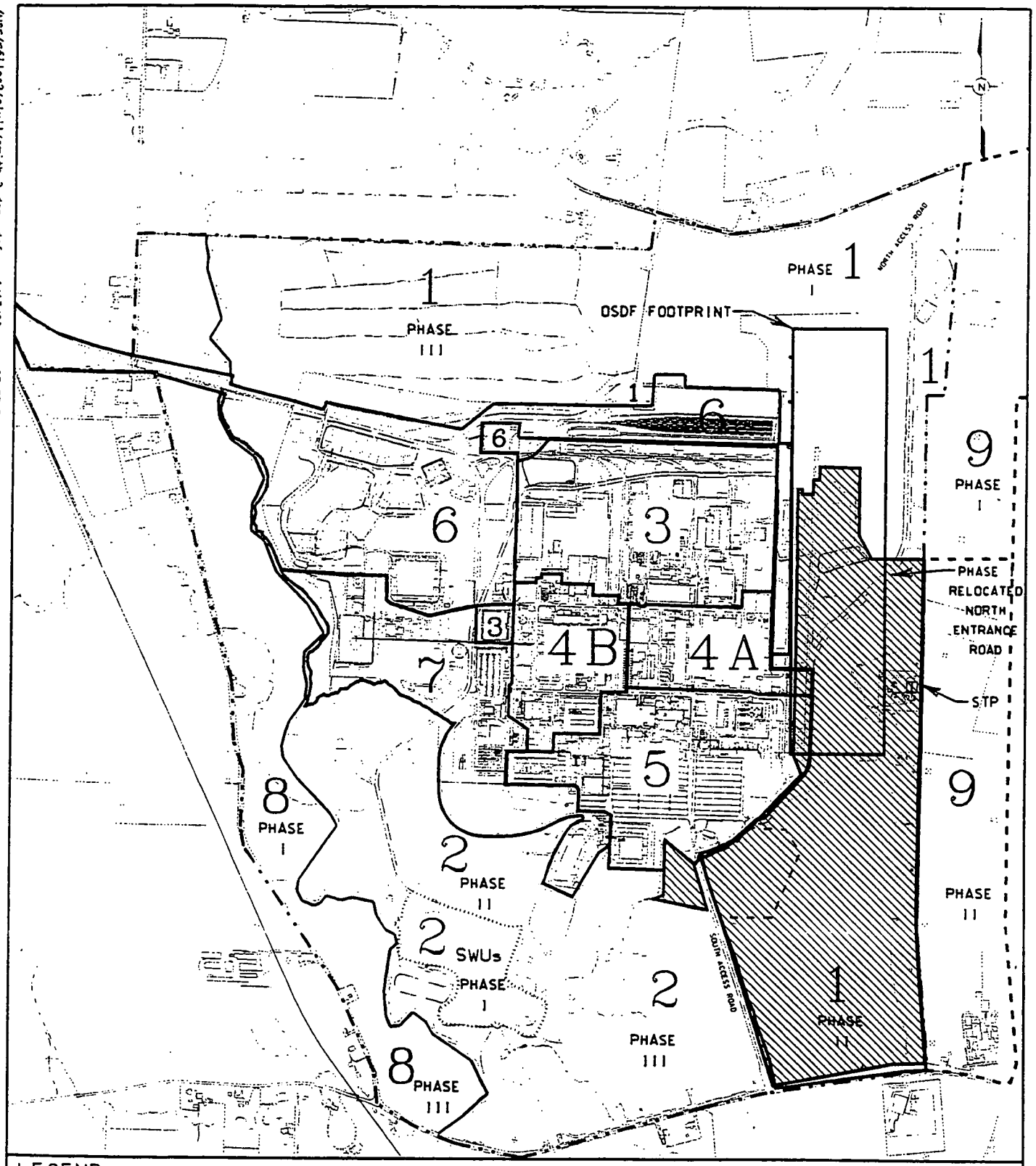

LEGEND:

AREA 1-PHASE II

PHASE BOUNDARIES

FEMP BOUNDARY

1 REMEDIATION AREA

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SCALE

1200 600 0 1200 FEET

FIGURE 1-1. SITEWIDE REMEDIATION AREAS

REF: SITEWIDE EXCAVATION PLAN, CURRENT REVISION

1.2 Description of Alternative Selected

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The design work proposed for A1PII is the result of the Remedial Investigation/Feasibility Study (RI/FS) process wherein the contamination, which was a result of a variety of past operating practices, was identified and delineated. The proposed alternative of contaminated soils excavation with on-site disposal, was selected as the remedial action. For overall project planning purposes, identification of work areas, and to better control access, Sectors (1-3) were defined as shown on Figure 1-2.

Potential contamination in A1PII includes wind-blown radiological contaminants from the former production area and the incinerator in the Sewage Treatment Plant (STP). The Trap Range area contains soil with concentrations of arsenic and lead above the final remediation level (FRL); in some locations the lead concentration exceeds the Resource Conservation and Recovery Act (RCRA) toxicity characteristic threshold of 5 mg/L or its corresponding 20X rule value of 100 mg/kg. The Sludge Drying Beds in the STP are designated as a hazardous waste management unit.

Using soil sample analytical results, FDF has estimated the approximate extent of soil excavation required to achieve the remedial objectives outlined in the Operable Unit (OU) 5 Record of Decision (ROD). The required excavation limits are defined by a model which consists of the three-dimensional (3-D) surface (1-foot interval topographic contours) defining the required excavation expected to satisfy FRLs.

The objective of the design work is to prepare design documents, in accordance with the Project Order Plan (POP) and this DCP, to excavate at-grade and below-grade structures, utilities and impacted material above FRLs in A1PII.

The currently existing Advanced Waste Water Treatment Facility (AWWT) discharge line, Dissolved Oxygen (DO) Facility, Mid-Valley Pipeline Company oil pipeline, and the Cincinnati Gas and Electric (CG&E) electrical transmission towers, with the exception of one tower noted below in Sector 3, will remain during and after the A1PII work. Specifications or other measures will control required nearby soil excavation to avoid potential damage to the towers or their foundations. The Facilities Closure and Demolition Project (FC&DP) is responsible for the demolition and disposal of all above grade facilities to be removed in A1PII.

1.2.1 Design Packages

For the A1PII work up to five design packages (drawings, specifications, and associated documents) are currently planned, including an initial Site Preparation Package and a subsequent STP Excavation Package. It is also planned that work associated with stabilization and removal of some lead contaminated soil, described more completely below, will be presented in a separate design package (Trap Range Remediation).

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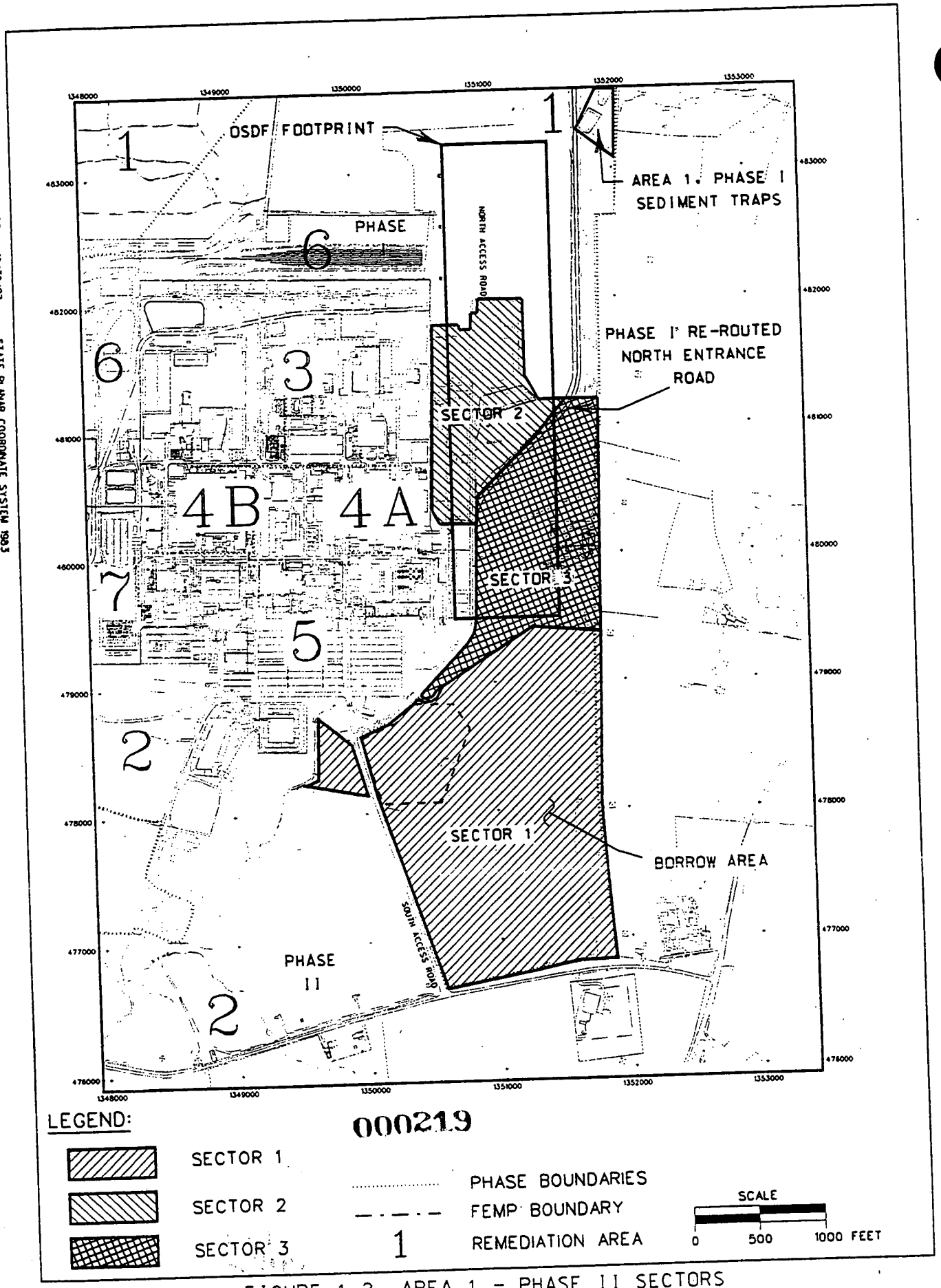

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FIGURE 1-2 AREA 1 - PHASE II SECTORS

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Two other packages, including an A1PI Sediment Trap Certification package and an STP Backfill Borrow Area package are also included with this project. The work associated with these final two packages may instead be incorporated into other packages. This DCP applies to all the design packages. It will be revised and reissued as necessary through the course of project work as the various design packages are finalized.

1.2.2 Sectors

The Site Preparation Package will mainly consist of the stormwater controls facilities described in the following Section 1.3. The STP Excavation Package will contain most other project work except for the three other packages as noted above. The sectors shown in Figure 1-2 will also be identified in the packages and may be used to phase some of the package construction in order to integrate it with the entire FEMP site remediation plan and schedule. Most access controls (i.e., fencing and gates) to be presented in the design packages will be developed based on the sector limits. The limits of the sectors are based primarily on readily identifiable features (mainly roads), but also consider contamination model results, surface water drainage conditions, other FEMP construction projects and other criteria. Adjustments may be made to the sector limits as additional information becomes available.

1) Sector 1 - Sector 1 includes a sediment basin and portion of a conveyance channel and drainage ditches to control stormwater runoff from Sectors 1 and 3 activities and remediation of the Trap Range, which is located in the north part of Sector 1.

   After necessary remediation excavation and certification, most of Sector 1 will be developed as a borrow source for clean soil for On-Site Disposal Facility (OSDF) use. Development of the OSDF borrow area is not in the scope of this project. Also, an area in the southeast of Sector 1 has been identified as a potential borrow source for backfill material for the excavation at the STP area (the STP Backfill Borrow Area).

2) Sector 2 - Work within Sector 2 includes minor surficial soil excavation (stripping) (as necessary) and removal of agricultural drain tiles (when encountered). Various temporary facilities and stockpiles related to construction of the initial OSDF phase now exist in Sector 2. After remediation and certification, future OSDF Phases (cells) will be constructed in Sector 2.

3) Sector 3 - The main existing facility within Sector 3 is the STP. The STP Excavation Design Package shall include the excavation, treatment (limited to size reduction and moisture adjustment, if necessary), and transport of impacted soil and debris obtained from within and near the STP area to the OSDF. STP Excavation Package will include collection and transfer of water collected in the STP and associated utility excavation in the vicinity of the STP and transfer of that water to the Leachate Conveyance System (LCS) ~~Permanent Lift Station (PLS)~~. Expected necessary excavations in the STP area will be the deepest overall throughout A1PII. Except for the STP area and immediate vicinity,

the remaining area of Sector 3 will include only surficial soil excavation as necessary to meet FRLs and certification.

The DO Facilities and associated substation and the Rerouted North Entrance Road (Phase I and old portion) are also located in Sector 3, but they will not be removed during this project. Necessary work associated with these facilities will occur later depending on OSDF future cell development.

1.3 General Description of the Project Components

1.3.1 Excavation

Design and/or specify requirements to excavate, treat [limited to size reduction and moisture adjustment to meet OSDF Waste Acceptance Criteria (WAC)], and dispose of soils within A1PII with contaminant concentrations above FRLs.

Design and/or specify systems requirements to excavate and dispose of abandoned utility lines and impacted soil from utility excavation. These utilities include concrete electric ducts, water, storm and sanitary sewer lines, field drain tile (only when encountered during other excavation), and a 4-inch natural gas line.

Design and/or specify requirements to excavate, treat, (limited to size reduction and moisture adjustment), and dispose of RCRA listed waste (sludge) located in the vicinity of the STP sludge drying beds.

Disposal of excavated materials will be in the OSDF, except for materials above OSDF WAC which will include their transfer to Stockpile SP-7 (formerly SP-5) for subsequent management by FDF.

1.3.2 Facilities Decontamination and Decommissioning (D&D)

Design and/or specify requirements for the removal of at and below-grade structures and facilities at the STP area. PARSONS will use existing facility drawings to delineate at-grade and below-grade structures removal. Removal of the above-grade structures will be completed by the FC&DP following the OU-3 Sewage Treatment Plant Complex Implementation Plan for Above Grade D&D.

There are also several small facilities at the Trap Range area that will be removed, including an at-grade concrete slab (for the Skeet Range Building), a firing pad, and the trap house. The Skeet Range Building (above grade portion) will be removed by the FC&DP.

For at and below grade facilities, PARSONS will design and/or specify requirements to process (reduce size) structures, demolition debris (concrete, structural steel, etc.), and pipelines for acceptance into the OSDF.

1.3.3 Stormwater Controls

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Prepare a Surface Water Management Plan (SWMP) which addresses surface water run-off, and erosion and sedimentation controls. The SWMP will address necessary aspects of erosion and stormwater control and management, and will be the basis of related design work.

To the extent practical, the stormwater controls will be designed for potential future use or modification for OSDF related needs. This may include use of the sediment basin associated with the OSDF Borrow Area in Sector 1. Design and/or specify stormwater control features to prevent stormwater run-on from upgradient contaminated and/or potentially contaminated areas (i.e., areas that have not been certified clean).

Develop an erosion control plan and design an erosion and sediment control system to minimize sediment run-off from the A1PII area. Sediment basin sizing and design will be based on ODNR requirements. Stormwater and water removed from the STP excavation area will be separately collected and transferred to the LCS ~~PLS~~ for transfer for AWWT treatment. Other A1PII surface water only requires retention for sediment control. As soon as an excavated area has been regraded and vegetation reestablished, its drainage water no longer requires retention and it can be redirected for direct discharge. Sediment basin water will discharge to the nearest natural water course with no provision for transfer to the AWWT.

1.3.4 STP Excavation Dewatering

Design and/or specify requirements for a water collection/management system at the STP excavation area for collection and transfer of water to the AWWT for treatment. The system will collect groundwater draining to the excavations at the STP area and stormwater directly entering the excavation area. Water entering the excavation is expected to require normal Phase II AWWT treatment. Collected water will be transferred to the AWWT via the existing LCS. Water from the STP excavation area will be pumped through a new pipe system to be connected to a clean out located north of the Permanent Lift Station (PLS) of the LCS. From the lift station it will be pumped with the OSDF leachate water to the Biodenitrification Surge Lagoon (BSL) and then to the AWWT. PARSONS will estimate the quantity of water to be collected and recommend to FDF the method to transfer the water to the ~~PLS of the~~ LCS.

There will be one semi-permanent sump collection and pump system within the STP excavation area. Other excavation areas within the STP area that are not directly connected for drainage and ~~the equipment wash facility water~~ will be pumped and drained by the excavation contractor with water transferred to the semi-permanent sump. The separate water transfer system(s) within the other STP excavation areas will be relocatable, temporary installations, provided as contractor supplied equipment.

To the extent possible, stormwater runon controls will limit STP excavation area water to direct precipitation within the excavation(s). Since water will be held temporarily within the excavation containing the semi-permanent sump, a practical combination of temporary holding volume, holding time in the excavation, and

water transfer pumping rate will all be considered during design. The flexibility to hold water temporarily in the excavation and with a short excavation period will also allow consideration of a smaller than normal design storm.

Because the LCS is primarily for OSDF use, it will have first priority when either the OSDF or STP excavation area has water to transfer. Controls will be provided on the STP excavation area pumping system to assure that the OSDF has priority for use of the LCS.

Other minimal automatic control and instrumentation will be included to prevent equipment damage and provide basic water quantity information.

1.3.5 Support Facilities

Locate areas for support facilities trailers to be used during construction, including contractor's offices, radiation control, parking, equipment laydown areas, temporary stockpile area(s), and decontamination/ washing facilities. The support facilities will be located adjacent to work they support (primarily the STP area excavation) to the extent practical. Except for electrical service and communications, no utilities will be provided.

At the STP area a radiation control trailer will be included which will have electrical service, heating/cooling, telephone, and a fire alarm system, in addition to its specialized equipment. An existing radiation control trailer will be used, so that only electrical power supply, fire alarm, and communications hookups are necessary. Portable toilets will be used. A gravel surface parking area will be included.

A centralized FDF construction support area that would serve OSDF, A1PII, and other projects is also planned. This project (PO-175) has not included any work associated with the planned centralized support area.

The equipment will be washed within the excavation areas, with the runoff collected in the STP excavation area sumps. The water will then be pumped to the LCS. ~~wash facility will be a lined gravel pad with a timber roadway surface for use of a low-flow, high pressure washer to clean haul trucks and other equipment. The design will incorporate a manhole to serve as a sediment trap for periodic removal of sediment (by the contractor) with disposal at the OSDF. The design will follow a similar pad design used with the initial phase of the OSDF construction. The pad will be located adjacent to the STP area excavation. Wash water will be collected and transferred by the contractor to the STP excavation area sump.~~ The contractor will be required to provide water and power for the high pressure washer(s) (or use gas engine powered equipment).

As cleanup and certification progresses, and if any contamination areas become "landlocked", small relocatable equipment washing facilities may be employed for final cleanup of isolated areas.

1.3.6 Electrical Power

Electrical power will be provided from Substation N18-2 to the trailer(s), area lighting for the parking area and the pumps associated with the STP Excavation Dewatering system. Power will be provided for the pump required to transfer water from the STP excavation area sump and a power drop will be provided for the contractor-~~provided~~ installed pump(s) within the STP excavation area. The electrical power supply work will be coordinated with other ongoing FEMP work to upgrade the 13.2 kV system.

1.3.7 On-Site Traffic Routing

The design will include plans for on-site traffic routing during A1PII remediation. Consideration of transfers from excavation sites with contaminated conditions through or across clean areas or roads shall be included in the plans. Phasing of construction and integration with other FEMP project construction will also be considered in developing the traffic routing plans. It is assumed that crossing the Rerouted North Entrance Road to haul to the OSDF or SP-7 will be coordinated with OSDF Borrow Area activities..

1.3.8 Restoration Grading

Restoration grading will be accomplished after certification has been completed. The restoration grading will be accomplished under a separate design package. ~~Design and specify restoration grading of the site and restore vegetation after above FRL material has been excavated. Except for the STP area only minimal regrading will be performed sufficient to create positive drainage, reduce slope grades, and minimize future final regrading. The restoration grading completed with this project is considered as interim grading which may later be altered to integrate it with an overall FEMP site final reclamation grading plan.~~

Within the STP area, grades will be restored to their original level. Backfill compaction within the STP area will be specified in accordance with design requirements for the OSDF and Rerouted North Entrance Road. The remaining area will be regraded to assure positive drainage.

In the disturbed and backfilled areas the vegetation will be restored through seeding. Seeding mixes will be used that are consistent with final reclamation plans. The final reclamation plans are the responsibility of the FDF Natural Resources Group.

1.3.9 Quantity Takeoffs and Construction Estimates

On an as-requested basis, PARSONS will provide Construction Cost Estimates to FDF with the 30 percent, 90 percent, and Certified for Construction (CFC) design packages. The cost estimate at the 30 percent and 90 percent design will include all work in one estimate. For the CFC design, costs associated with each package will be identified. The construction quantities will also be updated based on the interim

(approximately 60 percent) design package. A final cost estimate incorporating FDF comments will also be submitted. All estimates will be prepared using PCS-002 dated August 1994 and DOE Cost Estimating Guideline, Volume 6, Revision 0, dated November 1994. The direct and indirect costs will be summarized on the standard format provided by FDF.

1.3.10 Construction Scheduling

On an as-requested basis, PARSONS will provide Construction Schedules with the 30 percent, 90 percent, and CFC design packages. The Construction Schedules will be based on and tie into the estimated construction quantities, the activities and work by package, the estimated construction crew(s), and their production/ construction rates.

1.3.11 Construction and Post-Construction Systems Plan

PARSONS will prepare a Systems Plan for implementation and performance of the STP Excavation Dewatering System.

1.3.12 Title III Services

Title III services provide, on an as-needed basis, engineering support during pre-construction, construction, and at construction closeout to prepare as-built (record) drawings (from FDF redline drawings and incorporation of Design Change Notices [DCN]) of the final construction. PARSONS will assist FDF in reviewing and addressing Requests for Clarification of Information (RCI), DCNs, and reviewing construction contractor and Vendor Data Submittals (VDS). During construction, PARSONS will provide a representative(s) as requested to assist in resolution of technical issues, support FDF in their inspection of construction workmanship and specification compliance, and to evaluate design modifications.

1.4 Assumptions/Clarifications

1) The number of sediment basins shall be minimized to the extent practical to stay within the requirements of the ODNR Rainwater and Land Development Manual.

2) FDF will be responsible for compliance with stormwater management and wetlands issues, including all National Pollutant Discharge Elimination System and Clean Water Act requirements and permits.

3) FDF will prepare and implement any sampling and analysis plans to characterize soil, guide excavation, and determine compliance with clean-up levels.

4) Air monitoring will be provided by FDF in accordance with ARARs.

5) Above ground pipes associated with the dewatering system will be provided with drains for the contractor's use to prevent freeze up. Heat tracing will not be used.

6) Above-grade vegetation will be cut, chipped, and stockpiled in the Area 2, Phase I woodchip pile as shown on the construction documents.

7) Electrical power and communications wiring to the radiation control trailer and an FDF office trailer (if required) will be provided by PARSONS and the Site Plan will show the locations of the trailers. A location will also be shown for the contractor's trailer (if required).

8) Existing geotechnical and water data in the vicinity of the STP is available and is sufficient to provide a basis for design and/or specification of a water collection system at the STP area for collection and transfer of water. If these data are found to be not available or are insufficient, FDF may collect additional data to provide a basis for the design, or PARSONS will make the necessary assumptions (with FDF concurrence) on which to base the design.

9) The DO Facilities will be retained and not relocated or removed as part of this project work. At some future time (beyond the scope of this project) the planned alignment of Phase II of the Rerouted North Entrance Road will be revised to avoid interference with the DO Facilities.

10) Equipment wash procedures and/or facilities will be required for trucks hauling material to the OSDF, prior to crossing public access roadways.

1.5 Project Interfaces

The Remediation of A1PII requires interfacing with existing systems, projects, and procedures. The existing and planned physical interfaces include:

1) Site access and haul roads
2) Site utilities and storm drains
3) AWWT
4) OSDF and Off-site Disposal
5) OU-5 South Field Extraction System and Injection Demonstration System (subject to doing work west of the South Access Road).
6) DO Facility
7) Rerouted North Entrance Road
8) Above WAC material SP-7 stockpile at the former SP-5 stockpile area.
9) Staging area for containerized RCRA soils.
10) Redesign of 13.2 kV electrical distribution.
11) Modification of site 138 kV power supply.

1.5.1 Site Access and Haul Roads

Traffic plans shall be included in the bid documents to illustrate to the contractor the site access and support area access, the haul route to the OSDF, above WAC stockpile area, ~~the Equipment Wash Facility location~~ and other necessary access areas. It is assumed that the contractor will prepare a Traffic Plan which will address road closures as well as planned transportation routes to the various sites.

1.5.2 Site Utilities and Storm Drains

~~Portable tanks provided by the contractor (per 1.3.5) will be used for temporary water supply for use at the Equipment Wash Facility.~~ A water source (located near building 45 ~~the OSDF well in Sector 1~~) for use by the contractor for water for the Equipment Wash Facility and for dust control is also available. No other water or any sanitary sewer will be required.

Once the FEMP has the new sewage treatment plant (STP) operational, the old plant can be dismantled. The existing AWWT discharge line will remain in place. At a future time the DO facilities will be removed for construction of Phase II of the Rerouted North Entrance Road or the road will be relocated if the DO Facilities are retained.

The existing utilities which serve the STP, namely the 3-inch drinking water line, 8-inch sanitary forcemain and the 12-inch stormwater forcemain are to be properly capped and removed within the limits of A1PII. The existing 4-inch fuel gas supply line shall also be properly capped and removed within the A1PII limits. There are numerous culverts along the roads which are to be removed. There are drain tiles in some areas, but they will only be removed if encountered during other excavation work. As remediation is completed and the area certified and stabilized, runoff from the work area may be diverted from sediment control measures and discharged to natural water courses.

1.5.3 Advanced Wastewater Treatment Facility

Under normal conditions the AWWT Phase II facility will receive all water pumped from the STP area excavation. Based on existing RI/FS and predesign sampling results, the perched water is below the 1,000 μg/l mixture rule exclusion de minimis level for tetrachloroethene. Thus the collected water will be pumped to the LCS PLS from where it will be transferred via the BSL to the AWWT for Phase II treatment.

1.5.4 OSDF and Off-Site Disposal

An OSDF will be constructed (by others) to dispose of low level impacted material and waste fill. The contractor will be responsible to ensure that the impacted material meets all OSDF WAC including size and moisture content. Impacted material or other material that does not conform to the OSDF WAC will be

segregated and transported to areas designated by FDF (SP-7 or other designated above WAC stockpile) for further processing for on-site or off-site disposal.

1.5.5 South Field Extraction System (SFES) and Injection Demonstration System

Water lines from the SFES and the Injection Demonstration project run through Sector 1 west of the South Access Road. These shall be considered and protected for any grading in this area.

1.5.6 DO Facility

The DO Facility (outfall line pit, building, tank) and associated substation are not included in any A1PII work and are to be retained at this time.

1.5.7 Rerouted North Entrance Road

Phase I of the Rerouted North Entrance Road has been completed and will be in use at the start of Area 1, Phase II Remediation. Phase II of the Rerouted North Entrance Road and removal of part of the current road will be completed (by others) following required A1PII work. Depending on the future plans for the DO facilities, the current planned alignment of Phase II of the Rerouted North Entrance Road may require adjustment.

1.5.8 Above WAC Stockpile Area

A new stockpile (SP-7) will be established at the former SP-5 stockpile area and designated on the traffic plans for transfer of waste not meeting the OSDF WAC. Specifications will require the contractor to transport such material to the Above WAC Stockpile Area at SP-7.

1.5.9 Staging Area for Containerized RCRA Soils

If the lead contaminated soils or any other soils must be disposed of off site they will be excavated and containerized adjacent to the excavation area and staged at a special material transfer area for further management and disposition by FDF. The lead contaminated soils at the Trap Range area are expected to be stabilized in-place to meet OSDF WAC by blending in a soil additive and then excavated, loaded onto trucks, and hauled to the OSDF for disposal. Only minimal quantities of soils (such as those from the Sludge Drying Bed area) may require containerization for transportation.

1.5.10 Redesign of 13.2 kV Electrical Distribution

This project will install an aerial, pole mounted 13.2 kV electrical service (on a tap from one of the main distribution circuits) to the DO Facility unit substation (N18-2), allowing removal of the existing underground ductbank service. Pole locations have been selected to avoid interference with A1PII activities. This design is complete and construction is scheduled during the summer of 1998.

1.5.11 Modification of 138 kV Site Power Supply

CG&E will be removing two 138 kV electrical towers which support the existing 138 kV electrical service to the site at the main substation. The southern of the two 138 kV circuits will be supported by wooden poles located in the existing right of way which runs southeast from the substation. The northern of the 138 kV circuits will be disconnected and removed. CG&E will connect their two circuits that now are tied at the primary of the FEMP substation using the existing towers routed north-south to the east of the A1PII remediation area.

1.6 Remediation Schedules

Scheduling of remediation activities needs to be closely integrated with all other work, including OSDF requirements. The schedule of OSDF and A1PII activities maintained by FDF will be used for planning of and phasing of all A1PII work. It is assumed A1PII work will be done in conjunction with a phase of the OSDF development.

SECTION 2

DESIGN BASIS

2.1 Functional Requirements

The functional requirements for the Remediation of A1PII will be in accordance with the final FRD prepared by FDF for this project.

2.2 Design Criteria

Title I, II, and III work will be performed in compliance with pertinent S/RIDs as identified in the FDF *Policies and Requirements Manual.* Pertinent S/RIDs for this project are those requirements in the following S/RIDs contained in PARSONS Generic Requirements List forwarded to FDF on June 13, 1996 (PARSONS ID# 26:000:091:0128-96).

1) S/RID No. 2, Engineering Design
2) S/RID No. 3, Emergency Preparedness and Management
3) S/RID No. 5, Environmental Protection
4) S/RID No. 6, Fire Protection
5) S/RID No. 8, Management Systems
6) S/RID No. 10, Occupational Safety and Health
7) S/RID No. 14, Radiological Protection
8) S/RID No. 15, Security
9) S/RID No. 17, Environmental Restoration and Waste Management

2.2.1 Regulations, Codes, Standards, Orders, Manuals, and Guides

This section presents the general regulations, codes, standards, and orders that are to be followed for the design of the Remediation of A1PII other than ARARs/TBCs. This information is organized by engineering discipline. Pertinent ARARs/TBCs developed by FDF are listed in Appendix A.

Civil

1) American Association of State Highway and Transportation Officials (AASHTO), GDHS-90, "Policy on Geometric Design of Highways and Streets," 1990, by AASHTO.

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2) American Society of Civil Engineers (ASCE), Manual 37, "Design and Construction of Sanitary and Storm Sewers," ASCE.

3) ASCE, Manual 77, "Design and Construction of Urban Stormwater Management Systems".

4) American Water Works Association (AWWA) C 906-90 Polyethylene Pressure Pipe and Fittings, 4 Inch through 63 Inch for Water Distribution.

5) AWWA, C 600-93 Installation of Ductile-Iron Water Mains and their Appurtenances.

6) FEMP Stormwater Pollution Prevention Plan RM-0039.

7) North American Datum of 1983.

8) North American Vertical Datum of 1929.

9) Ohio Department of Transportation (ODOT), Location and Design Manual, Volume II, Drainage Design.

10) ODOT, Construction and Material Specifications, January 1997.

11) Ohio Department of Natural Resources (ODNR), "Rainwater and Land Development, Ohio's Standard for Stormwater Management, Land Development, and Urban Stream Protection," 2nd ed., 1996.

12) Soil Conservation Service (SCS), Soil Survey of Hamilton County, Ohio.

13) SCS, Soil Survey of Butler County, Ohio.

14) SCS, "TR-55 Urban Hydrology for Small Watersheds," Technical Release 55, SCS.

15) SCS, State of Ohio Engineering Standard Pond (No.)-378.

16) Ohio Safe Dams Act

17) TM 5 814-2, "Sanitary and Industrial Wastewater Collection - Pumping Stations and Force Mains," U.S. Dept. of Army.

18) AASHTO HS-20, Traffic Loadings across Force Mains.

Cost Estimating

1) FEMP, PCS-002, Cost Estimating.

2) DOE Office of Infrastructure Acquisition (FM-50), "Cost Estimating Guide, Cost Guide, Volume 6."

Electrical

1) American National Standards Institute (ANSI) C.-97 National Electrical Safety Code.

2) ANSI C80.1-90 Rigid Steel Conduit (RGS) -Zinc Coated.

3) ANSI C80.6-94 Intermediate Metal Conduit (IMC) - Zinc Coated.

4) ANSI C135.1-79 Galvanized Steel Bolts and Nuts for Overhead Line Construction.

5) ANSI O5.1-92 Wood Poles Specifications and Dimensions.

6) American Society for Testing and Materials (ASTM) ASTM A36/A36M-96 Standard Specification for Carbon Structural Steel.

7) ASTM A475-95 Standard Specification for Zinc-Coated Steel Wire Strand.

8) American Wood-Preservers Association (AWPA) C4-89 Poles - Pressure Process.

9) AWPA C25-89 Standard for the Preservative Treatment of Crossarms by the Pressure Process.

10) InterNational Electrical Testing Association (NETA) ATS-95 Acceptance Testing Specification for Electrical Power Distribution Equipment.

11) National Fire Protection Association (NFPA) 70 National Electrical Code, 1996 Edition.

12) National Electrical Manufacturers Association NEMA 250-91 Enclosures for Electrical Equipment (1,000 Volts Maximum).

13) NEMA AB 1-93 Molded Case Circuit Breakers and Molded Case Switches.

14) NEMA ICS 1-93 Industrial Control and Systems General Requirements.

15) NEMA ICS 2-93 Industrial Control and System Controllers, Contactors, and Overload Relays Rated Not More Than 2000 Volts AC or 750 Volts DC.

16) NEMA ICS 4-93 Industrial Control and Systems Terminal Blocks.

17) NEMA ICS 6-93 Industrial Control and Systems Enclosures.

18) NEMA KS 1-90 Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).

19) NEMA OS 1-89 Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.

20) NEMA PB 1-90 Panelboards.

21) NEMA PB 1.1-91 General Instructions for Proper Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or Less.

22) NEMA ST 20-92 Dry Type Transformers for General Applications.

23) NEMA WC 7-88 Cross-Linked Thermosetting Polyethylene-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

24) NEMA WD 1-83 General Requirements for Wiring Devices.

25) NEMA WD 6-88 Wiring Devices - Dimensional Requirements.

26) State of Ohio, Department of Transportation (ODOT) Construction and Material Specifications, January 1, 1997.

27) Underwriters Laboratories Inc. (UL) 360-96 UL Standard for Safety Liquid-Tight Flexible Steel Conduit.

28) .UL 467-93 UL Standard for Safety Grounding and Bonding Equipment.

29) UL 486A-91 UL Standard for Safety Wire Connectors and Soldering Lugs for Use with Copper Conductors.

30) UL 510-94 UL Standard for Safety Polyvinyl Chloride, Polyethylene and Rubber Insulating Tape.

31) UL 854-96 Service-Entrance Cables.

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32) UL 870-95 Standard for Safety Wireways, Auxiliary Gutters, and Associated Fittings.

33) Electrical Construction Materials Directory - 97.

Environmental Safety and Health

1) 29 Code of Federal Regulations (CFR) 1910, "Occupational Safety and Health Standards."

2) 29 CFR 1926, "Safety and Health Regulations for Construction."

3) 10 CFR 835, "Occupational Radiation Protection" (this is the promulgation of DOE Order 5480.11).

4) DOE Order 5480.10, "Contractor Industrial Hygiene Program."

5) DOE/EH-0256T, Radiological Control Manual.

6) DOE-EM-STD-5502-94, "Hazard Baseline Documentation."

7) DOE-STD-1088-95, DOE Standard "Fire Protection for Relocatable Structures," June 1995.

8) RM-0016, Management Plan FDF Policies and Requirements Manual.

9) RM-0021, Safety Performance Requirements Manual.

10) RM-0047, Fugitive Dust Control Requirement.

Geotechnical

1) American Society for Testing and Materials (ASTM), Annual Book of Standards, Section 4, Construction; applicable standards, practices and guidelines associated with investigating, testing and construction with soil, rock and geosynthetic materials.

2) Department of the Navy, NAVFAC DM-7.1, Soil Mechanics.

3) Department of the Navy. NAVFAC DM-7.2, Foundations and Earth Structures.

4) Department of the Navy. NAVFAC DM-7.3, Dynamics, Deep Stabilization and Special Geotechnical Construction.

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5) Department of the Navy, NAVFAC P-418, Dewatering and Groundwater Control.

Material Handling

1) DOE/ID-10500, Hoisting and Rigging Manual.

2) Ohio Administrative Code (OAC) 3745-20, Asbestos Emission Control.

Mechanical Process/Piping

1) American Society of Mechanical Engineers (ASME) B31.3, Process Piping.

2) American Society for Non-Destructive Testing (ASNT) SNT-TC-1A, Recommended Practices.

3) ASTM A36, Standard Specifications for Carbon Structural Steel.

4) ASTM A53, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

5) ASTM A105/A105M Revision B, Standard Specification for Carbon Steel Forgings for Piping Applications.

6) ASTM A193, Standard Specification for Alloy-Steel and Stainless Steel Bolting Material for High Temperature Service.

7) ASTM A194, Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service.

2.3 Discipline Criteria

The discipline criteria included herein is the full set of criteria for the entire project. Depending on the specific work within either the Site Preparation, STP excavation, and other design packages, the appropriate criteria will be used.

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2.3.1 Civil

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General

The civil design will relate to site preparation required to support construction activities; control of stormwater; collecting and sending potentially contaminated and contaminated water to treatment; excavation of impacted material (primarily at the STP area); sediment control; and restoration grading and stabilization.

Site Preparation

The A1PII STP excavation areas will have a radiation control trailer ~~(provided by others)~~ to support the construction activities and a FDF construction trailer (if required). Space will also be designated for the contractor to provide a construction trailer (if required). The trailers will require electric power in order to function. The contractor is to supply water for the ~~Equipment Wash Facility~~ necessary equipment washing. The contractor shall provide temporary sanitary service (port-a-johns) and the contractor's own phone service. PARSONS will design electrical power to the trailers, and indicate locations of fire and evacuation alarm services (as required) in the trailer(s). Temporary gravel roads or drives may also be required to serve the trailers and construction activities as well as access to OSDF activities. The locations for the roads, trailers, utilities, as well as access control and security issues will be coordinated with FDF.

Clearing and Grubbing

Clearing and grubbing work will be minimal, as the A1PII area is essentially clear of any major vegetation or debris. Trees, stumps, roots, bushes, and high grass will be removed only from the areas that require excavation to meet FRLs. The vegetation will be chipped and transferred to a stockpile area that will be designated on the Construction Drawings. The Technical Specifications will require that the contractor will clear the entire area and will grind stumps at the areas shown for excavation in the Construction Drawings or at other areas further specified by FDF. Work will be planned to control the area that has been cleared at any one time to limit the amount of erosion and sedimentation from exposed/disturbed areas.

Stormwater and Sediment Controls

One of the major design issues is how stormwater and sediment are controlled, both during and after construction. Stormwater runon needs to be minimized to the extent practical,. Since stormwater that runs onto disturbed areas during site preparation must also be controlled and sent through a sediment basin before leaving the site. Stormwater that would run on the STP excavation area must be sent to the AWWT for treatment prior to leaving the site. This will be accomplished primarily by diversion dikes, culverts, ditches, and similar drainage controls upstream of the contaminated areas being excavated. Runoff controls will be designed consistent with the ODNR "Rainwater and Land Development" manual.

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A stormwater conveyance channel will collect stormwater runoff from the majority of the A1PII work area and discharge through a sediment basin. The conveyance channel and other drainage system components (except where noted) will be designed for a 10-year, 24-hour storm. The conveyance channel drainage will be based on a contributing A1PII area of approximately 74 acres. In order to minimize earthwork and to permit the channel to drain over the existing AWWT outfall line (GW-24-inch) and provide an approximate 4-inch clearance, a 0.40 percent flow line slope will be used. Following ODNR guidelines and FDF soils and water projects recommended practices, the following channel and ditch linings will normally be used:

Grass (Erosion Control Blanket) - V < 3 fps
Grass (Erosion Control Blanket) with check dams - 3fps < V< 4 fps
Dumped Rock Channel Protection V > 4 fps.

For the conveyance channel the design velocity will be less than 4 fps. Culvert pipe(s) will be used to convey the Conveyance Channel flow over the GW-24-inch pipe. In order to avoid future rework, the culvert pipe(s) will be designed for the 25-year, 24-hour storm for the associated A1PII catchment area (of approximately 74 acres) plus approximately 16 acres from the OSDF cell construction area. Any future changes necessary to the Conveyance Channel to handle the increase flow due to the OSDF cell construction will be completed later by the OSDF project.

Dewatering Pump(s)

The contractor shall use a dewatering pump(s) (typical portable trash or submersible) to remove water from the STP excavation area(s). The ~~contractor~~ excavation area dewatering pump(s) will discharge to a semi-permanent pump installation in a deeper STP excavation area to be used as a sump area for collecting STP excavation area drainage water. Water from the sump area will be pumped to the LCS ~~PLS~~ for transfer by the LCS to the BSL and then to Phase II of the AWWT. ~~Water from the Equipment Wash Facility will be collected and also transferred to the STP excavation sump area by the contractor.~~

To minimize water handling requirements, stormwater run-on water will be diverted so that only direct precipitation will enter the STP excavation area. During design, water volumes and handling requirements will be established. These will consider groundwater inflow/seepage and appropriate stormwater quantity. Design of the overall water handling system will consider holding time in the STP excavation areas and the excavation sump area and transfer rates to the LCS ~~PLS~~, giving priority of use to the OSDF generated water.

Sediment Control

1) Surface water control structures (excluding the sedimentation basin) shall be designed for the 10-year, 24-hour storm event.

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2) Design criteria for the sedimentation basin will be in accordance with the ODNR "Rainwater and Land Development" manual.

3) The sedimentation basin shall be designed for the following:

   a) 67 cubic yards of total storage per acre of watershed area. The A1PII watershed area for basin sizing is approximately 74 acres.
   b) Sediment storage volume shall be determined based on 27 cubic yards per acre of watershed area.
   c) Dam height shall be less than 10 feet and the basin shall impound less than 50 acre-feet of water.
   d) The principal spillway structure will consist of riser pipes within the sediment basin and discharge pipes running under the South Access Road discharging to natural drainage.
   e) Per ODNR (Rainwater and Land Development), sediment basins spillway discharge pipes are to have anti-seep collars. Use the design criteria from OH-378 [Soil Conservation Service, State of Ohio Engineering Standard Pond (No.)-378]. Assume the saturation zone to be based on the maximum elevation before overtopping and a line projected at 4 horizontal to 1 vertical to the bottom of the pipe. Assume bentonite modified soil plugs are suitable for use as anti-seep collars.
   f) A defined emergency spillway will not be constructed. Emergency basin overflow (beyond the principal spillway capacity) will flow north and west over the North Entrance Road.

These facilities may also be subject to modified or additional criteria to make them adaptable for future OSDF use.

Additional information regarding the sedimentation basin design criteria with respect to the A1PII - OSDF relationship is presented in Appendix B - A1PII - OSDF Sedimentation Basin Design Criteria.

Other measures to control sediment, such as sediment traps and silt fence will follow the criteria from ODNR "Rainwater and Land Development" manual.

Excavation

Excavation also includes the associated operations of loading, hauling, unloading (at the OSDF and other areas). Information to support tracking of transferred material will also be included.

Impacted material that meets the OSDF WAC will be transported to the OSDF. Pockets of impacted material exceeding the WAC will be excavated and transported to the above-WAC SP-7 stockpile area as they are encountered. Each of the excavated areas will serve as the initial sump for stormwater control. The sequence of excavation needs to consider stormwater and sediment control.

Sector 1 will be surveyed for contamination and the impacted areas (above FRL) will be removed by spot excavation or surface stripping (6 inches) only as necessary. Typically, stormwater runon and runoff will be limited to the extent practical, with the excavation area made to collect stormwater. The level of radioactivity found will determine if the water can be pumped out for direct discharge or sent to the AWWT Phase II Facility for treatment. The threshold shall follow the National Pollutant Discharge Elimination System Permit limits. RCRA contaminated soils at the Trap Range area will undergo additional management including stabilization and disposal in the OSDF.

Sector 2 contamination (areas above FRL) will be removed by spot excavation or stripping of the top layer (typically 6 inches) for larger areas if they are identified.

Sector 3 excavation will include deep (10-foot to 20-foot) excavation at the STP and spot excavation or top layer (6 inches) stripping as necessary depending on contamination survey results. Geotechnical analyses will establish typical slopes for shallow and deeper excavations. Excavation at the STP will also include wall (below grade), floor slab, and foundation removal. Perched water is expected at the STP excavation area and will require collection and treatment by the AWWT Phase II System. Water pumped from the STP excavation area will be transferred through the LCS to the AWWT for treatment. The deep areas excavated in the STP that are in the area of Phase II of the Rerouted North Entrance Road will be backfilled to match existing grade (in the fill areas). Backfill in the footprint of the roadway and OSDF will have special material and compaction requirements. RCRA contaminated soils that may be encountered at the STP area will undergo additional management depending on the volume encountered.

Stabilization of Disturbed Areas

During excavation, temporary or interim seeding or other temporary stabilization measures, such as erosion control mats or crusting agent, will be applied to limit erosion of excavated areas not expected to be worked for a period of 45 days or more. The final configuration of the sites will be to grade them to blend in with the adjacent topography, with positive drainage if possible. Low areas may remain and be maintained until the FEMP Final Sitewide Remediation Grading is performed.

Maximum slopes during initial excavation/grading will be determined by slope stability calculations with appropriate factors of safety, prepared by PARSONS. The maximum slope after final grading shall be 2 horizontal to 1 vertical or as otherwise determined by PARSONS. Flatter slopes (4 horizontal to 1 vertical or flatter) shall be used where feasible to provide a slope that is easier to maintain. Once final excavation has occurred, seed and mulch will be applied according to technical specifications. No other landscaping or improvements are planned as part of this project.

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Site Preparation

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1) Support Area: A1PII will require an area for a personnel access/radiological monitoring trailer and contractor and FDF office trailers (if required), and parking. The support areas will be gravel.

2) Roads: Roads shall be crowned with a transverse slope of 2 percent or as otherwise shown in the Construction Drawings. Longitudinal slopes shall be between 0 and 8 percent. Roadway sections (including surfaces) will be shown in the Construction Drawings. Permanent roads shall comply with AASHTO GDHS-90.

3) Dust control will be required for all activities within the Project area. Dust control procedures will be provided by the contractor as required by FDF. Air particulate emission requirements are listed in the ARARs in Appendix A. (Fugitive Dust Control Requirement, RM-0047)

   The contractor will proactively apply water or a dust suppressant using tanks with a suitable sprinkling device to control dust within the project area for all activities involving the potential for generating airborne emissions.

4) Access Control: The type, size, and location of fences and gates will be determined in conjunction with FDF. Access control will consider, but not be limited to:

   a) Radiation Control Areas.
   b) Stockpiles.
   c) Certified Areas.

Utilities

The locations of existing utilities are available on FEMP Grid Utilities drawings. Major utilities include the CG&E-supplied 4-inch gas line (to be removed), CG&E towers, Mid-Valley Oil Company Pipeline, AWWT effluent line (GW-24"), electrical lines, and the South Field Extraction System/Optimization and Injection Demonstration Project lines (GW-20", GW-10"). Due to site conditions, utility relocation will be avoided if possible.

Civil Design Drawings and Specifications

Separate listings of drawings and specifications are being maintained on a continuous basis. The initial listing of drawings and specifications has been presented in the POP and the listings will be updated as necessary.

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Calculations

The following calculations will be provided:

1) Stormwater (runon and runoff) management including ditch, channel, and culvert flows and associated calculations, and sediment basin design calculations.
2) Earthwork (volumes).
3) Water lines (if necessary).
4) Roadway design (if necessary).

2.3.2 Electrical

General

Electrical power will be provided to the FDF construction support facilities (if required), radiation control facilities, and the STP excavation dewatering system (including power for ~~the contractor's~~ all dewatering pumps).

Electrical Design Drawings and Specifications

Separate listings of drawings and specifications are being maintained on a continuous basis. The initial listing of drawings has been presented in the POP and the listings will be updated as necessary.

2.3.3 Environmental Safety and Health Requirements

The subsections below describe worker health and safety, radiation exposure, and other regulatory requirements. All of the requirements provided are derived from pertinent S/RIDs identified in the *Management Plan, FDF Policies and Requirements Manual (RM-0016)*, and PARSONS Generic Requirements List.

Worker Health and Safety

Several health-and-safety-related requirements for this project are provided below. This subsection complements the Project-Specific Health and Safety Plan (PSHSP) (to be prepared by FDF) and is not to be considered a replacement or summary of the Health and Safety Plan.

Waste unit excavation activities will take place in controlled areas; therefore, workers shall be required to have Hazardous Waste Operations and Emergency Response training in accordance with 29 CFR 1910.120.

Site clearing activities shall be done in accordance with 29 CFR 1926.604. Equipment used in site clearing activities shall also meet this requirement.

Material handling equipment shall meet the requirements of 29 CFR 1926.602. These requirements address seat belts, brakes, rollover protection, audible alarms, and scissor points.

Workers may be required to enter excavated trenches to relocate or remove utilities and deep excavations. This type of work will be minimized. Excavations shall be maintained in accordance with 29 CFR 1926, Subpart P.

Measures shall be identified and implemented which comply with American Conference of Governmental Industrial Hygienists (ACGIH) and FDF requirements to prevent heat stress during warm weather. Heat stress hazards are more serious for activities where special protective clothing and equipment are required.

Valves, switches, and like devices shall be designed to accept a FDF Facility Owner's lock shank to provide a means for energy control.

Worker Exposure

1) Radiological: Radiologically contaminated soil will become airborne during earth-moving activities in contaminated areas. 10 CFR 835.1002 requires that airborne radioactive material be controlled and that the inhalation of such material by workers be kept to levels that are As Low As Reasonably Achievable (ALARA). The Nearfield Box Model and/or the Industrial Source Complex Version 3 (ISC3) were used to conservatively model dispersion of airborne contaminated soil generated during excavation activities [OU-5 FS Short Term Risk Assessment (STRA)]. The results indicate that conventional dust suppression techniques, when properly used, will maintain exposures below levels requiring further consideration of engineered controls for airborne radioactive materials.

   Eating, drinking, and smoking shall not be allowed in radiologically controlled areas. The need for respirators will be specified in the PSHSP and/or the Radiation Work Permit, when it is prepared.

   Waste materials of varying concentrations are expected and modeling of external dose components with Microshield 4.0 was completed (OU-5 FS STRA). 10 CFR 835.1002 requires that personnel exposure to external sources of radiation be controlled to an average of 1 rem per year, or ALARA. Additional engineered controls for limiting personnel exposure are not anticipated as being required. A Radiation Protection Program will be in place for the remediation activities.

2) Particulates, Gases, and Vapors: Remedial activities will have the potential to generate various particulates, gases, and vapors. Where necessary, exposure monitoring will be provided to ensure that worker exposures are properly controlled within Occupational Safety and Health Administration (29 CFR 1910 and 1926) and ACGIH limits. Specific control measures and Personal Protective Equipment will be identified in the PSHSP to be developed by FDF.

The excavation of the STP and the Trap Range area may generate particulate emissions. Particulates are regulated under OAC 3745-17-02. Also, the emission rates provided in OAC 3745-17-11 apply (see Appendix A for values). FDF's requirements for control of fugitive particulate emissions are provided in Fugitive Dust Control Requirements (RM-0047).

Applicable or Relevant and Appropriate Requirements

The ARARs for this project have been prepared by FDF and are provided in Appendix A of this DCP. The table provides a requirement summary and implementation strategy for each ARAR. The implementation strategy references applicable sections of this DCP where appropriate.

2.3.4 Geotechnical

General

The geotechnical Title I/II design effort will support excavation planning and the transfer of water to the AWWT by means of the water collection/management system at the STP area. Based on scope of the project, the geotechnical Title I/II activities will include evaluation of subsurface conditions from existing data, slope stability analyses, and providing geotechnical recommendations and specifications pertaining to geotechnical aspects of the design. Title III Services will include support, on an as-requested basis, to provide a geotechnical engineer to assist FDF in addressing geotechnical related RCIs, DCNs and reviewing geotechnical related VDSs.

PARSONS will also provide support as requested for evaluation and development of a potential borrow area (the STP Backfill Borrow Area) located in the southeast area of the site. Some or all of the work associated with this potential borrow area may also be completed under other project orders.

Geotechnical Data

Existing geotechnical data from prior investigation at the project site provide the basis for geotechnical design and recommendations. These data come from the following sources:

1) 3-Dimensional Geological Computer Model (files maintained by FDF)

2) Remedial Investigation Boring Logs and Well Completion records (files maintained by FDF)

3) Remedial Investigation and subsequent water elevation measurements and contour maps (files maintained FDF)

4) *Final Remedial Investigation Report for Operable Unit 5*, U.S. Department of Energy

5) *Geotechnical Investigation Report On-Site Disposal Facility*, Revision 0, December 1995. (PARSONS Project Order 140)

6) *Geotechnical Data and Evaluation Report for East and South Field Borrow Areas*, Revision 0, June 1996 (PARSONS Project Order 154)

Additionally, if data contained in these sources or other existing data provided by FDF are insufficient to support the design, it is assumed that FDF will collect additional site-specific geotechnical data to provide a basis for the design, or otherwise PARSONS and FDF will agree on necessary assumptions on which to base the design.

Calculations

1) Slope Stability
2) Water Collection/Management system (at STP) - geotechnical related calculations

2.3.5 Material Handling

General

The design will describe methods or requirements for waste excavation or retrieval, size reduction, and segregation into separate waste streams. Packaging and hauling requirements will be established for on and off-site disposal for the various waste streams, including low-level radioactive, hazardous, and mixed waste. The method for separation, handling, and packaging of lead, arsenic, and perchlorethylene or other RCRA contaminated soil will be addressed in the specifications. Material Handling and or Civil will develop these specifications with input from Environmental Safety and Health. If asbestos is encountered during this remedial action, it must be prepared for disposal in accordance with the requirements of OAC 3745-20 (Asbestos Emission Control) and the Impacted Material Placement Plan for the OSDF.

Impacted material that is to be placed within the OSDF must satisfy OSDF WAC for moisture content and size.

Equipment

1) Mobile size reduction equipment may include chipper, grinder, shredder, shear, and baler

2) Excavation equipment may include front-end loaders, backhoe, hydraulic crane, and track dozers

3) Transportation equipment may include covered or uncovered dump trucks, stake-bed trucks, forklift, flatbed semi trucks, and tank trucks

Testing

Lifting devices shall be tested in accordance with DOE/ID-10500 Hoisting and Rigging Manual.

Material Handling Specifications

Separation, packaging, and hauling of impacted materials (STP related hazardous materials, lead and arsenic contaminated wastes associated with the trap shooting range) and asbestos containing material (if encountered) are part of the Division 2 specifications.

2.3.6 Mechanical Process/Piping

General

The design shall meet the requirements of all applicable regulations, codes and standards.

Equipment Washing ~~Facility~~

The contractor will perform necessary equipment washing on existing paved areas ~~An Equipment Wash Facility will be~~ located as near to the STP area excavation as possible. ~~This facility will~~ Washing to remove bulk solids and contaminates from haul vehicles will be by high-pressure spray from a portable pressure washer. Vehicles leaving the STP excavation area shall be cleaned to a level suitable to travel within "Certified" areas and public roads.

A tank for temporary water supply will be provided by the contractor for this ~~facility~~ washing. Wash water will be ~~collected and transferred~~ directed to the STP area excavation sump by the contractor.

Testing

Except for the buried systems (HDPE), pipe and pipe systems testing shall conform to the requirements set forth in ASME B31.3 and ASNT SNT-TC-1A.

Pipe Supports

Pipe supports shall be spaced in accordance with ASME B31.3. Steel for auxiliary supports shall be in accordance with ASTM A-36.

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Welding/Joining

Welding shall be in accordance with ASME B31.3. HDPE pipe material shall be joined/fused per manufacturer's instructions.

Materials

Corrosion, abrasion resistance, and ease of decontamination shall be considered when selecting pipe, fittings, valves, and equipment items.

Mechanical Process/Piping Design Drawings and Specifications

Separate listings of drawings and specifications are being maintained on a continuous basis. The initial listing of drawings has been presented in the POP and the listings will be updated as necessary.

Calculations

The following calculations will be provided:

1) Pump heads for the ~~semi-permanent~~ STP Excavation System dewatering pumps.

2.3.7 Mechanical Utilities

General

A personnel access control point will be established at the egress point of the STP area excavation. Portable sanitary facilities will be used and will be serviced periodically by the contractor.

2.3.8 Structural

Structural Material/Design Requirements

There is very limited structural work on this project. Structural discipline will provide support to civil and other disciplines as required to provide input and review of equipment pads, pipe supports, drainage pipes, and other design features that have a structural aspect.

Design requirements for structural materials and design are as follows:

1) Concrete: Concrete material, design, and construction shall be per American Concrete Institute 318-89. Minimum concrete strength at 28 days shall be 3,000 psi for foundations and 4,000 psi for slabs.

2) Reinforcement: Deformed billet steel shall conform to ASTM A615, Grade 60.

2.3.9 Instrumentation and Controls

General STP Excavation Dewatering Transfer Sump Pump

Instrumentation will be included to indicate the STP excavation dewatering transfer sump pump is operating and to measure pump run time data for determining pumped volumes. Controls will be included to assure that OSDF generated leachate water has first priority for transfer by the LCS PLS. This is accomplished by using water level control switches at the PLS to shut down the STP excavation dewatering system. By incorporating a timed delay into the restart of the STP excavation dewatering system the removal of OSDF generated water always has higher priority.

Equipment

1) Run time meter
2) Level control float switch

Excavation Area Dewatering Pumps PMP2, 3, and 4

Instrumentation will be included to indicate which dewatering pump is operating.

Equipment

1) Level control float switch.

SECTION 3

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REFERENCES

This DCP and the associated work is/will be based on the following documents:

1) FERMCO, September 1994. FEMP Engineering Procedure, Document No. 12-4003, Design Criteria Package. Fernald, Ohio: FERMCO.

2) FERMCO, February 16, 1996. *Policies and Requirements Manual.* Fernald: FERMCO.

3) FERMCO, September 30, 1994. Document No. RM-0012, *Quality Assurance Program, Revision 3.* Fernald: FERMCO.

4) FERMCO, February 28, 1996. *Site Procedures Manuals*, Volumes 1 - 12. Fernald: FERMCO.

5) FERMCO, 1996. *Remediation of Area 1, Phase I.* CFC Contract Documents and as-built drawings.

6) Record of Decision for Remedial Actions at Operable Unit 5, August 1995.

7) Remedial Design Work Plan for Remedial Actions at Operable Unit 5, April 1996.

8) U.S. Department of Energy, 1995a, *Final Remedial Investigation for Operable Unit 2, FEMP. Fernald, OH, Remedial Investigation, Feasibility Study*, U.S. DOE Fernald Office, Fernald, OH.

9) U.S. Department of Energy, 1995a, *Final Feasibility Study Report for Operable Unit 2, FEMP, Fernald OH, Remedial Investigation, Feasibility Study,* U.S. DOE Fernald Office, Fernald, OH.

10) U.S. Department of Energy, 1995a, *Final Record of Decision for Remedial Actions at Operable Unit 2, FEMP, Fernald, OH,* U.S. DOE Fernald Office, Fernald OH.

11) U.S. Department of Energy, 1995, *Draft Remedial Design Work Plan for Remedial Actions at Operable Unit 2, FEMP, Fernald, OH,* U.S. DOE Fernald Office, Fernald OH.

12) United States Environmental Protection Agency, 1990. *OSWER Directive 9355.5-01, Interim Guidance on EPA Oversight of Remedial Designs and Remedial Actions Performed by Potentially Responsible Parties.*

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13) PARSONS, 1996. *Rerouted North Entrance Road.* CFC contract documents, plus DCNs during construction.

14) GeoSyntec, *OSDF Legacy Package (Plans and Calculations)*

15) GeoSyntec, PARSONS. *Leachate Conveyance System.* CFC contract documents plus DCNs.

16) FDF, *Sitewide Excavation Plan*, current revision.

17) FDF, *Waste Acceptance Criteria Attainment Plan for the On Site Disposal Facility*, current revision.

18) FDF, *Impacted Materials Placement Plan, On Site Disposal Facility*, current revision.

19) GeoSyntec, *OSDF Phase I.* CFC contract documents.

20) GeoSyntec, PARSONS, *OSDF Phase II and Southern Waste Units.* CFC contract documents.

APPENDIX A

ARARS AND TBCs FOR AREA 1, PHASE II

Appendix A has been prepared by FDF and identifies design and implementation-related ARARs and TBCs for the A1PII Remediation Project. Compliance with these ARARs/TBCs is addressed therein. See the Site Wide Excavation Plan and the Implementation Plan for further discussion.

TABLE A-1

GROUPINGS OF ARARs AND TBCs USED IN TABLE A-2

FOR REMEDIATION AREA 1 PHASE II

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Presentation Group	Topical Subdivision(s)	Page
Natural and Cultural Resources	Threatened and Endangered Species Protection	A-2
	Archeological, Historic, and Cultural Resource Protection	A-3
Air Pathway	Noise Pollution Control	A-8
	Air Emissions	A-8
Surface Water Pathway	Wetlands/Floodplain Protection	A-18
	Discharge to Surface Water	A-25
Groundwater Pathway	Groundwater Protection	A-29
	Wells - Construction	A-29
	Wells - Abandonment	A-29
Soil Remediation	Closure of Hazardous Waste Management Units	A-30
	Radionuclide Concentrations	A-34
	Lead Concentration	A-37
	PCB Concentration	A-37
	Certification of Cleanup	A-38
Impacted Material Management	Definitions and General Facility Standards	A-40
	Management of Low-level Radioactive Waste Material	A-55
	Management of Hazardous Remediation Waste	A-55
	Management of PCB-tainted Material	A-62
Post-Closure	Description of Post-closure Care	A-64
	Modifications to Post-closure Care Plan or Period	A-66
	Property Use Restrictions	A-67
	Post-closure Notice/Survey Plat	A-68
	Deed Notation	A-69

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TABLE A-2

PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
NATURAL & CULTURAL RESOURCES						
THREATENED & ENDANGERED SPECIES PROTECTION						
Procedures for Implementing the National Environmental Policy Act 40 CFR §6.302(h) 10 CFR Part 1021 Endangered Species Act 16 U.S.C. §1531, et seq. Endangered and Threatened Wildlife and Plants 50 CFR §17.21, §17.31, §17.61, §17.71, and §17.94 Interagency Cooperation-Endangered Species Act 50 CFR §402.01	All federal agencies must ensure that any action authorized, funded, or carried out by them is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of the constituent elements essential to the conservation of a listed species within a defined critical habitat. Additional requirements apply if it is determined that a proposed activity could adversely affect these species or their habitat.	Appl	Appl	Appl	Findings of 1993-94 updated surveys at the FEMP property: • Populations of the state-listed threatened Sloan's crayfish (*Orconectes sloanii*) are located in sections of Paddy's Run. • Good habitat for the federally-listed endangered Indiana bat (*Myotis sodalis*) exists along Paddy's Run and the storm sewer outfall ditch. • Suitable habitat exists in limited areas for the federal-listed endangered running buffalo clover (*Trifolium stoloniferum*), and only in the northern woodlot for the state-listed threatened spring corralroot (*Corallorhiza wisteriana*). • Marginal habitat for the state-listed endangered cave salamander (*Eurycea lucifuga*) exists in a very limited single area. • Neither habitat nor populations were located for the state-listed endangered mountain bindweed (*Polygonum cilinode*) and slender fingergrass (*Digitaria filiformis*).	Addressed in Section 5.1 of the Sitewide Excavation Plan, and will be addressed in the IEMP's Natural Resource Impact Monitoring Plan (NRIMP); however, DOE does not expect to encounter any federal- or state-listed threatened or endangered species or critical habitat in the Remediation Area 1 Phase 2 areas to be addressed by this remediation project; no additional surveys conducted or planned.

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TABLE A (continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
THREATENED & ENDANGERED SPECIES PROTECTION, continued						
Interagency Cooperation-Endangered Species Act 50 CFR §402.12(a), (b)	A biological assessment shall evaluate the potential effects of the action on listed and proposed critical habitat and determine whether any such species or habitat are likely to be adversely affected by the action and is used in determining whether formal consultation or a conference is necessary. These procedures are required for federal actions that are "major construction activities."	Appl	Appl	Appl	No critical habitat is present on the Fernald property. Updated surveys of the FEMP property in 1993 found marginal habitat for the state-listed endangered cave salamander (*Eurycea lucifuga*) exists in a very limited single area.	See preceding.
Endangered Species Regulations ORC 1531.25	No person shall take or possess any native species of wild animal, or any eggs or offspring thereof, that is endangered with state-wide extinction.	Appl	Appl	Appl	Updated surveys of the FEMP property in 1993-94 found populations of the state-listed threatened Sloan's crayfish (*Orconectes sloanii*) in sections of Paddy's Run.	See preceding.
Endangered Species Regulations ORC 1518.02 OAC 1501:18-1	No person shall root-up, injure, destroy, remove, or carry away on or from public highways, public property, or waters of the state, or on or from the property of another, without the written permission of the owner, lessee, or other person entitled to possession, any endangered plant listed in OAC 1501:18-1.	Appl	Appl	Appl	Surveys of the FEMP property in 1994 did not locate populations of the following plants: the federal-listed endangered running buffalo clover (*Trifolium stoloniferum*); the state-listed endangered mountain bindweed (*Polygonum cilinode*) and slender fingergrass (*Digitaria filiformis*); and the state-listed threatened spring corralroot (*Corallorhiza wisteriana*).	See preceding.
ARCHAEOLOGICAL, HISTORIC AND CULTURAL RESOURCE PROTECTION						
Antiquities Act of 1906 16 U.S.C. §431	No person may appropriate, excavate, injure, or destroy any historic or prehistoric ruin or monument, or any object of antiquity situated or controlled by the Government of the United States without an applicable permit. Identification and preservation of cultural resources on federal lands is required, including natural landmarks.	Appl	Appl	Appl	Proposed areas of disturbance will be surveyed and consultation will occur between DOE, the Advisory Council on Historic Preservation and the State of Ohio Historic Preservation Office (OHPO) as agreed upon in the Programmatic Agreements (later entries).	Section F.4.2 of the Sitewide Excavation Plan
Historic Sites Preservation Act 16 U.S.C. §461-467		✓	Appl	Appl		

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TABLE A-2 (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
ARCHAEOLOGICAL, HISTORIC AND CULTURAL RESOURCE PROTECTION, continued						
Archaeological Resources Protection Act 16 U.S.C. § 470aa-470ll Procedures for Implementing the National Environmental Policy Act 40 CFR §6.301(c) Protection of Archaeological Resources 43 CFR §7.4(a)	Whenever any Federal agency finds, or is notified, in writing, by an appropriate historical or archaeological authority, that its activities in connection with any Federal construction project or federally licensed project, activity, or program may cause irreparable loss or destruction of significant scientific prehistorical, historical, or archaeological data, such agency shall notify the Secretary of the Interior, in writing, and shall provide the Secretary with appropriate information concerning the project, program, or activity. No person may excavate, remove, damage, or otherwise alter or deface or attempt to excavate, remove, damage, or otherwise alter or deface any archaeological resource located on public lands unless such activity is pursuant to a permit. If an EPA activity may cause irreparable loss or destruction of significant scientific, prehistoric, historic, or archaeological data, the responsible official or the secretary of the Interior is authorized to undertake data recovery and preservation activities.	Appl	Appl	Appl	See preceding.	See preceding.
National Historic Preservation Act (NHPA) 16 U.S.C. §470 Protection of Historic Properties 36 CFR Part 800 Procedures for Implementing the National Environmental Policy Act 40 CFR §6.301(a), (b)	A federal agency (DOE) must take into account the effect of an undertaking on historic properties and accord the Advisory Council on Historic Preservation a reasonable opportunity to comment. Historic properties are defined as any prehistoric or historic district, building, site, structure, or object included in or eligible for inclusion in the National Register of Historic Places. This term includes artifacts, records, and persons released to and located within such properties. Historic properties that are to be substantially altered or demolished must be recorded for future use and reference. The purpose of this Act is not only to protect those properties listed in or eligible for the National Register of Historic Places, but also those properties that have not been listed or formally determined eligible for the listings. The heads of all Federal agencies shall assume responsibility for the preservation of historic properties which are owned or controlled by such agency. Prior to any Federal undertaking which may directly and adversely affect any National Historic Landmark, the head of the responsible agency shall, to the extent possible, minimize the harm to such landmark.	Appl	Appl	Appl	See preceding.	See preceding.
Archaeological and Historic Preservation Act 16 U.S.C. §469	Upon discovery that a project may cause the irreparable loss, destruction, significant scientific finding, prehistorical finding, or loss of historical or archaeological data, DOE must notify the Dept. of the Interior in writing and provide appropriate information concerning the project. DOE must, with possible assistance from the OHPO, undertake recovery, protection, and preservation of the data.	√	Appl	Appl	See preceding.	See preceding.

TABLE A (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
ARCHAEOLOGICAL, HISTORIC AND CULTURAL RESOURCE PROTECTION, continued						
Executive Order 11593, Protection and Enhancement of Cultural Environment 3 CFR Part 54	An inventory of a site with potential historic places is required for eligibility in the National Register of Historic Places.	✓	Appl	Appl	See preceding and following entries.	See preceding.
Programmatic Agreement Regarding Disposition of Facilities under the Operable Unit 3 Record of Decision for Interim Remedial Action at the Fernald Environmental Management Project (January 16, 1996)	• Prepare a report package describing the primary buildings and structures at the FEMP, using existing information to provide information regarding construction details, production process descriptions, design changes, current structural conditions, and current use. The report package is to include written descriptions, photographs, representative engineering drawings, and videotape, as appropriate. If existing documentation is not adequate, additional documentation will be obtained (i.e., additional photographs). Representative support buildings and structures are to be documented with photographs and written summaries as well. • Prepare a separate report package describing the FEMP's role in the DOE weapons complex and the significance of the FEMP contribution to the U.S. defense.		✓	✓	Draft reports have been submitted to the Ohio Historic Preservation Office (OHPO). Once finalized, both documents will be available to the public in the Public Environmental Information Center and archived as appropriate.	See preceding.

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TABLE A-2 (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	ARCHAEOLOGICAL, HISTORIC AND CULTURAL RESOURCE PROTECTION, continued					
Programmatic Agreement Regarding Archaeological Investigations at the Fernald Environmental Management Project (March 6, 1997)	Annual report packages, the first of which must be submitted on July 1,1997, must be submitted to the Ohio Historic Preservation Office (OHPO) and the Advisory Council on Historic Preservation (the Advisory Council) containing the following information: 1 list of all response actions and associated activities initiated within the year reported on; 2. map showing locations of above response actions/ associated activities; 3. list of response actions/associated activities conducted in previously surveyed (archeological survey) areas; 4. a list of surveys which identified no eligible historic properties; 5. a list of eligible historic properties that were avoided when implementing response actions and/or associated activities; 6. a list of Phase I-III reports generated; and 7. a map of locations of areas identified in item 6 and all properties identified.	✓	✓	✓	All of Remediation Area 1 Phase 2 has been surveyed in accordance with this programmatic agreement. All potential historic properties discovered have undergone data recovery after consultation with the OHPO and the Advisory Council. Unexpected discoveries will be addressed accordingly (see Section F.4.2 of the SEP).	See preceding.
	DOE-FEMP must also submit any and all Phase I reports generated within the last year, and not previously submitted, with the annual report.				Draft reports are under preparation for submission to the OHPO and the Advisory Council. Once finalized, the reports will be available to the public in the Public Environmental Information Center and archived as appropriate.	
	By September 2, 1997 (within 180 days of the signing of the Programmatic Agreement), submit to the OHPO and the Advisory Council a literature search, examination of aerial photographs, and use of a predictive model for all disturbed and/or contaminated areas of the FEMP (as defined in the Agreement). The predictive model is to utilize existing archeological data from the FEMP and surrounding area to determine the likelihood of additional archeological sites within the contaminated/disturbed areas and the spatial distribution, physical characteristics, and uses.					

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TABLE A (continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
ARCHAEOLOGICAL, HISTORIC AND CULTURAL RESOURCE PROTECTION, continued						
Native American Graves Protection and Repatriation Act 25 U.S.C. §3001 et seq.	Identification and preservation of cultural resources on federal lands is required, including natural landmarks. DOE must consult with appropriate Indian tribes before the intentional excavation or removal after an inadvertent discovery of Native American cultural items including human remains and objects of cultural significance.	Appl	Appl	Appl	DOE will consult with likely culturally affiliated tribes to determine the excavation, treatment, analysis and preparation of any extra reviews, associated funerary objects, unassociated funerary objects, sacred objects, or objects of cultural patrimony. Consultation will be coordinated with NHPA compliance when possible.	See preceding.
43 CFR Part 10	Provides for the return of human remains and cultural objects from Native American graves to affiliated tribes.	Appl	√	√		
American Indian Religious Freedom Act 42 U.S.C. §1996	Provides for tribal access by native peoples to grave sites and sites of cultural, symbolic, or religious significance.	Appl	Appl	Appl	See preceding.	See preceding.

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TABLE A-2 (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
AIR PATHWAY						
	NOISE POLLUTION CONTROL					
Noise Control Act, as amended 42 U.S.C. §4901, *et seq.* Noise Pollution and Abatement Act 42 U.S.C. §7641	The public must be protected from noises that jeopardize health and welfare.	Appl	Appl	R&A	Appropriate engineering controls and best management practices will be implemented so that nuisance noise from vehicles and equipment will be reduced to the maximum practicable extent during conduct of the actions.	Section 5.1.2.1 of the Sitewide Excavation Plan
	AIR EMISSIONS					
Solid Waste and Infectious Waste Regulations, Authorized, Limited, and Prohibited Solid Waste Disposal Methods OAC 3745-27-05 ORC 3734.03	Open dumping of solid waste is prohibited [OAC 3745-27-05(C)]. Solid waste disposal by means of open burning, as defined in OAC 3745-19, is permitted only as provided therein [OAC 3745-27-05(B)].	Appl	Appl	Appl		Addressed through the description of the selected remedy in the OU2 ROD (Section 9.0), OU5 ROD (Section 9.0), and OU3 ROD (Section 8.0)
Criteria for Classification of Solid Waste Disposal Facilities and Practices, Air 40 CFR §257.3-7]	Open burning of residential, commercial, institutional or industrial solid waste is prohibited. This requirement does not apply to infrequent burning of agricultural wastes in the field, silvicultural wastes for forest management purposes, land-clearing debris, diseased trees, debris from emergency clean-up operations, and ordnance [40 CFR §257.3-7].	✓	✓	Appl		
Open Burning Standards, Open Burning in Unrestricted Areas OAC 3745-19-04(C)	Open burning is allowed for the following purposes [OAC 3745-19-04(C)]: • Recognized horticultural, silvicultural, range, or wildlife management practices [OAC 3745-19-04(C)(5)]. • Disposal of land clearing waste if the following conditions are met [OAC 3745-19-04(C)(4)]: - The fire is set only when atmospheric conditions will readily dissipate contaminants; - The fire does not create a visibility hazard on roadways, railroad tracks, or air fields; - The fire is located at a point on the premises no less than 1000 feet from any inhabited building not located on said premises.	✓	✓	Appl		

TABLE [illegible] (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	AIR EMISSIONS, continued					
General Provisions on Air Pollution Control, Air Pollution Nuisances Prohibited OAC 3745-15-07 ORC 3704.01-.05	Measures shall be taken to adopt and maintain a program for the prevention, control, and abatement of air pollution in order to protect and enhance the quality of the state's air resource so as to promote the public health, welfare, and economic vitality of the people of the state. The emission or escape into open air from any source whatsoever of smoke, ashes, dust, dirt, grime, acids, fumes, gases, vapors, odors and combinations of the above in such a manner or in such amounts as to endanger the health, safety, and welfare of the public, or to cause unreasonable injury or damage to property shall be declared to be a public nuisance. It is unlawful for any person to cause, permit, or maintain any such public nuisance.	Appl	Appl	Appl	Only fugitive dust (dirt, flyash, bottom ash) is anticipated from this soil remedial action project. Air pollution nuisance prohibitions will be met by employing best management practices for control of fugitive dust.	FEMP Fugitive Dust Control BAT Determination, Fugitive Dust Control Requirements (RM-0047), and Section 5.1.2 of the Sitewide Excavation Plan
ORC 3734.02(I)	No owner or operator of a hazardous waste facility, in the operation of the facility, shall cause, permit, or allow the emission therefrom of any particulate matter, dust, fumes, gas, mist, smoke, vapor, or odorous substances that, in the opinion of the Director [of Environmental Protection, a.k.a., the Director of the OEPA], unreasonably interferes with comfortable enjoyment of life or property by persons living or working in the vicinity of the facility, or that is injurious to public health. Any such action is hereby declared to be a public nuisance.	✓	✓	R&A		
Particulate Matter Standards, Non-Degradation Policy OAC 3745-17-05	The significant and avoidable deterioration of air quality in any part of the area where presently existing air quality is better than the particulate ambient air quality standards in OAC 3745-17-02 (described above) shall be prohibited.	Appl	Appl	✓	Appropriate control measures will be applied to all construction grading, excavation, loading/unloading and material management activities to reduce fugitive emissions. Also see preceding entry.	FEMP Fugitive Dust Control BAT Determination, Fugitive Dust Control Requirements (RM-0047), and Section 5.1.2.2 of the Sitewide Excavation Plan
Particulate Matter Standards, Control of Visible Particulate Emissions from Stationary Sources OAC 3745-17-07(A)(1)(a)	Visible particulate emissions from any point source shall not exceed 20 percent opacity, as a 6-minute average, but shall not exceed 60 percent opacity, as a 6-minute average, at any time. Transient exceedance limits are included in this regulation.	Appl	Appl	Appl	All point sources associated with a remedial action project (i.e., sludge dewatering, etc.) will employ best available emissions control technologies to mitigate particulate emissions.	As necessary, monitoring requirements will be addressed in the appropriate IRDP.

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TABLE A-2 (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	AIR EMISSIONS, continued					
Particulate Matter Standards, Control of Visible Particulate Emissions from Stationary Sources OAC 3745-17-07(B)(1)	Visible particulate emissions from any fugitive dust source shall not exceed 20 percent opacity, as a 3-minute average.	√	√	√	Appropriate control measures will be applied to all construction grading, excavation, loading/unloading and material management activities to reduce fugitive emissions.	FEMP Fugitive Dust Control BAT Determination, Fugitive Dust Control Requirements (RM-0047), and Section 5.1.2.2 of the Sitewide Excavation Plan
Particulate Matter Standards, Control of Visible Particulate Emissions from Stationary Sources OAC 3745-17-07 (B)(4), (5), (6)	There shall be no visible particulate emissions from any paved roadway or paved parking area except for a period of time not to exceed 6 minutes during any 60-minute observation period. There shall be no visible particulate emissions from any unpaved roadway or unpaved parking area except for a period of time not to exceed 13 minutes during any 60-minute observation period. There shall be no visible particulate emissions from any material storage piles except for a period of time not to exceed 13 minutes during any 60-minute observation period.	Appl	R&A	√	Appropriate control measures will be applied to all construction grading, excavation, loading/unloading and material management activities to reduce fugitive emissions.	FEMP Fugitive Dust Control BAT Determination, Fugitive Dust Control Requirements (RM-0047), and Section 5.1.2.2 of the Sitewide Excavation Plan
Particulate Matter Standards, Restriction of Emission of Fugitive Dust OAC 3745-17-08(B)	No person shall cause or permit any fugitive dust source to be operated; or any materials to be handled, transported, or stored; or a building (or its appurtenances) or a road to be used, constructed, altered, repaired, or demolished without taking or installing reasonably available control measures to prevent fugitive dust from becoming airborne. Such reasonably available control measures shall include, but are not limited to, one or more of the following which are appropriate to minimize or eliminate visible particulate emissions of fugitive dust. • The use of water or other suitable dust suppression chemicals for the control of fugitive dust from the demolition of existing buildings or structures, construction operations, the grading of roads, or the clearing of land; or • The periodic application of asphalt, oil, water, or other suitable dust suppression chemicals on dirt or gravel roads and parking lots, and any other surfaces that may cause emissions of fugitive dust.	Appl	R&A	Appl	This requirement is applicable only to certain cities in Butler and Hamilton Counties. Appropriate control measures will be applied to all construction grading, excavation, loading/unloading and material management activities to reduce fugitive emissions.	See preceding.

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TABLE A (continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	AIR EMISSIONS, continued					
Particulate Matter Standards, Restrictions on Particulate Emissions from Industrial Processes OAC 3745-17-11	The following are restrictions for particulates from any operation, process, or activity which releases or may release particulate emissions into the ambient air. These limits are based on the weight of material being processed. Process Weight at Maximum Capacity (lb/hr) — Allowable Particulate Emission Rate (lb/hr) 100 — 0.551 200 — 0.877 400 — 1.40 600 — 1.83 800 — 2.22 1000 — 2.58 *These limits do not apply to generation of fugitive dust* subject to OAC 3745-17-08 (listed above).	Appl		R&A	All point sources associated with a remedial action project (i.e., sludge dewatering, etc.) will employ best available emissions control technologies to mitigate particulate emissions.	See preceding.
Permit to Install New Sources of Pollution OAC 3745-31-05 (A)(3)	The installation or modification and operation of an air contaminant source, solid waste disposal facility, water pollution source, disposal system, land application of sludge, or public water system, must employ the best available technology. The terms used in the above are defined in OAC 3745-15-01, unless otherwise defined in OAC 3745-31-01.	R&A	Appl	R&A	Appropriate control measures will be applied to all construction grading, excavation, loading/unloading and material management activities to reduce fugitive emissions. All point sources associated with a remedial action project (i.e., sludge dewatering, etc.) will employ best available emissions control technologies to mitigate particulate emissions.	FEMP Fugitive Dust Control BAT Determination, Fugitive Dust Control Requirements (RM-0047), and Section 5.1.2.2 of the Sitewide Excavation Plan

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TABLE A-2 (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	AIR EMISSIONS, continued					
Standards of Performance for New Stationary Sources, Subpart OOO—Standards of Performance for Nonmetallic Mineral Processing Plants 40 CFR §60.672(a), (d), (e)	No owner or operator shall cause to be discharged into the atmosphere from a crusher any emissions which: • Contain particulate matter in excess of 0.05 grams per dry cubic meter at standard conditions (g/dscm); and • Exhibit greater than 7 percent opacity Truck dumping of nonmetallic minerals into any crusher is exempt from these requirements.	R&A	✓		It is not anticipated that a crusher will be used during this remedial action project. All point sources associated with a remedial action project (i.e., sludge dewatering, etc.) will employ best available emissions control technologies to mitigate particulate emissions.	See preceding.
40 CFR Part 61, Subpart M-National Emission Standard for Asbestos, Standard for Waste Disposal for Manufacturing, Fabrication, Demolition, Renovation, and Spraying Operation 40 CFR §61.150	(a) Discharge no visible emissions to the outside air during the collection, processing, packaging, or transporting of any asbestos-containing waste material, or use one of the emission control methods specified in paragraphs (a)(1) through (4) of this section: (1) Adequately wet asbestos-containing material. After wetting, seal all asbestos-containing waste material in leak-tight containers while wet; or, put materials that will not fit into containers without additional breaking into leak-tight wrapping. Label the containers or wrapped materials in accordance with 29 CFR 1910.1001(j)(2) or 1926.58(k)(2)(iii). ... (4) Use an alternative emission control and waste treatment method that has received prior approval from the Administrator. (5) As applied to demolition and renovation, the requirements above under paragraph (a) of this section do not apply to Category I non-friable ACM waste and Category II non-friable ACM waste that did not become crumbled, pulverized, or reduced to powder. "Adequately wet" means sufficiently mix or penetrate with liquid to prevent the release of particulates; if visible emissions are observed coming from the asbestos-containing material, the material has not been adequately wetted [40 CFR §61.41].	✓	✓	Appl		See preceding, and following sections of the Sitewide Excavation Plan: 2.5.8 Special Materials 3.3.2.2 Special Materials F.4.1.1 Asbestos
Asbestos Emission Control, Standard for Asbestos Waste Handling OAC 3745-20-05(B), (C)&(D)	(B) Discharge no visible emissions [of asbestos] during the collection, processing, packaging, transporting or deposition of any asbestos-containing waste material, and use one of the emission control methods below: (1) Adequately wet asbestos-containing material and seal the material into durable leak-tight containers or enclosure system. (2) For facilities where asbestos was not removed prior to demolition [or excavation], keep asbestos-containing waste adequately wet or sealed/encapsulated until collected for disposal.					

TABLE A (continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	(C) Seal all friable asbestos-containing waste material into durable leak-tight disposal containers or use an approved alternative disposal system in accordance with the following: (1) Label all containers of asbestos-containing waste material: DANGER CONTAINS ASBESTOS FIBERS AVOID CREATING DUST CANCER AND LUNG DISEASE HAZARD R.Q. Hazardous Substance N.O.S. asbestos ORM-E 9188 (2) Seal asbestos-containing waste materials in plastic bags at least 6 mils (0.006 inch) thick, and seal that in a second clean, leak-tight plastic bag at least 6 mils thick; or (4) Facility components coated with, covered or containing friable asbestos materials and removed in sections or units — Seal with leak-tight plastic at least 12 mils (0.012 inch) thick or leak-tight polypropylene woven fabric at least 10 mils (0.010 inch) thick; or (3) Whenever necessary to prevent any asbestos-containing waste material from pentrating a container (bag or wrap) — Seal the materials using a combination of a 6 mils thick plastic bag and a leak-tight steel, plastic, or fiber drum, or reinforced disposal box, leak-tight polypropylene woven fabric bag, or similar suitable and durable container. Fit drums with a matching lid and lock-rims. Band and seal boxes with reinforced tape or in accordance with manufacturers recommendations; or (5) Asbestos-containing waste materials, facility components, and contaminated debris may be disposed of using an alternative disposal system which has received prior approval from the Director. (D) Prepare and secure any load of asbestos-containing waste material in a manner that prevents any visible emissions [of asbestos], load loss, and spillage or leakage of liquids.					

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TABLE A-2 (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	AIR EMISSIONS, continued					
Asbestos Emission Control, Standard for Active Asbestos Disposal Sites OAC 3745-20-06(A)&(B) [40 CFR Part 61, Subpart M-National Emission Standard for Asbestos, Standard for Active Waste Disposal Sites, 40 CFR §61.154]	(A) Each owner or operator of an active asbestos waste disposal site shall cause or permit no visible emissions [of asbestos] to the outside air; or shall comply with the requirements of paragraph (B) of this rule. (B) Rather than meet the no visible emissions requirement of paragraph (A) of this rule, each owner or operator of an active asbestos waste disposal site shall comply with the following: (1) There shall be no visible emissions [of asbestos] from asbestos-containing waste materials during the on-site transportation, transfer, deposition or compacting operations. (2) Deposition and burial operations shall be conducted in a manner which prevents handling by equipment or persons that causes asbestos-containing waste materials to be broken-up or dispersed before the materials are buried. (3) As soon as practicable after deposition of the asbestos-containing waste materials but no later than at the end of each operating day, the asbestos-containing waste material deposited at the site during the operating day shall be buried with at least twelve inches of compacted nonasbestos-containing material. Alternatively, any owner or operator of an active asbestos waste disposal site may apply for approval of the Director [of Environmental Protection, a.k.a. Director of the OEPA] to utilize alternative control measures to bind dust, control wind erosion or convert [friable] asbestos to non-friable forms. (4) During the unloading, deposition, burial, and initial compaction of asbestos-containing materials, the owner or operator of the active [asbestos] waste disposal site shall establish a restricted area adequate to deter the unauthorized entry of the general public and any unauthorized personnel from any location within one hundred feet of the operations, and shall display the following information on a sign not less than twenty by fourteen inches, so that it is visible before entering the restricted area: ASBESTOS DUST HAZARD Do Not Remain In Area Unless Your Work Requires It Breathing Asbestos Dust Is Hazardous To Your Health	✓	✓	Appl	Pertinent to the management of asbestos-containing materials. Also note that requirements from paragraphs (A) and (B) which are pertinent to disposal of asbestos-containing materials, are included in the OSDF Impacted Materials Placement Plan (20100-PL-007). NOTE: The sizing & language for warning signs under (B)(4) at left conflicts with that required by OSHA under 29 CFR §1926.1101(k)(7). The FEMP will follow either the Ohio active asbestos disposal sites language or the OSHA required sign language: DANGER ASBESTOS CANCER & LUNG DISEASE HAZARD AUTHORIZED PERSONNEL ONLY OSHA does not impose a minimum sign size.	See preceding.

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TABLE A (continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	AIR EMISSIONS, continued					
Asbestos Emission Control, Standard for Inactive Asbestos Disposal Sites OAC 3745-20-07(C) [40 CFR Part 61, Subpart M-National Emission Standard for Asbestos, Standard for Inactive Waste Disposal Sites, for Asbestos Mills and Manufacturing and Fabricating Operations 40 CFR §61.151]	The owner or operator may use an alternate control method that has received prior approval of the Director [of Environmental Protection, a.k.a. Director of the OEPA] rather than comply with the requirements of paragraph (A) [emissions and cover requirements] or (B) [posting and access control requirements] of this rule.	✓	✓	Appl	These requirements for inactive asbestos waste disposal sites are very similar to those for active asbestos waste disposal sites under OAC 3745-20-06 (preceding entry). During soil remediation activities under this remedial action project, the requirements for active asbestos disposal sites (preceding entry) will be followed while managing friable asbestos-containing material. Also note that requirements pertinent to disposal of asbestos-containing materials under paragraphs (A) and (C) of OAC 3745-20-07 are included in the OSDF Impacted Materials Placement Plan (20100-PL-007).	See preceding.

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F-1228

TABLE A-2 (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	AIR EMISSIONS, continued					
Asbestos Emission Control, Standard for Inactive Asbestos Disposal Sites OAC 3745-20-07(D) [40 CFR Part 61, Subpart M-National Emission Standard for Asbestos, Standard for Inactive Waste Disposal Sites for Asbestos Mills and Manufacturing and Fabricating Operations, 40 CFR §61.151(d)]	Each owner or operator of an inactive asbestos waste disposal site shall notify the Director [of Environmental Protection, a.k.a. the Director of the OEPA] in writing prior to disturbing or removing any asbestos-containing waste material. The notice shall contain:	✓	✓	✓	Submission of the project-specific IRDPs to OEPA constitute this notification.	
	• the reason for disturbing the waste,					The reason for disturbing the material is documented in the OU2, OU5 and OU3 RODs.
	• the procedures to be used to control emissions,					FEMP Fugitive Dust Control BAT Determination, Fugitive Dust Control Requirements (RM-0047), the OSDF Impacted Materials Placement Plan (20100-PL-007), and following sections of the Sitewide Excavation Plan: 2.5.8 Special Materials 3.3.2.2 Special Materials 5.1.2.2 Fugitive Emissions F.4.1.1 Asbestos
	• the duration of the operation, and				Project schedules contained in project-specific IRDPs.	
	• the location of the final disposal site.					The OSDF, unless the OSDF WAC is not met; else, an off-site permitted/licensed disposal facility.

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TABLE A (continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	AIR EMISSIONS, continued					
National Emission Standards for Hazardous Air Pollutants, Subpart H—National Emission Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities, 40 CFR §61.90, §61.91 and §61.92 - .97 [Radiation Protection of the Public and the Environment DOE Order 5400.5 Chapter II (1)(b)]	Emissions of radionuclides (except radon-220 and radon-222) to the ambient air from DOE facilities shall not exceed those amounts that would cause any member of the public to receive in any year an effective dose equivalent of 10 mrem/yr: To determine compliance with the standard, radionuclide emissions shall be determined and effective dose equivalent values to members of the public calculated using EPA-approved sampling procedures, computer models CAP-88 or AIRDOS-PC, or other procedures for which EPA has granted prior approval.	Appl	Appl	Appl		Section 6 of the Integrated Environmental Monitoring Plan (IEMP) and the following sections of the Sitewide Excavation Plan: 5.1.2.3 Airborne Radiological Particulates 5.1.2.4 Radon 5.1.2.5 Direct Radiation
National Emission Standards for Hazardous Air Pollutants, Subpart Q—National Emission Standards for Radon Emissions From Department of Energy Facilities 40 CFR §61.190, §61.192	No source at a DOE facility shall emit more than 20 pCi/m²/sec of radon-222 as an average for the entire source into the air.	Appl	Appl	R&A	The existing distribution of contaminants within the site soils attains compliance with this requirement. Will be addressed sitewide as necessary by the Integrated Environmental Monitoring Plan (IEMP).	

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TABLE A-2 (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
SURFACE WATER PATHWAY						
	WETLANDS/FLOODPLAIN PROTECTION					
Executive Order 11990, Protection of Wetlands	Federal agencies are required to take action to avoid adversely impacting wetlands wherever possible, to minimize wetland destruction, and to preserve the values of wetlands.	Appl	Appl		Floodplain and wetland impacts associated with soil remediation activities will be minimized and avoided to the maximum extent practicable. Projects with unavoidable impacts will be undertaken in accordance with 33 CFR Parts 323 and 330. Based on an overlay of the Remediation Area 1 Phase 2 boundary on the FEMP Jurisdictional Wetland Delineation (Drwg. 75X-5500-G-00372), approximately 0.71 acres of jurisdictional wetlands are anticipated to be dredged and filled during excavation of the remediation area. Dredge and fill activities within these wetlands will comply with the substantive requirements of Nationwide Permit Nos. 38 and 26 (subsequent entry) — promulgated in Appendix A of 33 CFR Part 330 (subsequent entry) and OEPA's corresponding State Water Quality Certification (see subsequent entry for OAC 3745-32).	Approximately 36 acres of jurisdictional wetlands and 9 acres of waters of the United States were identified on the FEMP property as a result of the 1993 Jurisdictional Wetlands & Waters of the U.S. (1993 FEMP Wetland Delineation). The U.S. Army Corps of Engineers officially approved the delineation on August 19, 1993. See also: Appendix H of the OU2 FS Report; Appendix J of the OU5 FS Report, and Appendix J of the OU3 RI/FS. The Natural Resources Restoration Plan (NRRP); also, operable unit closure reports must include NEPA compliance, as per following sections of the Sitewide Excavation Plan: 1.4.2 Related Documents 7.4 Certification Report 7.5 Other Related Future Documents

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TABLE A (continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	WETLANDS/FLOODPLAIN PROTECTION, continued					
Procedure for Implementing the National Environmental Policy Act 40 CFR §6.302(a)	Federal agencies conducting certain activities must avoid, to the extent possible, the adverse impacts associated with the destruction or loss of wetlands, and avoid support of new construction in wetlands when a practicable alternative exists.	Appl	Appl		See preceding.	See preceding.
Executive Order 11988, Floodplain Management Procedures for Implementing the National Environmental Policy Act 40 CFR §6.302(b)	Federal agencies must evaluate the potential effects of actions they may take in a floodplain to avoid, to the extent possible, adverse effects associated with direct and indirect development of a floodplain.	Appl	Appl		Remediation is needed, and can not be avoided. Nationwide Permit # 38 (subsequent entry) authorizes such remedial activity in a floodplain. A wetland/floodplain assessment has been conducted. Remediation Area 1 Phase II is located *outside* the 100-year floodplains of Paddy's Run and of the Great Miami River. No floodplain impacts will result from excavation activities associated with this soil remediation project.	An updated floodplain determination was conducted in October 1992 for Paddy's Run using the U.S. Army Corps of Engineers' standard HEC2 water surface profile analysis program. The 100-year flood elevations reach the western slope of the Inactive Flyash Pile and the toe of the South Field slope.

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TABLE A-2 (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	WETLANDS/FLOODPLAIN PROTECTION, continued					
DOE Compliance with Floodplain/ Wetlands Environmental Review Requirements 10 CFR §1022.3(a), 3(b)(1), 3(b)(2), 3(b)(3), 3(b)(5), 3(b)(6), 3(c), 3(d), 3(e)	DOE shall exercise leadership and take action to: • Avoid to the extent possible the long- and short-term adverse impacts associated with the destruction of wetlands and the occupancy and modification of floodplains and wetlands, and avoid direct and indirect support of floodplain and wetland development wherever there is a practicable alternative. • Incorporate floodplain management goals and wetlands protection considerations into its planning, regulatory, and decision-making processes and shall to the extent practicable: - Reduce the hazard and risk of flood loss. - Minimize the impact of floods on human safety, health, and welfare. - Restore and preserve natural and beneficial values served by the floodplain. - Minimize the destruction, loss, or degradation of wetlands. - Preserve and enhance the natural and beneficial values of wetlands. • Undertake a careful evaluation of the potential effects of any DOE action taken in a floodplain and any new construction undertaken by DOE in wetlands not located in a floodplain. • Identify, evaluate, and as appropriate, implement alternative actions which may avoid or mitigate adverse floodplain/wetlands impacts. • Provide opportunity for early public review of any plans or proposals for actions in floodplains and new construction in wetlands.	Appl	Appl	Appl	10 CFR Part 1022 is the DOE implementing regulation for Executive Orders 11988 and 11990 (see corresponding preceding entries).	Remediation decisions included avoidance to/ minimization of wetlands impacts. See: Appendix H of the OU2 FS Report; Appendix J of the OU5 FS Report, and Appendix J of the OU3 RI/FS. Also, see preceding entries.
DOE Compliance with Floodplain/ Wetlands Environmental Review Requirements 10 CFR §1022.5(b), (h)	This part shall apply to all proposed floodplain/wetlands actions, including those sponsored jointly with other agencies, where practicable alternatives to the proposed actions are still available. The policies and procedures of this part which are applicable to floodplain actions shall apply to all proposed actions which occur in a wetlands located in a floodplain.	Appl	Appl	Appl	See preceding entries.	See preceding entries.

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TABLE A (continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	WETLANDS/FLOODPLAIN PROTECTION, continued					
DOE Compliance with Floodplain/ Wetlands Environmental Review Requirements 10 CFR §1022.11 (a), (b), (c)	Concurrent with its review of a proposed action to determine appropriate NEPA requirements, DOE shall determine applicability of the floodplain management and wetlands protection requirements of this part. In making a floodplain determination, DOE shall utilize the Flood Insurance Rate Maps (FIRMs) or the Flood Hazard Boundary Maps (FHBMs) prepared by the Federal Insurance Administration of the Department of Housing and Urban Development to determine if a proposed action is located in the base or critical action floodplain, as appropriate. For a proposed action in an area of predominately federal or state land holdings where FIRM or FHBM maps are not available, information shall be sought from the land administering agency (e.g., Bureau of Land Management, Soil Conservation Service, etc.) or from agencies with floodplain analysis expertise.	Appl	Appl		See preceding entries.	See preceding entries.
DOE Compliance with Floodplain/ Wetlands Assessments 10 CFR §1022.12(a)	If DOE determines, pursuant to 10 CFR §§ 1022.5 and 1022.11, that this part is applicable to the proposed action, DOE shall prepare a floodplain/wetlands assessment, according to the requirements in this section (10 CFR §1022.12).	Appl	Appl		See preceding entries.	See preceding entries.
DOE Compliance with Floodplain/ Wetlands Environmental Review Requirements 10 CFR §1022.15(a)	If DOE finds that no practicable alternative to locating in the floodplain/wetland is available, consistent with the policy set forth in Executive Order 11988, DOE shall, before taking action, design, or modify its action in order to minimize potential harm to or within the floodplain or wetland.	Appl	Appl		See preceding entries.	See preceding entries.
Federal Water Pollution Control Act (a.k.a., Clean Water Act) General Regulatory Policies 33 CFR §323.3	Permits will be required for the discharge of dredged or fill material into waters of the United States including wetlands. Certain discharges specified in 33 CFR Part 330 are permitted by that regulation (nationwide permits). If a discharge of dredged or fill material is not permitted by 33 CFR Part 330 (Nationwide Permits), an individual section 404 permit will be required for the discharge of dredged or fill material into waters of the United States. Discharges of dredged or fill material into waters of the United States done by or on behalf of any Federal agency, other than the Corps of Engineers, are subject to the authorization procedures of these regulations. Remedial actions involving the discharge of dredge and fill material into these areas shall meet the substantive requirements of this section and 40 CFR Part 230.	Appl	 Appl		See the preceding entry for Executive Order 11990 (first Floodplains/Wetlands Protection entry). Discharges of dredged and fill material not authorized by a NWP will be conducted in accordance with the substantive requirements of these regulations.	See preceding entries.

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8-1-1228

TABLE A-2 (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	WETLANDS/FLOODPLAIN PROTECTION, continued					
Federal Water Pollution Control Act (a.k.a., Clean Water Act) Nationwide Permit (NWP) Program 33 CFR Part 330	The U.S. Army Corps of Engineers has authorized certain categories of activities involving the discharge of dredged and fill material into wetlands and waters of the United States under the NWP program. Activities involving the discharge of dredged and fill material will be conducted in accordance with the substantive requirements of applicable NWPs as required. Discharges not authorized by NWP will be conducted in accordance with the substantive requirements of 33 CFR Part 323 and 40 CFR Part 230.	√	Appl	R&A	See preceding entries.	Following sections of the Sitewide Excavation Plan: 3.3.1 Implementation of Construction, Excavation, and Material-handling Activities 5.1.1 Natural Resource Impacts 5.1.3 Surface Water Pathway
Federal Water Pollution Control Act (a.k.a., Clean Water Act) Nationwide Permit Program 33 U.S.C. §1341(a)(1), (d) 33 CFR §330.1(c)	An activity is authorized under an Nationwide Permit (NWP) only if that activity and the permittee satisfy all of the individual NWP's terms and conditions. Potentially applicable NWPs include: • Nationwide Permit #38 — Cleanup of Hazardous and Toxic Waste - This permit authorizes specific activities required to affect the containment, stabilization or removal of hazardous or toxic waste materials that are performed, ordered, or sponsored by a government agency with established legal or regulatory authority provided the permittee notifies the district engineer. - For discharges in special aquatic sites, including wetlands, the notification must include a delineation of affected special aquatic sites, including wetlands. - This nationwide permit does not authorize the establishment of new disposal sites or the expansion of existing sites used for the disposal of hazardous or toxic waste. • Nationwide Permit #26 — Headwaters and Isolated Waters Discharges - The discharge does not cause the loss of more than 10 acres of waters of the United States. - The permittee notifies the district engineer if the discharge would cause the loss of waters of the United States greater than one acre. - For discharges in special aquatic sites, including wetlands, the notification must also include a delineation of affected special aquatic sites, including wetlands. - The discharge, including all attendant features, both temporary and permanent, is part of a single and complete project.	Appl	Appl	R&A	See preceding entry for Executive Order 11990 (first Floodplains/Wetlands Protection entry).	January 17, 1992 letter from Donald R. Schregardus, Director of the OEPA, to the U.S. Army Corps of Engineers, "401 Certification — Grant," the OEPA conditionally certified that projects authorized by NWP #s 38 and 26 will comply with the applicable provisions of the Federal Water Pollution Control Act.

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TABLE A (continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	WETLANDS/FLOODPLAIN PROTECTION, continued					
Federal Water Pollution Control Act (a.k.a., Clean Water Act) Nationwide Permit Program Section B(26) to Appendix A of 33 CFR Part 330	Discharges of dredged or fill material into headwaters and isolated waters [under Nationwide Permit # 26] are approved provided: • The discharge does not cause the loss of more than 10 acres of waters of the United States. • The permittee notifies the district engineer if the discharge would cause the loss of waters of the United States greater than one acre. • For discharges in special aquatic sites, including wetlands, the notification must also include a delineation of affected special aquatic sites, including wetlands. • The discharge, including all attendant features, both temporary and permanent, is part of a single and complete project.	✓	✓	✓	See preceding and following entries.	See preceding and following entries.
Federal Water Pollution Control Act (a.k.a., Clean Water Act) Nationwide Permit Program 33 CFR §330.4 (c)(1) Ohio Section 401 State Water Quality Certifications OAC 3745-32-02	Section 401 State Water Quality Certification pursuant to Section 401 of the Clean Water Act, or waiver thereof, is required to prior to issuance or reissuance of individual or nationwide permits authorizing (dredge and fill) activities which may result in a discharge into waters of the United States. State Water Quality Certification is granted provided: 1. The discharge does not prevent or interfere with the attainment or maintenance of applicable water quality standards; and 2. The discharge does not result in a violation of any applicable provisions of the Federal Water Pollution Control Act (a.k.a., Clean Water Act).	Appl	Appl		See preceding and following entries.	January 17, 1992 letter from Donald R. Schregardus, Director of the OEPA, to the U.S. Army Corps of Engineers, "401 Certification — Grant," the OEPA conditionally certified that projects authorized by the NWP #s 38 and 26 (see previous entry) will comply with the applicable provisions of the Federal Water Pollution Control Act.
Federal Water Pollution Control Act (a.k.a., Clean Water Act) Nationwide Permit Program Section C of Appendix A to 33 CFR Part 330	In addition to the General Conditions, the following [Section 404 only] conditions apply only to activities that involve the discharge of dredge or fill material and must by followed in order for authorization of the nationwide permits to be valid: • No discharge of dredged or fill material may consist of unsuitable material (e.g., trash, debris, car bodies, etc.). And material discharged must be free from toxic pollutants in toxic amounts (see Section 307 of the Clean Water Act). • Discharges of dredged or fill material into waters of the United States must be minimized or avoided to the maximum extent practicable at the project site, unless the District Engineer has approved a compensation mitigation plan for the specific regulated activity.	✓	✓		See preceding entries.	The Natural Resources Restoration Plan (NRRP)

TABLE A-2 (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	WETLANDS/FLOODPLAIN PROTECTION, continued					
Federal Water Pollution Control Act (a.k.a., Clean Water Act) Nationwide Permit Program Section C of Appendix A to 33 CFR Part 330 000274	Factors that the District Engineer will consider when determining the acceptability of appropriate and practicable mitigation include, but are not limited to: • To be practicable, the mitigation must be available and capable of being done considering costs, existing technology, and logistics in light of overall project purposes. • To the extent appropriate, permittees should consider mitigation banking and other forms of mitigation including contribution to wetland trust funds, which contribute to the restoration, creation, replacement, enhancement, or preservation of wetlands. • Furthermore, examples of mitigation that may be appropriate and practicable include but are not limited to: reducing the size of the project; establishing buffer zones to protect aquatic resource values; and replacing the loss of aquatic resource values by creating, restoring, and enhancing similar functions and values. In addition, mitigation must address impacts and cannot be used to offset the acreage of wetland losses that would occur in order to meet the acreage limits of some of the nationwide permits.	✓	✓		See preceding entries.	The Natural Resources Restoration Plan (NRRP)
Federal Water Pollution Control Act (a.k.a., Clean Water Act) §404 (33 U.S.C. §1344) Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material, Subpart B—Compliance With the Guidelines, Restrictions on Discharge 40 CFR §230.10	No discharge of dredged or fill material shall be permitted: • If there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as, the alternative does not have other significant adverse environmental consequences. • Unless appropriate and practicable steps have been taken which will minimize potential adverse impacts of the discharge on the aquatic ecosystem. No discharge of dredged or fill material shall be permitted if it: • Causes or contributes, after consideration of disposal site dilution and dispersion, to violations of any applicable state water quality standard. • Violates any applicable toxic effluent standard or prohibition under section 307 of the Clean Water Act. • Jeopardizes the continued existence of species listed as endangered or threatened under the Endangered Species Act of 1973, as amended, or results in likelihood of the destruction or adverse modification or a habitat which is determined to be a critical habitat under the Endangered Species Act of 1973, as amended.	Appl	✓	✓	See preceding entries.	Appendix H of the OU2 FS Report; Appendix J of the OU5 FS Report, and Appendix J of the OU3 RI/FS.

TABLE A (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	DISCHARGE TO SURFACE WATER					
Pollution to Waters of the State ORC 6111.04	No person shall cause pollution or place or cause to be placed any sewage, industrial waste, or other wastes in a location where they cause pollution of any waters of the state. No person to whom a permit has been issued shall place or discharge, or cause to be placed or discharged, in any waters of the state any sewage, industrial waste, or other wastes in excess of the permissive discharges specified under such existing permit without first receiving a permit from the Director to do so. Pollution to waters of the state is prohibited.	Appl	Appl	R&A		FEMP Site NPDES Permit Number 1H000004*ED, the FEMP Stormwater Pollution Prevention Plan (RM-0039), Section 4 of the Integrated Environmental Monitoring Plan (IEMP), and the following section of the Sitewide Excavation Plan: 5.1.3 Surface Water Pathway
Compliance with Ohio Water Pollution Control Requirements ORC 6111.07(A), (C)	Failure to comply with water pollution control requirements is prohibited.	✓	Appl	Appl		See preceding.
Water Quality Standards, Criteria Applicable to All Waters OAC 3745-1-04	To every extent practical and possible, all surface waters of the State of Ohio shall be free from: • Suspended solids or other substances that enter the waters as a result of human activity that will form putrescent or otherwise objectionable sludge deposits • Floating debris, oil, scum and other floating materials entering the waters as a result of human activity in amounts sufficient to be unsightly or cause degradation • Materials entering the waters as a result of human activity producing color, odor or other conditions in such a degree as to create a nuisance • Substances entering the waters as a result of human activity in concentrations that are toxic or harmful to human, animal or aquatic life and/or are rapidly lethal in the mixing zone • Nutrients entering the waters in concentrations that create nuisance growths of aquatic weeds or algae	✓	R&A	R&A		See preceding.

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TABLE A-2 (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	DISCHARGE TO SURFACE WATER, continued					
Water Quality Standards, Antidegradation Policy OAC 3745-1-05(A)&(B)	(A) Existing instream water uses as defined in OAC 3745-1-07 [subsequent entry] shall be maintained and protected. No further water quality degradation which would interfere with or become injurious to designated uses is allowable. (B) Waters in which existing water quality is better than the criteria prescribed in these rules and exceeds those levels necessary to support propagation of fish, shellfish and wildlife and recreation in and on the water shall be maintained and protected. ... Degradation of water quality shall not interfere or become injurious to existing or planned uses, and the Director shall require that ... feasible management or regulatory programs pursuant to Section 208 and 303 of the Act [Clean Water Act], 33 U.S.C. Sections 1288 and 1313, be applied to nonpoint sources.	✓	✓	Appl	Soil remedial action projects will ensure that existing instream water uses of the Great Miami River and Paddy's Run will be maintained as health protective.	See preceding.
Water Quality Standards, Great Miami River OAC 3745-1-21	Paddy's Run and the Great Miami River are designated as: • Warm water aquatic life habitat • Agricultural and industrial water supply • Primary contact recreation The Great Miami River between Ross Road (RM 95.7) to Taylorsville Dam (RM 92.6) is a state resource water, and RM 130 and 118 are public water supplies.	Appl	Appl	Appl	Discharges to the Great Miami River and Paddy's Run must not cause a violation of applicable numeric or narrative water quality standards for these designations. The FEMP effluent discharge pipe, located at River Mile (RM) 24.73 on the Great Miami River, is downstream of the state resource waters and public water supplies.	See preceding.
National Pollutant Discharge Elimination System 40 CFR §122.26(a)(l)(ii), 40 CFR §122.26(b)(14)(v), (x)	A discharge composed entirely of storm water associated with industrial activity is required to obtain a NPDES permit. These categories of facilities are considered to be engaging in "industrial activity": • Landfills, land application sites, and open dumps that receive or have received any industrial wastes (waste that is received from any of the facilities described under this subsection), including those that are subject to regulation under Subtitle D of RCRA; and • Construction activities including clearing, grading, and excavation that disturbs five acres or more of total land area.	Appl	Appl	Appl	Discharges of stormwater associated with industrial and/or construction activities are regulated in accordance with the existing FEMP NPDES Permit, and the FEMP Stormwater Pollution Prevention Plan.	See preceding.

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TABLE A-2 (Continued)
PERTINENT ARARs AND TBCs F[illegible] REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	DISCHARGE TO SURFACE WATER, continued					
Ohio NPDES Permits, Ohio NPDES Permits Required OAC 3745-33-02(A)	No person may discharge any pollutant or cause, permit, or allow a discharge of any pollutant [from a point source] without applying for and obtaining an Ohio NPDES permit in accordance w with the requirements of this Chapter, 3745-33.	✓	✓	✓	See preceding and following entries.	FEMP Site NPDES Permit (Ohio EPA Number 1IO00004*ED), and the FEMP Stormwater Pollution Prevention Plan (RM-0039).
Ohio NPDES General Permits, Ohio NPDES Permit Required OAC 3745-38-02(A)	No person may discharge any pollutant or cause, permit, or allow a discharge of any pollutant from a point source without either applying for and obtaining an Ohio NPDES permit in accordance w with the requirements of Chapter 3745-33 of the Administrative Code [preceding entry], ... or have authorization to discharge under an Ohio NPDES general permit in accordance with the requirements of this chapter [3745-38]. **NOTE:** In September 1992, the FEMP applied for an individual stormwater permit to cover its industrial stormwater discharges to Paddy's Run. On the basis of the information provided in the original FEMP Stormwater Permit Application , Ohio EPA has chosen to regulate FEMP site industrial stormwater discharges under the individual permit process (OAC 3745-33, preceding entry), by incorporating stormwater monitoring requirements at Paddy's Run into the NPDES Permit. The site NPDES permit also addresses discharges of stormwater associated with construction activities by requiring a Stormwater Pollution Prevention Plan that defines the manner in which these discharges will be managed.	✓	✓	✓	In accordance with the note at left, the general permitting process described in OAC 3745-38 is not applicable to the FEMP site stormwater discharges. Rather, these are regulated within the context of the existing FEMP NPDES Permit (Ohio EPA Number 1IO00004*ED) and the FEMP Stormwater Pollution Prevention Plan (RM-0039), both of which derive their regulatory basis from OAC 3745-33 (preceding entry).	See preceding entries.
Rules and Regulations of the Hamilton County Soil and Water Conservation District Governing Earthwork for Unincorporated Hamilton County, Ohio	Temporary and/or permanent erosion and sediment control features and devices shall be designed and constructed in general accordance with the State of Ohio Temporary Erosion Control Specifications. *Exempted* from these requirements are: • *any public work performed by or under control of any governmental agency*, provided such operations do not cause instability of any adjacent or contiguous property and substantially equivalent sediment control policies are applied [3.10 E]. • *operations involving process and stockpiling of soils or rock materials where controlled by other regulations*, provided such operations do not cause instability of any adjacent or contiguous property [3.10 H].	✓	TBC	TBC		FEMP Site NPDES Permit (OEPA Number 1IO00004*ED), and the FEMP Stormwater Pollution Prevention Plan (RM-0039), and the following sections of the Sitewide Excavation Plan: 5.1.3 Surface Water Pathway App F Implementation of Construction

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TABLE A-2 (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	DISCHARGE TO SURFACE WATER, continued					
Federal Water Pollution Control Act (a.k.a., Clean Water Act) Subpart K—Best Management Practices (BMP) Programs 40 CFR §125.104	BMP programs shall be developed in accordance with good engineering practices and: 1) Be documented in narrative form and include any necessary plot plans, drawings or maps; 2) Establish specific objectives for the control of toxic and hazardous pollutants: (a) Each facility component or system shall be examined for its potential for causing a release of significant amounts of toxic or hazardous pollutants to waters of the United States due to equipment failure, improper operation, natural phenomena such as rain or snowfall, etc. (b) Where experience indicates a reasonable potential for equipment failure (e.g., a tank overflow or leakage), natural condition (e.g., precipitation), or other circumstances to result in significant amounts of toxic or hazardous pollutants reaching surface waters, the program should include a prediction of the direction, rate of flow and total quantity of toxic or hazardous pollutants which could be discharged from the facility as a result of each condition or circumstance; 3) Establish specific BMPs to meet the objectives identified in (2) above, addressing each component or system capable of causing a release of significant amounts of toxic or hazardous pollutants to the waters of the United States.		Appl	R&A	BMP requirements will be met by implementing FEMP's BMP Plan. The BMP Plan will be progressively updated to accommodate changing site activities during the conduct of CERCLA remedial actions.	Addressed as part of the selected remedy described in the OU5 ROD. Also see preceding entries.

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TABLE A (continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
GROUNDWATER PATHWAY						
GROUNDWATER PROTECTION						
Safe Drinking Water Act 42 U.S.C. §1424(e)	All Federal financially assisted projects constructed in the area of a sole source aquifer and its principal recharge zone will be subject to EPA's review to insure that these projects are designed and constructed so that they do not create a significant hazard to public health.	Appl	Appl	Appl	A notice in 53 FR 15876 (May 4, 1988) designated the Buried Valley Aquifer System of the Great Miami/ Little Miami River Basins of southwestern Ohio as a sole or principal source of drinking water. The Fernald site is located above this aquifer.	EPA and OEPA review of project submittals
WELLS – CONSTRUCTION						
Water Well Standards, Pumping Wells OAC 3745-9-08(C)	Pumps may only be primed with potable water.		Appl		Pertains to all well pumps that require priming.	The Sitewide CERCLA Quality Assurance Project Plan (SCQ), the Integrated Environmental Monitoring Plan (IEMP), and the individual project-specific plans for sampling.
Water Well Standards, Monitoring Well Maintenance and Modification OAC 3745-9-09(A) through (C), and (E) through (G)	Monitoring wells must be maintained or modified to avoid cross-contamination of groundwater.		Appl		Pertains to all groundwater wells and piezometers.	The Sitewide CERCLA Quality Assurance Project Plan (SCQ), the Integrated Environmental Monitoring Plan (IEMP), and the following section of the Sitewide Excavation Plan: F.6.3 Monitoring Well Preservation
WELLS – ABANDONMENT						
Water Well Standards, Abandonment of Test Holes and Wells OAC 3745-9-10	Upon completion of testing, a test hole shall be either completely filled with grout or such other material as will prevent contaminants from entering groundwater. If a well [or similar device] containing walls is not being used for obtaining groundwater or for determining the quality, quantity, or level of groundwater, it shall be completely filled with grout or other similar material as will prevent contaminants from entering groundwater, or maintained in strict accordance with all applicable requirements of OAC 3745-9-09.		Appl	Appl	After they are no longer needed, wells, peizometers and lysimeters are to be properly plugged and abandoned in accordance with these requirements.	The Sitewide CERCLA Quality Assurance Project Plan (SCQ), the Integrated Environmental Monitoring Plan (IEMP), and the following section of the Sitewide Excavation Plan: F.6.1 Plugging and Abandonment F.6.2 Monitoring Well Excavation

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TABLE A-2 (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
SOIL REMEDIATION						
	CLOSURE OF HAZARDOUS WASTE MANAGEMENT UNITS					
OEPA Closure Plan Review Guidance for RCRA Facilities (Interim Final) September 1, 1993	Federal Regulations of May 2, 1986 (50 FR 16422) and March 19, 1987 (52 FR 8704) modified the closure performance standard such that risk assessment, or what constitutes "decontamination" of a site, may be considered by EPA as a closure option. On December 8, 1988 (see OAC 3745-67-28), the OEPA adopted the equivalent of the EPA's March 19, 1987 regulations, clarifying that risk assessment may be a closure option. It is OEPA and its Division of Hazardous Waste Management (DHWM) practice to consider risk assessment/risk-based closure as a possible third option for closure for all types of units [hazardous waste management units (HWMUs) and solid waste management units (SWMUs)].		TBC	✓	Risk-based closures are to be performed for HWMUs with media contamination as integrated with the CERCLA soil remediation activities (see following entry).	Risk-based soil cleanup levels, known as FRLs, are established in the RODs. Following sections of the Sitewide Excavation Plan: 2.1.1.1 Hazardous Waste Management Units 2.2.5 HWMU Closure 4.0 Location-Specific Excavation Approaches App F Implementation of Construction
RCRA/CERCLA Integrated Closure Director's Final Findings and Orders (June 4, 1996) Section V.1	The Respondent ... shall comply with the closure regulations contained in OAC rules 3745-66-11(A) and (B), 3745-66-11(C) as applicable, 3745-66-14, and 3745-66-16 through 3745-66-20 as applicable for the HWMUs [hazardous waste management units] listed in Attachment A [to these Orders].		✓	✓	Pertinent to closures of following HWMUs (see Table 2-1 of the Sitewide Excavation Plan, derived from the DF&O's Attachment A) during the CERCLA soil remediation activities: 41 Sludge Drying Beds (surface impoundment)	See subsequent entries in this table for those OAC rules determined by the RODs as ARARs. While OAC 3745-66-11 and -14 are presented in the next two entries, entries for 3745-66-16 through -20 for post-closure are addressed in the subsequent Post-Closure presentation group of this table.

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TABLE A (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
CLOSURE OF HAZARDOUS WASTE MANAGEMENT UNITS, continued						
Closure and Post-Closure Under Interim Standards Closure Performance Standard OAC 3745-66-11 [40 CFR §265.111]	The owner or operator shall close his facility or hazardous waste management unit (HWMU) in a manner that: (A) minimizes the need for further maintenance; (B) controls, minimizes, or eliminates, to the extent necessary to protect public health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated run-off, or hazardous waste decomposition products to the ground or surface waters or to the atmosphere; and (C) complies with these closure requirements.	✓	Appl	Appl	Pertinent to closure of HWMU #41 Sludge Drying Beds during the CERCLA soil remediation activities; also cited in RCRA/CERCLA Integrated Closure DF&O @ V.1. **NOTE:** These requirements are the same as those for new hazardous waste facilities under OAC 3745-55-11 (40 CFR §264.111). **NOTE:** DOE intends, and anticipates being able, to clean (risk-based) close all identified HWMUs.	Following sections of the Sitewide Excavation Plan: 2.1.1.1 Hazardous Waste Management Units 2.2.5 HWMU Closure 4.0 Location-Specific Excavation Approaches App F Implementation of Construction
Closure and Post-Closure Under Interim Standards Disposal or Decontamination of Equipment, Structures and Soils OAC 3745-66-14 [40 CFR §265.114]	During the partial and final closure periods, all contaminated equipment, structures, and soils must be properly disposed of or decontaminated [to risk-based cleanup levels] [i.e., clean closed, have risk-based closure, or be closed in place], unless otherwise specified in: OAC 3745-67-28 Surface Impoundments: Closure and Post-Closure	✓	Appl	Appl	Pertinent to closure of HWMU #41 Sludge Drying Beds during the CERCLA soil remediation activities; also cited in RCRA/CERCLA Integrated Closure DF&O @ V.1. **NOTE:** These requirements are the same as those for new hazardous waste facilities under OAC 3745-55-14 (40 CFR §264.114), with corresponding cross-references presented therein.	Risk-based soil cleanup levels, known as FRLs, are established in the RODs. Also see preceding entry.

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TABLE A-2 (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	CLOSURE OF HAZARDOUS WASTE MANAGEMENT UNITS, continued					
Surface Impoundments: [Surface Impoundments] Closure and Post-Closure Care OAC 3745-67-28	At closure of a surface impoundment HWMU, the owner or operator must remove or decontaminate [to risk-based cleanup levels] all waste residues, contaminated waste containment system components (liners, etc.), contaminated subsoils, and structures and equipment contaminated with waste and leachate. If the owner or operator demonstrates that not all contaminated soils can be practically removed or decontaminated [to risk-based cleanup levels], he must close the HWMU and perform post-closure care in accordance with the closure and post-closure care requirements that apply to landfills under OAC 3745-66-10 to 3745-66-20 and OAC 3745-68-10 (40 CFR §264.310).		✓	✓	Pertinent to closure of HWMU #41 Sludge Drying Beds during the CERCLA soil remediation activities, as cited in the preceding entry. **NOTE:** These requirements are the same as those for new hazardous waste facilities under OAC 3745-56-28 (40 CFR §264.228).	See preceding.
Landfills, Incinerators, Thermal Treatment, Miscellaneous Units: Closure and Post-Closure OAC 3745-68-10(A) [40 CFR §265.310(a)]	At final closure of a HWMU as a landfill ... the owner or operator must cover the HWMU ... with a final cover designed and constructed to: • provide long-term minimization of migration of liquids through the closed HWMU; • function with minimum maintenance; • promote drainage and minimize erosion or abrasion of the cover; • accommodate settling and subsidence so that the cover's integrity is maintained; and • have a permeability less than or equal to the permeability of any bottom liner system or natural subsoil present.	✓	R&A	✓	Pertinent to HWMUs that are "closed in place" — i.e., all contaminated soils can not practically be removed or decontaminated [to risk-based cleanup levels] — during the CERCLA soil remediation process. **NOTE:** DOE intends, and anticipates being able, to clean (risk-based) close all identified HWMUs rather than close in-place (close as a landfill).	See preceding.

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TABLE [illegible] (Continued)
PERTINENT ARARs AND TBCs F[illegible] REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
CLOSURE OF HAZARDOUS WASTE MANAGEMENT UNITS, continued						
RCRA/CERCLA Integrated Closure Director's Final Findings and Orders (June 4, 1996) Section V.2 in lieu of Closure and Post-Closure Under Interim Standards Closure Plan; Amendment of Closure Plan OAC 3745-66-12	The Respondent ... are hereby exempted from complying with OAC rule 3745-66-12 for the HWMUs identified in Attachment A of these Orders, provided that the Respondent: a. Submits the documents contained in Attachment C [of these Orders] to Ohio EPA in accordance with the dates established pursuant to the ACA [Amended Consent Agreement]. Within one week after submitting these documents to Ohio EPA, the Respondent shall submit a cross-reference index which contains pertinent page and section s identifications for each HWMU that is contained in the documents and said index shall be cumulative and reference all previous document locations. ... d. Implements the final remedies as reflected in the Records of Decision issued in accordance with the ACA.		✓	✓	Pertinent to closure of HWMU #41 Sludge Drying Beds listed in Table 2-1 of the Sitewide Excavation Plan (derived from the DF&O's Attachment A) during the CERCLA soil remediation activities. DOE will submit the cross-reference index for the listed HWMU accordingly.	

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TABLE A-2 (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	RADIONUCLIDE CONCENTRATIONS					
Radiation Protection of the Public and the Environment DOE Order 5400.5 Chapter I (4) and Chapter II (2)	An "as low as reasonably achievable (ALARA)" process is to be used in planning and carrying out all DOE activities that have the potential to cause radiation exposure to the public. ALARA requires judgement with respect to what is reasonably achievable. Factors that relate to societal, technological, economic, and other public policy considerations shall be evaluated to the extent practicable. Factors to be considered, at a minimum, include: • Maximum dose to members of the public; • Collective dose to the population; • Alternative processes, such as alternative treatment of discharge streams, operating methods, or controls; • Doses for each process alternative; • Cost for each of the technological alternatives; • Examination of the changes in cost among alternatives; and • Changes in societal impact associated with process alternatives (e.g., differential doses from various pathways). Except for meeting requirements of NEPA, qualitative analyses are acceptable, in most instances, for ALARA judgements, especially when the potential doses are well below the dose limit. The bases for these judgements should be documented. More detailed analyses should be considered if the decision might result in doses that approach the limit.	TBC	TBC		In addition to the evaluations conducted as part of the CERCLA selection of remedy process [the short- and long-term risk assessments of the Comprehensive Remedial Action Risk Evaluation (CRARE) within the feasibility studies (FSs)], documentation of "equivalent evaluations" for environmental ALARA are performed in accordance with the "FEMP Environmental ALARA Plan" and retained as part of the site and project records.	Following sections of the Sitewide Excavation Plan: 2.1.3 Final Remediation Levels 2.1.5.2 Radiological Hot Spots 2.1.5.3 ALARA Requirements 2.2.2 Certifying FRL Attainment 2.2.3 Detection of and Criteria for Hot Spots 3.3.1.4 ALARA Implementation 3.3.3 Precertification Activities 3.4.6 Implementation Strategy for Hot Spot Criteria 3.4.7 Certification Report
10 CFR Part 834 (PROPOSED)			TBC			
Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings, Subpart B—Standards for Cleanup of Land and Buildings Contaminated with Residual Radioactive Materials from Inactive Uranium Processing	Remedial actions shall be conducted so as to provide reasonable assurance that, as a result of residual radioactive materials, the concentration of radium-226 in land averaged over any area of 100 m^2 shall not exceed the background level by more than: • 5 pCi/g averaged over the first 15 cm of soil below the surface, and • 15 pCi/g, averaged over 15-cm-thick layers of soil more than 15 cm below the surface.	R&A	R&A	R&A	Met through the selection of FRLs based on risk assessment, followed by certification of cleanup.	See preceding.

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TABLE A (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
Subpart C— Implementation 40 CFR §192.20	Compliance with this requirement should be shown through measurements performed within the accuracy of currently available types of field and laboratory instruments in conjunction with reasonable survey and sampling procedures.					
Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings, Subpart C— Implementation 40 CFR §192.21(f) and §192.22(b)	Where radionuclides other than radium-226 and its decay product are present in sufficient quantity and concentration to constitute a significant radiation hazard from residual radioactive materials, remedial actions shall, in addition to satisfying the standards of Subpart A in 40 CFR §192.02 and Subpart B in 40 CFR §192.12 (both listed above), reduce other residual radioactivity to levels that are ALARA.	R&A	R&A	R&A	The approved selected remedy in the OU5 ROD set an ALARA goal for the total uranium FRL.	See preceiding.
Postclosure Standards for Uranium and Thorium Mill Tailings, Subpart D— Standards for the Management of Uranium Byproduct Materials Pursuant to Section 84 of the Atomic Energy Act of 1954, as Amended 40 CFR §192.32 (b)(2)	The requirements for the management of uranium byproduct materials after closure of a disposal area [40 CFR §192.32(b)(1)] shall not apply to any portion of a disposal site which contains a concentration of radium-226 in land, averaged over areas of 100 m^2, which, as a result of uranium byproduct material, does not exceed the background level by more than the limits specified in 40 CFR §192.12(a) (see above).	R&A	R&A	R&A		See preceding.
Management of Thorium Mill Tailings, Subpart E— Standards for the Management of Thorium Byproduct Materials Pursuant to Section 84 of the Atomic Energy Act of 1954, as Amended 40 CFR §192.40 - §192.42	The following are requirements for the management of thorium byproduct materials: • The provisions for the management of uranium byproduct material (40 CFR §192.32) shall apply to thorium byproduct material and: - Provisions applicable to the element uranium shall also apply to the element thorium - Provisions applicable to radon-222 shall also apply to radon-220 - Provisions applicable to radium-226 shall also apply to radium-228 With the concurrence of EPA, alternative provisions may be substituted for any of the above requirements provided the alternative provisions will provide at least an equivalent level of protection for human health and environment.	R&A	R&A	R&A		See preceding.

TABLE A-2 (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	RADIONUCLIDE CONCENTRATIONS, continued					
Radiation Protection of the Public and the Environment, DOE Order 5400.5 Chapter IV (4)(a)	Guidelines for residual concentrations of radionuclides other than thorium and radium shall be derived from the basic dose limits by means of an environmental pathway analysis using specific property data where available. Procedures for these derivations are given in DOE/CH-8901. Residual concentrations of radioactive material in soil are defined as those in excess of background concentrations averaged over an area of 100 m^2.	TBC			Considered in the development of the selected remedy in the OU2 and OU5 RODs.	See preceding.
Radiation Protection of the Public and the Environment, DOE Order 5400.5 Chapter IV (4)(a)(1) 10 CFR Part 834 (PROPOSED)	If the average residual concentration of radionuclides in any surface or below- surface area less than or equal to 25 m^2 exceeds the limit or guideline by a factor of $(100/A)^{0.5}$ [where A is the area (in square meters) of the region in which the concentrations are elevated], limits for "hot spots" shall also be developed and applied. Procedures for calculating these hot spots limits, which depend on the extent of the elevated local concentrations, are given in DOE/CH-8901. In addition, reasonable efforts shall be made to remove any source of radionuclide that exceeds 30 times the appropriate limit in the soil, irrespective of the average concentration in the soil.	TBC	TBC		See preceding.	Considered in the development of the selected remedy in the OU2 and OU5 RODs.
Radiation Protection of the Public and the Environment, DOE Order 5400.5 Chapter IV (4)(a)(2)(3) 10 CFR Part 834 (PROPOSED)	The generic guidelines for residual concentrations of radium-226, radium-228, thorium-230, and thorium-232 are: • 5 pCi/g, averaged over the first 15 cm of soil below the surface; and • 15 pCi/g, averaged over 15-cm-thick layers of soil more than 15 cm below the surface. These guidelines take into account ingrowth of radium-226 from thorium-230 and of radium-228 from thorium-232, and assume secular equilibrium. If both thorium-230 and radium-226, or both thorium-232 and radium-228, are present and not in secular equilibrium, the appropriate guideline is applied as a limit for the radionuclide with the higher concentration. If other mixtures of radionuclides occur, the concentrations of individual radionuclides shall be reduced so that either the dose for the mixture will not exceed the basic dose limit or the sum of the ratios of the soil concentration of each radionuclide to the allowable limit for that radionuclide will not exceed 1. Explicit formulas for calculating residual concentrations guidelines for mixtures are given in DOE/CH-8901.	TBC	TBC		Included as it is more restrictive than the federal standard in 40 CFR §192, .02, .12(a), .20, .21(f), .22(b), .32(b)(2), .40-.42.	See preceding.

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TABLE A (continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
RADIONUCLIDE CONCENTRATIONS, continued						
Guidelines for Residual Radioactive Material—Surface Contamination DOE Order 5400.5 Chapter IV (4)(d) 10 CFR Part 834 (PROPOSED)	These generic surface contamination guidelines are applicable to existing structures and equipment. These guidelines are generally consistent with standards of the NRC (1982) and functionally equivalent to Section 4, "Decontamination for Release for Unrestricted Use," of Regulatory Guide 1.86, but apply to nonreactor facilities. These limits apply to both interior equipment and building components that are potentially salvageable or recoverable scrap. If a building is demolished, the guidelines in paragraph IV (6)(a) are applicable to the resulting contamination in the ground.		TBC		Will be used for any process facility building or structures built and/or used for the remedial action, including the AWWT, soil staging, etc.	See preceding.
LEAD CONCENTRATION						
Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, OSWER Directive # 9355.4-12 (July 14, 1994)	EPA recommends using 400 ppm soil lead as a screening level for lead in soil for residential scenarios at CERCLA sites and at RCRA Corrective Action sites. Residential areas with soil lead below 400 ppm generally require no further action. Site-specific preliminary remediation goals (PRGs) at CERCLA sites and media cleanup standards at RCRA corrective action facilities for residential land use are described.	TBC	TBC		The selected remedy in the OU2 and OU5 RODs established this value as the lead FRL.	Following section of the Sitewide Excavation Plan: 2.1.3 Final Remediation Levels
PCB CONCENTRATION						
Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution In Commerce, And Use Prohibitions, Subpart A—Applicability, Definitions 40 CFR §761.3	PCB materials which appear at concentrations less than 50 ppm are excluded from the PCB disposal requirements in this regulation.	R&A	✓	R&A		Following sections of the Sitewide Excavation Plan: 2.5.8 Special Materials 3.3.2.2 Special Materials F.4.1 Materials Which Require Special Handling

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TABLE A-2 (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	PCB CONCENTRATION, continued					
Subpart G– PCB Spill Cleanup Policy, Requirements for PCB Spill Cleanup 40 CFR §761.125(c)	PCBs at a concentration of greater than 50 mg/kg (ppm by weight) are subject to TSCA decontamination requirements in 40 CFR §761.120(b). Soil in restricted access areas contaminated by a PCB spill shall be cleaned to 25 mg/kg PCBs [40 CFR §761.125(c)(3)(v)]. At such times as restricted access areas (other than outdoor electrical substations) are converted to another use, the spill site shall be cleaned up to the non-restricted access area requirements of 40 CFR §761.125(c)(4)(v). Soils in non-restricted access areas contaminated by a PCB spill shall be cleaned to 10 mg/kg PCBs, provided that the soil is excavated to a minimum depth of 10 inches. The excavated soil will be replaced with clean soil (i.e., containing less than 1 mg/kg PCBs), and the spill site will be restored (e.g., replacement of turf) [40 CFR §761.125(c)(4)(v)].		TBC	TBC	Soil containing PCBs will be excavated as necessary to attain FRLs; soil concentrations are expected to be less than 50 mg/kg PCBs. The OU5 ROD established FRLs for the PCBs Arochlor-1254 and Arochlor-1260 as 0.13 mg/kg (ppm by weight).	Following section of the Sitewide Excavation Plan: 2.1.3 Final Remediation Levels
Subpart G– PCB Spill Cleanup Policy, Sampling Requirements 40 CFR §761.130	Criteria that the EPA uses to determine the adequacy of the cleanup of spills resulting from the release of regulated PCB materials at concentrations of ≥50 ppm by weight. Applies to spills which occur after May 4, 1987.			TBC	Applies to spills of regulated PCB materials (i.e., those that have a concentration ≥50 ppm by weight) that occurred after May 4, 1987.	See preceding.
	CERTIFICATION OF CLEANUP					
Methods for Evaluating the Attainment of Cleanup Standards, Volume 1: Soils and Solid Media EPA 230/02-89-042 NTIS PB89-234959 February 1989	This EPA guidance document describes methods for testing whether soil chemical concentrations at a site are statistically below a cleanup standard or ARAR. If it can be reasonably concluded that the remaining soil or treated soil at a site has concentrations that are statistically less than relevant cleanup standards then the site can be judged protective of human health and the environment.	TBC	✓			Following sections of the Sitewide Excavation Plan: 2.2.2 Certifying FRL Attainment 3.4 Certification App G Certification Design Rationale

TABLE A (continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	CERTIFICATION OF CLEANUP, continued					
RCRA/CERCLA Integrated Closure Director's Final Findings and Orders (June 4, 1996) Section V.4 in lieu of Closure and Post-Closure Under Interim Standards Certification of Closure OAC 3745-66-15	For the HWMUs identified in Attachment A of these Orders, the Respondent ... are hereby exempted from complying with OAC rule 3745-66-15 provided that they submit Remedial Action Reports for the HWMUs contained in operable units 1, 3, and 5 within sixty (60) days from completion of remedial activities at each operable unit, which is determined by the U.S. EPA, in accordance with CERCLA. These Remedial Action Reports shall certify that the HWMUs contained in operable units 1 and 3 have been closed, and that the environmental media in operable unit 5 has been managed, in accordance with the final remedies contained in the Records of Decision and in accordance with the Director's closure performance standards. Attachment C [of these Orders] summarizes the documents that will be provided during remediation process. These CERCLA documents contain the substantive requirements of the RCRA and Ohio hazardous waste closure regulations.		✓	✓	Pertinent to closure of HWMU #41 Sludge Dryiong Beds listed in Table 2-1 of the Sitewide Excavation Plan (derived from the DF&O's Attachment A) during the CERCLA soil remediation activities.	Following sections of the Sitewide Excavation Plan: 2.2.5 HWMU Closure 3.4 Certification 7.3 Certification Design Letter 7.4 Certification Report 7.5 Other Related Future Documents

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TABLE A-2 (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
IMPACTED MATERIAL MANAGEMENT						
	DEFINITIONS & GENERAL FACILITY STANDARDS					
Resource, Conservation, and Recovery Act 42 U.S.C. §6903 (27)	Solid waste means any garbage, refuse, sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations and from community activities, but does not include source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954.	Appl	✓	✓		Following sections of the Sitewide Excavation Plan: 3.0 General Implementation Approach App F Implementation of Construction
Solid Waste and Infectious Waste Regulations, Definitions OAC 3745-27-01 (B)(40)	Solid wastes means such unwanted residual solid or semisolid material as results from industrial, commercial, agricultural, and community operations, *excluding earth or material from construction, mining, or demolition operations, or other waste materials of the type that would normally be included in demolition debris, nontoxic flyash, spent nontoxic foundry sand, and slag and other substances that are not harmful or inimical to public health,* and includes, but is not limited to, garbage, tires, combustible and noncombustible material, street dirt, and debris. Solid waste does not include any material that is an infectious waste or a hazardous waste. For the purpose of this definition, "semisolid material" does not contain liquids which can be readily released under normal climatic conditions, as determined by method 9095 (paint filter liquids test) in SW-846: "Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods".	Appl	✓	✓		See preceding.
Solid Waste and Infectious Waste Regulations, Definitions OAC 3745-27-01 (B)(15) OAC 3745-27-30 (A), (E), (H) ORC 3734.021 (A)(1)(c), (d)	Infectious waste is defined by nine categories of waste including human blood specimens and blood products, sharp wastes used in the treatment or inoculation of human beings, and any other waste materials generated in the diagnosis, treatment, or immunization of human beings. A generator who places all sharp infectious wastes and all unused hypodermic needles, syringes, and scalpel blades into a "SHARPS" container before they are transported and who generates less than 50 lbs. of infectious wastes each month and does not hold a certificate of registration as a generator of infectious wastes may transport and dispose of infectious wastes in the same manner as solid wastes. Treated infectious wastes can be transported and disposed in the same manner as noninfectious waste. Infectious waste that is also radioactive shall be managed in accordance with applicable Ohio Department of Health and U.S. Nuclear Regulatory Commission regulations.	Appl	✓			See preceding.

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TABLE A (continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	DEFINITIONS & GENERAL FACILITY STANDARDS, continued					
Identification and Listing of Hazardous Waste, Definition of Hazardous Waste OAC 3745-51-03(A) [Identification and Listing of Hazardous Waste, Subpart A—General, Definition of Hazardous Waste 40 CFR §261.3(a)]	A solid waste is a hazardous waste, if: (1) it is not excluded from regulation as a hazardous waste under OAC 3745-51-04(B) [40 CFR §261.4(b)]; and (2)(a) it exhibits any of the characteristics of hazardous waste identified in OAC 3745-51-20 to 3745-51-24, with certain exceptions noted therein; or (2)(b) it is listed as hazardous waste in OAC 3745-51-31 to 3745-51-33 [40 CFR §§ 261.30 - 261.35]; or (2)(c) it is a mixture of solid and hazardous wastes; (2)(d) it is a mixture of hazardous wastes as defined in OAC 3745-51-03(A)(2)(a) to 3745-51-03(A)(2)(c) [three previous bullets in this entry] and source material, special nuclear material, or by product material, as defined by the Atomic Energy Act of 1954, as amended, 42 U.S.C. 2011 et seq., or other radionuclides. However, only the hazardous components of the mixture are subject to regulation for purposes of this [OAC 3745-51] chapter. (2)(e) Wastewater mixed with a RCRA F-listed spent solvent waste, whose concentration is less then the following *de minimis* levels before *or* at introduction to the headworks of a Clean Water Act-regulated system, *is not a listed hazardous waste*: 1 mg/L: carbon tetrachloride; tetrachloroethene; and trichloroethene. 25 mg/L: the remaining listed spent solvents.	Appl	✓	✓	This Hazardous Waste Mixture Rule Exclusion is pertinent to management of perched water and other remediation-generated wastewaters, particularly near the Sludge Drying Beds (HWMU 41).	See preceding. Following section of the Sitewide Excavation Plan: 2.5.4 Perched Water
Identification and Listing of Hazardous Waste, Exclusions OAC 3745-51-04(B)(4) [Identification and Listing of Hazardous Waste, Subpart A—General, Exclusions 40 CFR §261.4(b)(4)]	The following are not hazardous wastes: fly ash waste, bottom ash waste, slag waste, and flue gas emission control waste generated primarily from the combustion of coal or other fossil fuels.	Appl	✓	✓		See preceding.

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TABLE A-2 (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	DEFINITIONS & GENERAL FACILITY STANDARDS, continued					
Identification and Listing of Hazardous Wastes, Requirements for Recyclable Materials OAC 3745-51-06(A)(3) [40 CFR §261.6]	The following recyclable materials are not subject to regulation under rules 3745-50-40 to 3745-50-62 or Chapters 3745-52 to 3745-57 and 3745-65 to 3745-69 of the Ohio Administrative Code [Parts 262 through 266 or 268, 270, or 124 of 40 CFR], and are not subject to the notification requirements of Chapter 3734 of the Ohio Revised Code [Section 3010 of RCRA]: (b) used batteries (or used battery cells) returned to a battery manufacturer for regeneration; (c) used oil that exhibits one or more of the characteristics of hazardous waste but is recycled in some other manner than being burned for energy recovery; (d) scrap metal.	√	√	Appl	Pertinent to remediation generated materials. Recycling of remediation generated materials may be conducted.	Operable Unit 3 Integrated RD/RA Work Plan
Termination of Operating Licenses for Nuclear Reactors Section C.4 Decontamination for Release for Unrestricted Use U.S. Nuclear Regulatory Commission Regulatory Guide 1.86 (June 1974)	A reasonable effort shall be made to eliminate residual surface radiological contamination and to achieve the acceptable surface contamination levels stated in this guide. 000292	√	√	TBC	Pertinent to releasing to off-site any potentially radiologically-contaminated materials. Radiation surveys will be performed prior to releasing any potentially radiologically-contaminated materials off-site to demonstrate compliance with the surface contamination levels stated in this guide.	Operable Unit 1 Design Criteria Package
Identification and Listing of Hazardous Waste, Subpart A—General, Definition of Hazardous Waste 40 CFR §261.3	Debris means solid material exceeding a 60-mm particle size that is intended for disposal and that is a manufactured object, plant or animal matter, or natural geologic material.	√	Appl	Appl	Applicable to hazardous debris that will be disposed of off-site.	Operable Unit 1 Design Criteria Package, and following sections of the Sitewide Excavation Plan: 1.3.2.4 Remediation Debris 2.5.10 Off-Site Shipments F.5.2 Off-Site Disposal

TABLE A (continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	DEFINITIONS & GENERAL FACILITY STANDARDS, continued					
Land Disposal Restrictions, Subpart A—General, Definitions Applicable to This Part 40 CFR §268.2	Hazardous debris means debris that contains a listed hazardous waste, or that exhibits a characteristic of hazardous waste.	✓	Appl	Appl	"contains a listed hazardous waste" portion is not applicable to on-property disposal within a CAMU under the CAMU Rule as invoked under the OU5 ROD.	See preceding.
Hazardous Waste Regulations Contained-In Policy 58 FR 48092 (September 14, 1993) Proposed rule. 58 FR 59976 (November 12, 1993) Notice to extend comment. 59 FR 10778 (March 8, 1994) Clarification, partial withdrawal.	Hazardous soil means soil that contains RCRA hazardous waste(s) listed in Subpart D of 40 CFR Part 261, or that exhibits one or more of the characteristics of a hazardous waste as defined in Subpart C of 40 CFR Part 261. This proposed rule recommends contained-in determinations for hazardous debris, hazardous soil and other environmental media. Any person may petition the Regional Administrator to exclude, under 261.3(f)(2) or 261.3(g) of this chapter, hazardous debris and hazardous soil or other environmental media, including but not limited to groundwater, surface water, and sediment, from regulation as hazardous waste. The petition for a contained-in determination must include information sufficient to demonstrate that specific constituent concentrations in the hazardous debris, hazardous soil, or other environmental media to be excluded do not pose a hazard to human health and the environment at that site. (Such a petition is not necessary for remedial actions conducted pursuant to RCRA or CERCLA authorities provided that a similar determination is made by the Regional Administrator based on substantially equivalent information including public notice and comment requirements).		TBC	TBC	"contains RCRA hazardous waste(s) listed" portion is not applicable to on-property disposal within a CAMU under the CAMU Rule as invoked under the OU5 ROD. Will be considered for managing treated soil that is contaminated with RCRA waste.	Addressed in the selected remedy in the OU5 ROD. Following sections of the Sitewide Excavation Plan: 3.3 Remedial Action App F Implementation of Construction
Ohio Petroleum Contaminated Soil Policy OEPA Policy PP.01-03-200	The basis of the "contained in" policy is that environmental media, such as soil or groundwater, are not considered to be waste material. Because they are not a solid waste, the mixture rule, as set forth in OAC 3745-51-03, does not apply when they become contaminated with a listed hazardous waste but only contains the waste. The result of this policy is that if the waste constituents can be removed, the soil is no longer considered to contain a hazardous waste. Therefore, since soil is not a waste material it does not have to be de-listed in order for it to be used for its intended purpose. However, as long as the soil contains the waste material, it must be managed as a hazardous waste. If this concept is applied to petroleum-contaminated soil, the soil containing a petroleum hydrocarbon would not need to be managed as a solid waste if the contaminants were removed.	TBC	TBC		Allows for treated/ clean soil to be used as backfill. Thus, all soil below FRLs can be backfilled as clean soil.	See preceding.

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TABLE A-2 (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	DEFINITIONS & GENERAL FACILITY STANDARDS, continued					
Hazardous Waste Management System: General, Subpart B—Definitions 40 CFR §260.10	Remediation waste means all solid and hazardous waste, and all media (including groundwater, surface water, soils, and sediments) and debris, which contain listed hazardous wastes or which themselves exhibit a hazardous waste characteristic, that are managed for the purpose of implementing corrective action requirements under 40 CFR §264.101 and RCRA section 3008(h). For a given facility, remediation wastes may originate only from within the facility boundary, but may include waste managed in implementing RCRA sections 3004(v) or 3008(h) for releases beyond the facility boundary.	R&A	√	√	Under the Consent Agreement as amended in 1991 (a.k.a., the ACA), remediation at the FEMP is conducted under the authorities of CERCLA as well as RCRA sections 3004(v) and 3008(h).	Following secctions of the Sitewide Excavation Plan: 1.3.2.1 Soil and Sediment 1.3.2.6 Corrective Action Management Unit Rule 2.1 Remediation Drivers 2.2.1 Demonstrating OSDF WAC Attainment
CERCLA Compliance with Other Laws Manual Section 2.7	Placement/disposal of waste does not occur under the following circumstances: • waste is consolidated within a unit (including an area of contamination that can be viewed as a single unit); • waste is capped in place, including grading prior to capping; • waste is treated in situ; and • waste is processed within the unit in order to improve its structural stability for closure or for movement of equipment over the area.	TBC	√	TBC	See following entry on the Corrective Action Management Unit.	See following entry.

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TABLE A (continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	DEFINITIONS & GENERAL FACILITY STANDARDS, continued					
Corrective Action Management Unit Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities, Subpart S- 40 CFR §264.552 (58 FR 865829, February 16, 1993)	For the purpose of implementing remedies under Sec. 264.101 or RCRA Section 3008(h), the EPA Regional Administrator may designate an area at the facility as a corrective action management unit (CAMU). One or more CAMUs may be designated at a facility under the following conditions: 1) Emplacement of remediation wastes into or within a CAMU does not constitute land disposal of hazardous wastes. 2) Consolidation or emplacement of remediation wastes into or within a CAMU does not constitute creation of a unit subject to minimum technology requirements. 3) The CAMU shall facilitate the implementation of reliable, effective, protective, and cost-effective remedies. 4) Waste management activities associated with the CAMU shall not create unacceptable risks to humans or to the environment resulting from exposure to the wastes. 5) The CAMU shall include uncontaminated areas of the facility only if including such areas for the purpose of managing remediation waste is more protective than management of such wastes at contaminated areas of the facility. 6) Areas within the CAMU, where wastes remain in place after closure of the CAMU, shall be managed and contained so as to minimize future releases, to the extent practicable. 7) The CAMU shall expedite the timing of remedial activity implementation, when appropriate and applicable. 8) The CAMU shall enable the use, when appropriate, of treatment technologies (including innovative technologies) to enhance the long-term effectiveness of remedial actions by reducing the toxicity, mobility, or volume of wastes that will remain in place after closure of the CAMU. 9) The CAMU shall, to the extent practicable, minimize the land area of the facility upon which wastes will remain in place after closure of the CAMU. The owner/operator shall provide sufficient information to enable the Regional Administrator to designate a CAMU in accordance with the criteria in Sec. 264.552. **Note:** RCRA regulated units (HWMUs) within a CAMU are fully subject to RCRA closure regulations.	R&A	Appl	R&A	Per the selected remedy in the OU5 ROD: • the FEMP property (bounded by its property boundaries) is designated as a CAMU; • consolidation or management of on-site remediation wastes into or within the CAMU does not constitute creation of a unit subject to minimum technology requirements (MTRs) [OAC 3745-68-101 and 40 CFR §265.301(a)] and does not invoke land disposal restrictions (LDRs)[OAC 3745-59 and 40 CFR§§268.40 through .44].	Section 9.1.8 of the OU5 ROD, and following secction of the Sitewide Excavation Plan: 1.3.2.6 Corrective Action Management Unit Rule.

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TABLE A-2 (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	DEFINITIONS & GENERAL FACILITY STANDARDS, continued					
Generator Standards, Hazardous Waste Determination OAC 3745-52-11(A) through (F)	A person who generates a solid waste must determine if that waste is a hazardous waste using the following method:	✓	R&A	R&A		Following secctions of the Sitewide Excavation Plan: 2.1.1 RCRA 2.1.2 Waste Acceptance Criteria 3.1 Predesign Investigation 3.3.1 Implementation of Construction, Excavation, and Material-handling Activities 3.3.2 Impacted Materials Handling and Tracking 3.6 Record Keeping and Information Management
[Standards Applicable to Generators of Hazardous Waste, Subpart A—General, Hazardous Waste Determination 40 CFR §262.11]	1) First determine if the waste is excluded from regulation (not a solid waste) under OAC 3745-51-04 (40 CFR §261.4).					
	2) If the waste is not excluded from regulation, then determine if the waste is listed as a waste ("listed waste") in OAC 3745-51-30 to 3745-51-33 (Subpart D of 40 CFR Part 261).				Not pertinent for on-site disposal because of the CAMU rule (see preceding entry); pertinent for off-site treatment or disposal.	See preceding entry, and following sections of the Sitewide Excavation Plan: 2.5.10 Off-Site Shipments F.5.2 Off-Site Disposal

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TABLE A (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	3) For purposes of complying with OAC 3745-59 (40 CFR Part 268), or if the waste is not a "listed waste" per step 2 above, then determine if the waste is a "characteristic waste" as identified in OAC 3745-51-20 through 3745-51-24 (Subpart C of 40 CFR Part 261), by either (a) testing the waste using appropriate methods, or (b) applying knowledge of the hazardous characteristic of the waste in light of the materials or processes used ("process knowledge").				Per the RODs, pertinent only to the following areas: In OU2: approx. 300 cubic yards of lead-containing soil in the South Field Firing Range. In OU5: 1) Abandoned sump west of Pilot Plant; 2) Area between KC-2 Warehouse and RR tracks; 3) Trap Range; 4) Paddy's Run streambank fill materials west of OU4's Silos 1-4; 5) Scrap Metal Pile area; and 6) Area north of maintenance building.	Sections 7.4 (@ p. 7-5), 9.1 (@ p. 9-2), and 10.2.2 (@ p. 10-4) of the OU2 ROD; Section 9.1.1 (@ p. 9-6) and Table 9-1 of the OU5 ROD

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TABLE A-2 (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	DEFINITIONS & GENERAL FACILITY STANDARDS, continued					
Interim [Status Hazardous Waste Facility] Standards —General Provisions, General Provisions OAC 3745-65-13 through -16 [Interim Status Hazardous Waste Facility Standards, Subpart B—General Facility Standards 40 CFR §§265.13 through .16]	Owners/operators of a facility must obtain chemical and physical analyses of a representative sample of each hazardous or nonhazardous waste to be treated, stored or disposed of at the facility prior to treatment, storage or disposal. At a minimum, the analysis must contain all the information which must be known to treat, store or dispose of the waste, and may include using existing published or documented data on the waste or on waste generated from similar processes ("process knowledge") [OAC 3745-65-13].	✓	R&A	R&A	Pertinent to management of hazardous waste.	Following sections of the Sitewide Excavation Plan: 3.3.2 Impacted Materials Handling and Tracking 4.0 Location-Specific Excavation Approaches F.5 Excavated Material Management
	The facility owner/operator must prevent the unknowing entry, and minimize the possibility of unauthorized entry, to the active portion of the facility unless certain conditions apply [OAC 3745-65-14].				Controls which limit access to the FEMP will remain in place throughout remediation activities.	F.2.1 Establishing Excavation Boundaries and Access Controls
	The facility operator must maintain and inspect all monitoring equipment, safety and emergency equipment, security devices, and operating and structural equipment that are important to preventing human health hazards. The frequency of inspection may vary by item, and should be based on the rate of possible deterioration of the equipment/item and the probability of an environmental or human health incident if the deterioration, malfunction, or operator error goes undetected [OAC 3745-65-15]. The facility operator must train personnel for procedures relevant to the positions in which they are employed [OAC 3745-65-16].					F.8 Remediation Maintenance Activities
Hazardous Waste Facility Environmental Impact ORC 3734.05(D)(6)(c)	A hazardous waste facility installation and operation permit shall not be approved unless it is proven that the facility represents the minimum adverse environmental impact, considering the state of available technology, the nature and economics of various alternatives and other pertinent considerations	✓	Appl	✓	**NOTE:** Incorrectly cited in RODs as OAC 3745.05(D)(6)(c).	Appendix H of OU2 FS, Appendix J of OU5 FS, and Appendix J of OU3 RI/FS.

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TABLE A (continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	DEFINITIONS & GENERAL FACILITY STANDARDS, continued					
Hazardous Waste Facility Minimum Risk ORC 3734.05(D)(6)(d)	A hazardous waste facility installation and operation permit shall not be approved unless it is proven that the facility represents the minimum risk of all the following: 1) contamination of groundwater and surface water; 2) fires or explosions from treatment, storage, or disposal methods; 3) accidents during transportation; 4) impact to public health and safety; 5) air pollution; and 6) soil contamination.	✓	Appl	✓	**NOTE:** Incorrectly cited in RODs as OAC 3745.05(D)(6)(d).	OU2, OU5, and OU3 FS Reports and RODs. Also, see preceding.
Interim [Status Hazardous Waste Facility] Standards—General Provisions, Preparedness and Prevention OAC 3745-65-31 through -35, and -37 [Interim Status Hazardous Waste Facility Standards, Subpart C—Preparedness and Prevention 40 CFR §§265.31 through .35, and .37]	TSD facility operators must design, construct, maintain and operate facilities to minimize the possibility of fire, explosion or any unplanned sudden or non-sudden release of hazardous waste to air, soil, or surface water which might threaten human health or the environment.	✓	R&A	R&A		See two preceding entries. For waste that is dispositioned for off-site disposal, see the Operable Unit 1 Design Criteria Package.

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TABLE A-2 (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	DEFINITIONS & GENERAL FACILITY STANDARDS, continued					
Interim [Status Hazardous Waste Facility] Standards—General Provisions, Contingency Plan and Emergency Procedures OAC 3745-65-51, -52, -55 and -56 [Interim Status Hazardous Waste Facility Standards, Subpart D—Contingency Plan and Emergency Procedures 40 CFR §265.51, .52, .55 and .56]	Each facility operator must have a contingency plan designed to minimize hazards to human health and the environment due to fires, explosions, or any unplanned releases of hazardous waste constituents to air, soil or surface/groundwater.	✓	R&A	R&A	Pertinent to on-site facilities that treat, store, or dispose of hazardous waste.	FEMP Emergency Plan (PL-3020); all HWMUs identified in Table 2-1 of the Sitewide Excavation Plan (and the subset identified previously in this table) are addressed in Section G: Contingency Plan of the RCRA Part B Permit Application. Also, see three preceding entries. For waste that is dispositioned for off-site disposal, see the Operable Unit 1 Design Criteria Package.
Hazardous Waste Incinerators [and Miscellaneous Units], Environmental Performance Standards OAC 3745-57-91 and -92 [Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities, Subpart X—Miscellaneous Units, 40 CFR §§264.601 through .603]	Prevention of any release that may have adverse effects on human health or the environment includes, but is not limited to: A. Migration of waste constituents in the groundwater or subsurface environment. B. Migration of waste constituents in surface water, or wetlands or on the soil surface. C. Migration of waste constituents in the air. Monitoring, tests, analytical data, inspections, response, and reporting procedures and frequencies must ensure compliance with pertinent portions of the OAC.	✓	R&A	✓	Pertinent to on-site facilities that treat, store, or dispose of hazardous waste in miscellaneous units unless the CAMU Rule is applied.	See preceding.

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TABLE A-[illegible] (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	DEFINITIONS & GENERAL FACILITY STANDARDS, continued					
Radioactive Waste Management DOE Order 5820.2A Chapter III (3)(d)	Low-level waste shall be characterized with sufficient accuracy to permit proper segregation, treatment, storage, and disposal. This characterization shall ensure that, upon generation after processing, the actual physical and chemical characteristics and major radionuclide content are recorded and known during all stages of the waste management process. Waste characterization data shall be recorded on a waste manifest and shall include: • the physical and chemical characteristics of the waste; • volume of the waste (total of waste and any solidification or absorbent media); • weight of the waste (total of waste and any solidification or absorbent media); • major radionuclides and their concentrations; and • packaging date, package weight, and external volume.	TBC	✓	TBC	The CERCLA RI/FS process established the nature and extent of contamination at the FEMP. During excavation, monitoring will be performed in accordance with the Sitewide Excavation Plan and individual IRDPs, and results will be documented in order to determine if impacted material meets the OSDF WACs or off-site WACs. These sources of characterization information (RI/FS sampling, pre-design investigations, FRL attainment, WAC attainment) will provide the required manifest information.	Addressed throughout the CERCLA RI/FS and selection of remedy process, culminated in the OU2, OU5 and OU3 RODs; OSDF Impacted Materials Placement Plan (20100-PL-007); Waste Acceptance Criteria Attainment Plan for the On-Site Disposal Facility (20100-PL-0014); following section of the Sitewide Excavation Plan: 3.3.2 Impacted Materials Handling and Tracking

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TABLE A-2 (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	DEFINITIONS & GENERAL FACILITY STANDARDS, continued					
Waste Treatment DOE Order 5820.2A Chapter III (3)(f)	Waste treatment techniques such as incineration, shredding, and compaction to reduce volume and provide more stable waste forms shall be implemented as necessary to meet performance requirements. Use of waste treatment techniques to increase the life of the disposal facility and improve the long-term facility performance, by improved site stability and reduction of infiltrating water, is required to the extent it is cost effective. The development of large scale waste treatment facilities shall be supported by the appropriate National Environmental Policy Act documentation. Operation of waste treatment facilities shall be supported by adequate documentation.	TBC	TBC	TBC	Based upon CERCLA RI/FS data, the majority of the impacted material from OU2, OU5 & OU3 will meet the OSDF WACs and thus the performance objectives of the OSDF & DOE Order 5820.2A without treatment. This has been demonstrated through the modeling performed in the FSs to establish the OSDF WACs. Two categories of impacted materials may need to be treated before disposal. Lead-contaminated trap range soil, if toxicity characteristic hazardous, will be treated to the extent necessary to remove the toxicity characteristic that causes it to be regulated as hazardous. Physical sizing & treatment as per the OSDF Impacted Material Placement Plan (20100-PL-007) will be conducted as needed on debris for proper waste placement and stability within the OSDF.	Addressed throughout the CERCLA RI/FS and selection of remedy process, culminated in the OU2, OU5 and OU3 RODs; OSDF Impacted Materials Placement Plan (20100-PL-007); following sections of the Sitewide Excavation Plan: 1.3.2.7 RCRA Characteristic Waste Disposal 2.1.1.3 Toxicity Characteristic Hazardous Wastes 3.3.2 Impacted Materials Handling and Tracking F.5 Excavated Material Management

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TABLE A (continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	DEFINITIONS & GENERAL FACILITY STANDARDS, continued					
Radioactive Waste Management DOE Order 5820.2A Chapter III (3)(g)	The volume of waste and number of shipments of low-level wastes shall be minimized and the shipments will be conducted based on plans developed by field organizations. Generators shall provide an annual forecast in the third quarter of the fiscal year to the field organizations managing the off-site disposal facility to which the waste is to be shipped. Generators must receive advance approval from the receiving facility and shall certify prior to shipment that waste meets the receiving facility waste acceptance criteria. The certification program shall be auditable and able to withstand independent review.	TBC	TBC	TBC	The volume of impacted material to be disposed onsite in the OSDF will be minimized through a number of programs. First, extensive sampling has been performed during the CERCLA RI/FS process and the extent of excavation has been established using this data. Combined with the sampling/monitoring that will be performed during excavation in accordance with Section 3.3 of the Sitewide Excavation Plan and individual IRDPs, this will confirm that only impacted materials are excavated and sent to disposal. Compliance with the FEMP Pollution Prevention and Waste Minimization Awareness Plan will minimize the amount of low-level waste (i.e., equipment and personal protective equipment) generated during remediation.	FEMP Pollution Prevention and Waste Minimization Awareness Plan; also see preceding.

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TABLE A-2 (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	DEFINITIONS & GENERAL FACILITY STANDARDS, continued					
Control of Residual Radioactive Material DOE Order 5400.5 Chapter IV (6)(b) 10 CFR Part 834 (PROPOSED)	Interim storage must provide: 1) Control and stabilization features shall be designed to provide, to the extent reasonably achievable, an effective life of 50 years with a minimum life of at least 25 years. 2) Controls shall be designed such that radon-222 concentrations in the atmosphere above facility surfaces or openings in addition to background levels, will not exceed: (a) 100 pCi/L at any given point; (b) An annual average concentration of 30 pCi/L over the facility site; and (c) An annual average concentration of 3 pCi/L at or above any location outside the facility site. (d) Flux rates from the storage of radon producing wastes shall not exceed 20 pCi/m^2/sec, as required by 40 CFR Part 61.	✓	TBC		The selected remedies are for a permanent remedy, not for interim storage; any short-term management of impacted material to be employed is to facilitate the permanent remedy.	The approved selected remedy in the OU2 and OU5 RODs, associated remedial design documents (i.e., IRDPs).
	3) Controls shall be designed such that concentrations of radionuclides in the groundwater and quantities of residual radioactive material will not exceed applicable federal or state standards.					Section 5.0 of the Sitewide Excavation Plan, for environmental controls to be implemented during remediation.
	4) Access to a property and use of on-site material contaminated by residual radioactive material should be controlled through appropriate administrative and physical controls such as those described in 40 CFR Part 192. These control features should be designed to provide, to the extent reasonable, an effective life of at least 25 years.					Section 3.0 and Appendix F of the Sitewide Excavation Plan, and IRDPs, for access controls to be implemented during remediation.

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TABLE A (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
MANAGEMENT OF LOW-LEVEL RADIOACTIVE MATERIAL						
Low-level Radioactive Waste Generation DOE Order 5820.2A Chapter III (3)(c)	Technical and administrative controls shall be directed to reducing the gross volume of waste generated and/or the amount of radioactivity requiring disposal. Waste reduction efforts shall include consideration of process modification, process optimization, materials substitution, and decontamination. All DOE low-level waste generators shall establish auditable programs to assure that the amount of low-level waste generated and/or shipped for disposal is minimized. Each DOE low-level waste generator shall separate uncontaminated waste from low-level waste to facilitate cost-effective treatment and disposal. Each DOE low-level waste generator preparing a design for a new process or process change shall incorporate principles into the design that will minimize the generation of low-level waste.	TBC	TBC	TBC	Implementation of the FEMP Pollution Prevention and Waste Minimization Awareness Plan will confirm that all newly generated waste is minimized during remediation. Additionally, excavation controls such as rapid test methodology and additional laboratory sampling will be implemented to confirm that only impacted material with contamination that is potentially above the FRLs is being excavated and sent to disposal. Physical sampling of the impacted materials and/or rapid test method methodology will also confirm that only material that exceeds the OSDF WAC is sent offsite for disposal.	Addressed throughout the CERCLA RI/FS and selection of remedy process, culminated in the OU2, OU5 and OU3 RODs; also, FEMP Pollution Prevention and Waste Minimization Awareness Plan.
MANAGEMENT OF HAZARDOUS REMEDIATION WASTE						
Identification and Listing of Hazardous Waste, Residues of Hazardous Waste in Empty Containers OAC 3745-51-07(A) &(B) [Identification and Listing of Hazardous Waste, Subpart A—General, Residues of Hazardous Waste in Empty Containers 40 CFR §261.7]	Any hazardous waste remaining in either an empty container or an inner liner removed from an empty container is not subject to regulation under 40 CFR Parts 261 through 265 (RCRA requirements). A container is empty if: 1) 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 2) No more than 2.5 cm (1 inch) of residue remains on bottom of the container or inner liner; or 3) No more than 3 percent by weight of the total capacity of the container remains in the container or inner liner if the container is less than or equal to 110 gal. in size, or no more than 0.3 percent by weight of the total capacity of the container remains in the container or inner liner if the container is greater than 110 gal. in size.	√	R&A	Appl	Pertinent when containerizing: soil contaminated by RCRA waste; any treatment residues exhibiting RCRA characteristics including advanced wastewater treatment (AWWT) sludges and soil decontamination residues.	Following sections of the Sitewide Excavation Plan: 2.5.8 Special Materials 3.3.2.2 Special Materials App F Implementation of Construction

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TABLE A-2 (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	MANAGEMENT OF HAZARDOUS REMEDIATION WASTE, continued					
Closure and Post-Closure Under Interim Standards, Condition of Containers OAC 3745-66-71 Compatibility of Containers OAC 3745-66-72 Management of Containers OAC 3745-66-73 Inspections OAC 3745-66-74 Special Requirements for Ignitable or Reactive Waste OAC 3745-66-76 Special Requirements for Incompatible Wastes OAC 3745-66-77 [Interim Status Standards, Subpart I—Use & Management of Containers, 40 CFR §§265.171 through .174, .176 and .177]	If a container holding hazardous waste is not in good condition (e.g., severe rusting, apparent structural defects) or begins to leak, the owner or operator must transfer the hazardous waste from this container to a container that is in good condition or manage the waste in some other way that complies with this requirement.	✓	R&A	Appl	Pertinent to handling containers holding environmental media contaminated with RCRA waste.	See preceding.

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TABLE A (continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	MANAGEMENT OF HAZARDOUS REMEDIATION WASTE, continued					
[New Facilities] Corrective Action, Closure and Post-Closure Requirements Containment OAC 3745-55-75 [Interim Status Hazardous Waste Facility Standards, Subpart I—Use & Management of Containers 40 CFR §§265.175(a) through (c)]	A containment system for RCRA container storage areas must be designed and operated to provide: 1) A sufficiently impervious base, which is sloped to collect any leaking liquids. 2) Sufficient capacity to contain liquids. 3) Prevention of run-on into the containment system. 4) A sump to prevent overflow of the collection system. Storage areas for containers holding only wastes that do not contain free liquids need not have a containment system, provided that: 1) The storage area is sloped or is otherwise designed and operated to drain and remove liquid resulting from precipitation, or 2) The containers are elevated or are otherwise protected from contact with accumulated liquid.	✓	R&A	Appl	Pertinent to handling soil contaminated with RCRA listed or characteristic hazardous waste. A Part B Permit Application for RCRA storage has been submitted to the OEPA.	See preceding.
[New Facilities] Surface Impoundments, Waste Piles, and Tanks [Waste Piles] Design and Operating Requirements OAC 3745-56-51(A) through (F)	A waste pile used to store or treat hazardous waste must have: 1) A liner that is designed, constructed, and installed to prevent any migration of waste out of the pile into the adjacent subsurface soil or groundwater or surface water at any time during the active life (including the closure period) of the waste pile, and 2) A leachate collection and removal system immediately above the liner that is designed, constructed, maintained, and operated to collect and remove leachate from the pile.	✓	R&A	✓	Pertinent to on-site hazardous waste piles used for longer than 90 days unless the CAMU Rule is applied.	Addressed through remedial design documents (IRDPs).
	The owner/operator must design, construct, operate, and maintain a run-on control system capable of preventing flow onto the active portion of the pile during peak discharge from at least a 25-year storm and manage a runoff management system to collect and control at least the water volume resulting from a 24-hour, 25-year storm.	✓	R&A	✓		
	If the pile contains any particulate matter which may be subject to wind dispersal, the owner or operator must cover or otherwise manage the pile to control wind dispersal.	✓	R&A	✓		FEMP Fugitive Dust Control BAT Determination, Fugitive Dust Control Requirements (RM-0047), and Section 5.1.2.2 and Appendix F of the Sitewide Excavation Plan

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TABLE A-2 (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
Monitoring and Inspection OAC 3745-56-54(A) and (B)	During construction or installation, liners and cover systems must be inspected for uniformity, damage, and imperfections.	✓	R&A	✓		
	Collection and holding facilities associated with run-on and runoff control system must be inspected weekly and be emptied or otherwise managed expeditiously after storms to maintain design capacity of the system.	✓	R&A	✓		FEMP Stormwater Pollution Prevention Plan (RM-0039), and Appendix F of the Sitewide Excavation Plan
Special Requirements for Ignitable or Reactive Waste OAC 3745-56-56(A) and (B) Special Requirements for Incompatible Wastes OAC 3745-56-57(A), (B) and (C) [Subpart L—Waste Piles, 40 CFR §§264.251 through .259]	Ignitable, reactive, or incompatible waste must not be added to a waste pile, unless specified in OAC 3745-56-56(A) and (B) or 57(A), (B) and (C).	✓	R&A	✓	The CERCLA RIs did not find evidence of ignitive or reactive material on-site. Impacted and non-impacted materials management will be segregated and managed in separate piles, based upon intended disposition (waste acceptance criteria).	Following sections of the Sitewide Excavation Plan: 3.3.2 Impacted Materials Handling and Tracking 4.0 Location-Specific Excavation Approaches F.5 Excavated Material Management
Temporary Units Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities, Subpart S- 40 CFR §264.553 (a), (b) (58 FR 865829, February 16, 1993)	For temporary tanks and container storage areas used for treatment or storage of remediation wastes during remedial activities, the Regional Administrator may determine that a design, operating, or closure standard applicable to such units may be replaced by alternative requirements which are protective of human health and the environment. Any temporary unit to which alternative requirements are applied shall be: • located within the facility boundary; and • used solely for treatment or storage of remediation wastes.	R&A	✓	R&A	Pertinent to short-term management/storage of impacted materials during the CERCLA soil remediation activities. IRDPs can designate and utilize temporary units to facilitate remediation within the already designated CAMU. Alternative requirements which are protective of human health and the environment may be used in lieu of the design, operating, or closure requirements that would otherwise apply to such units under RCRA.	Following section of the Sitewide Excavation Plan: 1.3.2.6 CAMU Rule

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TABLE A (continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	MANAGEMENT OF HAZARDOUS REMEDIATION WASTE, continued					
Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities, Subpart DD—Containment Building 40 CFR §§264.1100 through .1102 57 FR 37194 (August 18, 1992)	The owner or operator is not subject to the definition of land disposal in RCRA Section 3004(k) provided that the unit: 1) Is a completely enclosed, self-supporting structure that is designed and constructed of synthetic materials of sufficient strength and thickness to support themselves, the waste contents, and any personnel and heavy equipment that operate within the unit, and to prevent failure due to pressure gradients, settlement, compression, or uplift, physical contact with the hazardous wastes to which they are exposed, climatic conditions, and the stresses of daily operation, including the movement of heavy equipment within the unit and contact of such equipment with containment walls; 2) Has a primary barrier for management of solids, in addition to a liquid collection system and secondary containment for management of liquids. 3) Has controls sufficient to prevent fugitive dust emissions to meet the no visible emission standard in Sec. 264.1101(c)(1)(iv); and 4) Is designed and operated to ensure containment and prevent the tracking of materials from the unit by personnel or equipment. At closure, the owner or operator must remove or decontaminate all waste residues, contaminated containment system components, contaminated subsoil, and structures and equipment contaminated with waste and leachate, and handle them as a hazardous waste.	✓	R&A	R&A	Pertinent to excavated RCRA hazardous soil and sediment that may require short-term management/ storage during the CERCLA soil remediation activities. DOE does not anticipate utilizing containment buildings.	Following sections of the Sitewide Excavation Plan: 3.3.2 Impacted Materials Handling and Tracking 4.0 Location-Specific Excavation Approaches F.5 Excavated Material Management

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TABLE A-2 (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	MANAGEMENT OF HAZARDOUS REMEDIATION WASTE, continued					
Procedures for Planning and Implementing Offsite Response Actions ("The CERCLA Offsite Rule") 40 CFR §300.400	Materials from remediation of a CERCLA site ("CERCLA waste") may only be transferred to offsite facilities that are in compliance with Resource Conservation and Recovery Act (RCRA), Toxic Substances Control Act (TSCA), or other applicable federal and state requirements. Only U.S. EPA has the authority to determine whether the facility in question meets the acceptability criteria and is acceptable for receiving CERCLA waste from offsite. A determination of acceptability for a potential receiving facility is to be made in advance (prior to initiating transportation offsite, and optimally prior to making offsite treatment/ storage/disposal contract arrangements). Materials covered under this rule ("CERCLA waste") are any hazardous substance, pollutant, or contaminant as defined under CERCLA sections 101(14) and 101(33). Samples of waste sent to a laboratory for characterization are exempt from the rule, as are certain treatability study waste. The receiving facility must meet compliance and release criteria presented therein. Facility is defined as the receiving unit(s) that directly stores, treats, or disposes of the CERCLA waste. Non-receiving units at the facility need not be in compliance in order for the U.S. EPA to determine that the receiving unit meets acceptance criteria. U.S. EPA may deem a facility acceptable even if certain minor violations have occurred at the facility. If a facility does not meet the criteria for receiving CERCLA wastes, the rule presents notification, determination, appeal/review and reinstatement procedures.	✓	✓	Appl	Pertinent to preparation of materials for off-site disposition.	Operable Unit 1 Design Criteria Package, and following sections of the Sitewide Excavation Plan: 2.5.10 Off-Site Shipments F.5.2 Off-Site Disposal
[Hazardous Waste] Generator Standards OAC 3745-52-20 through -23, and -30 through -33 [40 CFR §§262.20 through .23, and .30 through .33]	Before transporting hazardous waste or offering hazardous waste for transportation off-site ("pre-transport"), for either treatment or disposal, general requirements for the generator, require a manifest [OAC 3745-52-20 through -23], in accordance with the requirements specified therein. Pre-transport requirements also include appropriate packaging [OAC 3745-52-30], labeling [OAC 3745-52-31], marking [OAC 3745-52-32], and placarding [OAC 3745-52-33], in accordance with the requirements specified therein.	✓	Appl	Appl	Pertinent to preparation of RCRA hazardous waste (and mixed waste) for off-site treatment and/or disposal.	See preceding.

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TABLE A-2 (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	MANAGEMENT OF HAZARDOUS REMEDIATION WASTE, continued					
Implementation of the United Nations Recommendations, International Maritime Dangerous Goods Code, and the International Civil Aviation Organization's Technical Instructions 59 FR 67390 (December 29, 1994) as amended by 60 FR 26796 (May 18, 1995)	These rules (final rule was effective October 1, 1995) comprehensively revise the Hazardous Materials Regulations (HMR), 49 CFR Parts 171-173, 177, and 178, with respect to hazard communication, classification, and packaging requirements based on United Nations recommendations.	✓	✓	Appl	These Hazardous Materials Regulations are requirements embedded in both the state (OAC) and federal (CFR) regulations in both the generator standards (preceding entry) and the transporter standards (subsequent entry).	See preceding generator standards entry and subsequent transporter standards entry.
[Hazardous Waste] Land Disposal Restrictions OAC 3745-59 [Land Disposal Restrictions, Subpart D—Treatment Standards 40 CFR §§268.40 through .44]	A restricted hazardous waste may be land disposed only if: 1) An extract of the waste or of the treatment residue of the waste does not exceed the value shown in 40 CFR §268.41. 2) It is treated using a technology specified in 40 CFR §268.42(a) or an equivalent treatment method. 3) The constituent concentrations in the waste or treatment residue of the waste do not exceed the value shown in 40 CFR §268.43.	✓	Appl	Appl	Not applicable to on-property disposal within a CAMU under the CAMU Rule as invoked under the OU5 ROD. Applicable to those RCRA hazardous wastes that will be disposed of off-site.	See three preceding entries.
Land Disposal Restrictions, Subpart D—Treatment Standards, Treatment Standards Expressed as Concentrations in Waste Extract 40 CFR §268.41	The maximum concentration of lead (5.0 mg/L) may not be exceeded whether it is the extract of a waste or waste treatment residual.	R&A	Appl		Not applicable to on-property disposal within a CAMU under the CAMU Rule as invoked under the OU5 ROD. Applicable to those RCRA hazardous wastes that will be disposed of off-site.	See four preceding entries.

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TABLE A-2 (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
MANAGEMENT OF HAZARDOUS REMEDIATION WASTE, continued						
Land Disposal Restrictions, Subpart D—Treatment Standards, Contaminated Debris 40 CFR §268.45	Hazardous debris must be treated before land disposal unless the EPA determines that the debris is no longer contaminated with hazardous waste or the debris is treated to the waste-specific treatment standard for the waste contaminating the debris. Provided the debris does not exhibit a RCRA characteristic it is not subject to regulation under 40 CFR 260, 261 to 266, 268, or 270 if: 1) The hazardous debris has been treated using one of the required extraction or destruction technologies specified in 40 CFR §268.45; or 2) The debris, considering the extent of contamination, is determined to no longer be contaminated with hazardous waste.	✓	Appl	Appl	Not applicable to on-property disposal within a CAMU under the CAMU Rule as invoked under the OU5 ROD. Applicable to those RCRA hazardous wastes that will be disposed of off-site.	See five preceding entries.
[Hazardous Waste] Transporter Standards OAC 3745-53-20 through -22, -30 and -31 [40 CFR §§263.20 through .22, .30 and .31]	General requirements for the transporter during transportation of hazardous waste for off-site treatment and/or disposal require acceptance and handling of hazardous waste and use of the manifest system [OAC 3745-53-20], compliance with the manifest [OAC 3745-53-21], and recordkeeping [OAC 3745-53-22], in accordance with the requirements specified therein. Appropriate response actions must be taken for any hazardous waste discharge during transportation [OAC 3745-53-30 and -31], in accordance with the requirements specified therein.	✓	Appl	Appl	Pertinent to transportation of RCRA hazardous wastes (and mixed wastes) for off-site treatment and/or disposal.	See six preceding entries.
MANAGEMENT OF PCB-TAINTED MATERIAL						
Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution In Commerce, And Use Prohibitions, Subpart D—Storage and Disposal, Disposal Requirements 40 CFR §761.60(a)(4)	Any nonliquid PCBs at concentrations 50 mg/kg or greater in the form of contaminated soil, rags, or other debris shall be disposed of in an incinerator which complies with 40 CFR §761.70, or in a chemical waste landfill which complies with 40 CFR §761.75.		Appl	Appl	Pertinent if soil or other material containing PCBs above 50 mg/kg is excavated. PCBs were detected in soil beneath the Fire Training Facility.	Following sections of the Sitewide Excavation Plan: 3.3.2 Impacted Materials Handling and Tracking 4.0 Location-Specific Excavation Approaches F.5 Excavated Material Management

TABLE A-2 (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	MANAGEMENT OF PCB-TAINTED MATERIAL, continued					
Subpart D—[PCB] Storage and Disposal, Disposal Requirements 40 CFR §761.60(e)	Any person who is required to incinerate PCBs or PCB items under this subpart and who can demonstrate that an alternate method of destroying PCBs or PCB items can achieve a level of performance equivalent to the requirements under 40 CFR §761.70 may submit a written request to either the Regional Administrator or the Director, Exposure Evaluation Division, for an exemption from the incineration requirements of 40 CFR §§ 761.70 or 761.60. The applicant must show that the alternate method of destroying PCBs will not present an unreasonable risk of injury to health or the environment.		Appl	Appl	Pertinent only if PCB contaminated soil is greater than 50 mg/kg and is treated on-property using a method besides incineration. DOE neither currently anticipates any such material nor on-property treatment for any such material under the soil remediation projects.	See preceding entry, plus following sections of the Sitewide Excavation Plan: 2.5.10 Off-Site Shipments F.5.2 Off-Site Disposal
Subpart D—[PCB] Storage and Disposal, Storage for Disposal 40 CFR §761.65	This section applies to the design of storage areas to be used for later disposal of PCBs at concentrations of 50 ppm (mg/kg or mg/l) or greater.		Appl	Appl	Pertinent to storage of PCB-contaminated material at 50 ppm or greater. DOE does not currently anticipate any such material under the soil remediation projects.	See two preceding entries.

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TABLE A-2 (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
POST-CLOSURE						
	DESCRIPTION OF POST-CLOSURE CARE					
[New Facilities Hazardous Waste] Surface Impoundments, Waste Piles, and Tanks, [Waste Piles] Post-Closure OAC 3745-56-58(B) [Subpart L—Waste Piles, 40 CFR §§264.251 through .259]	If, after removing or decontaminating all residues and making all reasonable effort to effect removal or decontamination of contaminated components, subsoil, structures and equipment, the owner/operator finds that not all contaminated subsoil can be practically removed or decontaminated, he must close the unit/facility and perform post-closure care in accordance with OAC 3745-57-10. **NOTE:** If clean (or risk-based) closure is performed, then post-closure care is not required.	√	R&A		Only pertinent to those units where risk-based FRLs are not met. DOE intends, and anticipates being able, to clean (risk-based) close all identified HWMUs.	Currently addressed in the OSDF Post-closure Care and Inspection Plan (20100-PL-010), which notes in its Prologue that it can be revised at a later date to expand the scope of coverage to encompass the entire FEMP site as needed. Will also be addressed in the Certification Report and Remedial Action Report — see following sections of the Sitewide Excavation Plan: 1.4.2 Related Documents 2.2.5 HWMU Closure 3.4.7 Certification Report 3.5.3.6 Postremediation/post-closure Care and Inspection 7.4 Certification Report 7.5 Other Related Future Documents

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TABLE A (continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	DESCRIPTION OF POST-CLOSURE CARE, continued					
[New Facilities Hazardous Waste] Incinerators [and Miscellaneous Units], [Miscellaneous Units] Environmental Performance Standards OAC 3745-57-93 [Subpart X—Miscellaneous Units, 40 CFR §§264.601 through .603]	If a treatment or storage miscellaneous unit has contaminated soil or groundwater that cannot be completely removed or decontaminated during closure, the unit must also meet the requirements of OAC 3745-57-91 during the post-closure care period. The post-closure plan under OAC 3745-55-18 must specify the procedures that will be used to satisfy this requirement. A miscellaneous unit that is a disposal unit must be maintained in a manner that complies with OAC 3745-57-91 during the post-closure care period. **NOTE:** If clean (or risk-based) closure is performed, then post-closure care is not required.	√	R&A		Only pertinent to those units where risk-based FRLs are not met. DOE intends, and anticipates being able, to clean (risk-based) close all identified HWMUs.	See preceding.
Closure and Post-Closure Under Interim Standards, Post-closure Care and Use of Property OAC 3745-66-17(A) [40 CFR §265.117(a)(2)]	Post-closure care of hazardous waste management units must begin after completion of closure of the unit and continue for 30 years after that date unless shortened by the Director [of the OEPA, a.k.a. the Ohio Director of Environmental Protection] in accordance with OAC 3745-66-18(G) (40 CFR §117(a)(2)). **NOTE:** If clean (or risk-based) closure is performed, then post-closure care is not required.	√	Appl		**NOTE:** Identified in the OU5 ROD as applicable only to existing hazardous waste management units (HWMUs); also cited in RCRA/CERCLA Integrated Closure DF&O @ V.1. Only pertinent to those units where risk-based FRLs are not met. DOE intends, and anticipates being able, to clean (risk-based) close all identified HWMUs.	See preceding.
Closure and Post-Closure Under Interim Standards, Post-closure Care and Use of Property OAC 3745-66-17(A)(1) [40 CFR §265.117(a)(1)]	Post-closure care...must consist of at least the following: • monitoring and reporting; and • maintenance and monitoring of waste containment systems. **NOTE:** If clean (or risk-based) closure is performed, then post-closure care is not required.	√	√	√	Cited in the RCRA/CERCLA Integrated Closure DF&O @ V.1. Only pertinent to those units where risk-based FRLs are not met. DOE intends, and anticipates being able, to clean (risk-based) close all identified HWMUs.	See preceding.

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TABLE A-2 (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	DESCRIPTION OF POST-CLOSURE CARE, continued					
Closure and Post-Closure Under Interim Standards, Post-closure Plan; Amendment of Plan OAC 3745-66-18(A)&(C)	The owner of a hazardous waste disposal unit shall have a written post-closure plan, which shall identify the activities that will be carried on after closure of each unit and the frequency of those activities, and include at least: • a description of the planned monitoring activities and frequencies at which they will be performed; • a description of the planned maintenance activities and frequencies at which they will be performed, to ensure (a) the integrity of the cap and final cover or other containment systems, and (b) the functioning of the monitoring equipment; and • the name, address and telephone number of the person or office to contact about the hazardous waste disposal unit or facility during the post-closure period. **NOTE:** If clean (or risk-based) closure is performed, then post-closure care is not required.	✓	✓	✓	Cited in the RCRA/CERCLA Integrated Closure DF&O @ V.1. Only pertinent to those units where risk-based FRLs are not met. DOE intends, and anticipates being able, to clean (risk-based) close all identified HWMUs.	See preceding.
	MODIFICATIONS TO POST-CLOSURE CARE PLAN OR PERIOD					
Closure and Post-Closure Under Interim Standards, Post-closure Plan; Amendment of Plan OAC 3745-66-18(D)	The owner may amend the post-closure plan any time during the active life of the facility or during the post-closure period. **NOTE:** If clean (or risk-based) closure is performed, then post-closure care is not required.	✓	✓	✓	Cited in the RCRA/CERCLA Integrated Closure DF&O @ V.1. Only pertinent to those units where risk-based FRLs are not met. DOE intends, and anticipates being able, to clean (risk-based) close all identified HWMUs.	See preceding.
Closure and Post-Closure Under Interim Standards, Post-closure Plan; Amendment of Plan OAC 3745-66-18(G)	The post-closure plan and length of the post-closure period may be modified any time prior to the end of the post-closure care period. A modification of the post-closure plan may include, where appropriate, the temporary suspension rather than permanent deletion of one or more post-closure care requirements. At the end of the specified period of suspension, the Director [of the OEPA, a.k.a. the Ohio Director of Environmental Protection] would then determine whether the requirements should be permanently discontinued or reinstated to prevent threats to human health and the environment. **NOTE:** If clean (or risk-based) closure is performed, then post-closure care is not required.	✓	✓	✓	Cited in the RCRA/CERCLA Integrated Closure DF&O @ V.1. Only pertinent to those units where risk-based FRLs are not met. DOE intends, and anticipates being able, to clean (risk-based) close all identified HWMUs.	See preceding.

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TABLE A (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	PROPERTY USE RESTRICTIONS					
Closure and Post-Closure Under Interim Standards, Post-closure Care and Use of Property OAC 3745-66-17(C) [40 CFR §265.117(c)]	Post-closure use of property on or in which hazardous waste remain after partial or final closure must never be allowed to disturb the integrity of the final cover, liner(s), or any other component of the containment system, or the function of the facility's monitoring systems, unless the Director [of the OEPA, a.k.a. the Ohio Director of Environmental Protection] approves otherwise. NOTE: If clean (or risk-based) closure is performed, then post-closure care is not required.	√	Appl	√	NOTE: Identified in the OU5 ROD as applicable only to existing hazardous waste management units (HWMUs); also cited in RCRA/CERCLA Integrated Closure DF&O @ V.1. DOE intends, and anticipates being able, to clean (risk-based) close all identified HWMUs.	Currently addressed in the OSDF Post-closure Care and Inspection Plan (20100-PL-010), which notes in its Prologue that it can be revised at a later date to expand the scope of coverage to encompass the entire FEMP site as needed.
Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings Subpart A— 40 CFR §192.02(a)	Controls of residual radioactive materials from inactive uranium processing sites shall be designed to be effective for up to 1,000 years, to the extent reasonably achievable, and in any case, for at least 200 years, and provide protection of groundwater.	R&A	R&A		Most pertinent to the design and closure of the On-Site Disposal Facility.	Addressed by selected remedies of OU2 and OU5 RODs in establishment of FRLs.
Long-Term Management of Residual Radioactive Material DOE Order 5400.5 Chapter IV (6)(d) 10 CFR Part 834 (PROPOSED)	Controls of residual radioactive materials from inactive uranium processing sites shall be designed to be effective for up to 1,000 years, to the extent reasonably achievable, and in any case, for at least 200 years, and provide protection of groundwater.		TBC			Addressed by selected remedies of OU2 and OU5 RODs in establishment of FRLs.
	For long-term management of uranium, thorium, and their decay products, access to a property and use of on-site materials contaminated by residual radioactive material should be controlled through appropriate administrative and physical controls such as those described in 40 CFR Part 192. These controls should be designed to be effective to the extent reasonable for at least 200 years.	TBC	TBC			
Control of Residual Radioactive Material Above the Guidelines DOE Order 5400.5 Chapter IV (6)	Residual radioactive material with concentrations above the generic guidelines (see chemical-specific requirements) shall be managed in accordance with Chapter II, Requirements for Radiation Protection of the Public and the Environment, and operational and control requirements.	TBC	√			See preceding.

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TABLE A-2 (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	PROPERTY USE RESTRICTIONS, continued					
Supplemental Limits and Exceptions for Residual Radioactive Material DOE Order 5400.5 Chapter IV (7)	If special specific property circumstances indicate that the concentration guidelines or authorized limits are not appropriate, supplemental limits or an exception may be requested to those guidelines or limits.	TBC	√			See preceding.
Release of Property DOE Order 5400.5 Chapter II (5)	Real property (land and structures), personal property, materials, and equipment shall be released if the concentration of radioactivity is within the limits of residual radioactive contamination.	TBC	√			See preceding.
	POST-CLOSURE NOTICE/SURVEY PLAT					
Closure and Post-Closure Under Interim Standards, Survey Plat OAC 3745-66-16	The owner shall submit -- to the local zoning authority, or the authority with jurisdiction over local land use, and to the Director [of the OEPA, a.k.a. the Ohio Director of Environmental Protection] -- a survey plat, prepared and certified by a professional land surveyor, indicating the location and dimensions of landfill cells or other hazardous waste disposal units with respect to permanently surveyed benchmarks. The plat must contain a note, prominently displayed, which states the owner's obligation to restrict disturbance of the hazardous waste disposal unit in accordance with OAC 3745-66-17(C).	√	√	√	Cited in the RCRA/CERCLA Integrated Closure DF&O @ V.1.	Currently addressed in the OSDF Post-closure Care and Inspection Plan (20100 PL-010), which notes in its Prologue that it can be revised at a later date to expand the scope of coverage to encompass the entire FEMP site as needed.
Closure and Post-Closure Under Interim Standards, Post-closure Notices OAC 3745-66-19(A)	The owner shall submit -- to the local zoning authority, or the authority with jurisdiction over local land use, and to the Director [of the OEPA, a.k.a. the Ohio Director of Environmental Protection] -- a record of the type, location, and quantity of hazardous waste disposed of within each cell or disposal unit of the facility.	√	√	√	Cited in the RCRA/CERCLA Integrated Closure DF&O @ V.1.	See preceding.

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TABLE A-2 (Continued)
PERTINENT ARARs AND TBCs FOR REMEDIATION AREA 1 PHASE II

Citation	Requirement	OU2 ROD	OU5 ROD	OU3 ROD	Remarks	Cross-Reference
	DEED NOTATION					
Closure and Post-Closure Under Interim Standards, Post-closure Notices OAC 3745-66-19(B)	The owner shall record, in accordance with state law, a notation on the deed of the facility property, or on some other instrument which is normally examined during title search, that will notify in perpetuity the potential purchasers of the property that: • the land has been used to manage hazardous wastes; • its use is restricted under the Ohio Administrative Code closure and post-closure rules; and • a survey plat and record of the type, location, and quantity of hazardous wastes disposed of within each cell or hazardous waste unit of the facility as required by OAC 3745-66-16 and OAC 3745-66-19(A) have been filed with the local zoning authority or the authority with jurisdiction over local land use and the Director [of the OEPA, a.k.a. the Ohio Director of Environmental Protection].	√	√	√	Cited in the RCRA/CERCLA Integrated Closure DF&O @ V.1.	Currently addressed in the OSDF Post-closure Care and Inspection Plan (20100-PL-010), which notes in its Prologue that it can be revised at a later date to expand the scope of coverage to encompass the entire FEMP site as needed. Will also be addressed in the NRRP.
Closure and Post-Closure Under Interim Standards, Post-closure Notices OAC 3745-66-19(C)	If the owner or any subsequent owner of the land upon which a hazardous waste disposal unit was located wishes to remove hazardous wastes and hazardous waste residues in satisfaction of the criteria in OAC 3745-66-17(C), the owner may request that the Director [of the OEPA, a.k.a. the Ohio Director of Environmental Protection] approve either: • the removal of the notation on the deed to the facility property or other instrument normally examined during title search; or • the addition of a notation to the deed or instrument indicating the removal of the hazardous waste.	√	√	√	Cited in the RCRA/CERCLA Integrated Closure DF&O @ V.1.	See preceding.

KEY:

Appl = Applicable, as determined in the identified Record(s) of Decision (RODs)

R&A = Relevant & Appropriate, as determined in the identified ROD(s)

TBC = To be Considered, as determined in the identified ROD(s)

√ = indicates the pertinence of either an ARAR/TBC entry identified in another ROD, or the requirements identified under a new entry, to activities to be taken

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APPENDIX B

A1PII - OSDF SEDIMENTATION BASIN DESIGN CRITERIA

A1PII-OSDF Sedimentation Basin Design Criteria -- REV. 0

DATE	TIME	REV no.	COMMENT
2/2/98	1537	0	Issued to Parsons for PO175 by T. Crawford

1.0 Civil Design Criteria

1.1 Stormwater Controls- Area 1 Phase II (A1PII) Conveyance Channel

1.1.1 Stormwater Controls shall be consistent with the ODNR "Rainwater and Land Development Manual" guidelines

1.1.2 Conveyance Channel to be designed for a 10-year, 24-hour storm from the A1PII watershed Subareas 1 and 2 (refer to Figure 1 Drainage Area Map). If in future, runoff from the On-Site Disposal Facility (OSDF) watershed is discharged to this conveyance channel, the conveyance channel will be redesigned by others to meet the design criteria for the OSDF (Ref. "Design Criteria Package, On Site Disposal Facility," Rev. May 1997).

1.1.3 Conveyance Channel design velocity will be less than 4 feet/second.

1.2 Stormwater Controls-Conveyance Channel Culverts.

1.2.1 Culverts (Culvert No. 2) will be used to convey open channel flow from the Conveyance Channel to the Sedimentation Basin.

1.2.2 Culverts (Culvert No. 2) across the rerouted access road to the existing Dissolved Oxygen Building (Bldg 18P).

1.2.2.1 Designed for 25-year, 24-hour storm and runoff from the A1PII watershed Subareas 1 and 2 and the 16.3 acre OSDF area.

1.2.2.2 As per January 14, 1998, PO175 meeting minutes, the calculations will assume that the 16.3 acres will cause no change in the current Time of Concentration used in A1PII drainage.

1.2.3 Culverts (Culvert No. 1) across the existing access road to the Bldg. 18P will be designed for 10-year, 24-hour storm and runoff from watershed Subarea 2 of the A1PII.

1.2.4 Clearance between culverts and existing GW-24" pipeline shall be no less than 6 inches. Provide design justification if culverts are constructed below the existing GW-24"

1.3 Sediment Control A1PII-Sedimentation Basin

1.3.1 A1PII Sedimentation Basin shall be consistent with the ODNR "Rainwater and Land Development Manual" guidelines and the additional guidelines:

1.3.1.1 Sedimentation Basin dam height will be less than 10' and impound less than 50 ac-ft of water

1.3.1.2 Sedimentation Basin floor can have 0.0% slope or negative slope to the principal riser. A sump within the sedimentation basin may be considered.

1.3.1.3 Sedimentation Basin footprint will be within the current Certification Unit A1PII-S1-03.

1.3.2 Minimum Total Volume for A1PII Sediment Basin will be based on 67 cubic yards per watershed acre.

1.3.2.1 Watershed area will include:
A1PII watershed area (including Subarea 1, 2 and 3).

1.3.2.2 Watershed area for A1PII Sediment Basin will not include:

- o OSDF watershed area (approx 16.3 acres)
- o Any portion of the OSDF Borrow Area outside the A1PII Subareas 1, 2, and 3. Design philosophy is to minimize impact to present Certification Unit design and prevents co-mixing of uncertified A1PII/upstream watershed area drainage with certified OSDF Phase II borrow area drainage in one large sedimentation basin.

1.3.3 Principal Spillway structures:

1.3.3.1 Watershed area and design storm for the principal spillway will be as follows:

Watershed Area:	approx. 74 acre area from A1PII
	approx. 16.3 acre area from OSDF
	approx. 9.5 acre area from OSDF Borrow Area
Total watershed area	= 99.8 acre area

1.3.3.2 Principal Spillway

1. OPTION 1:

Principal spillway structures at the A1PII Sediment Basin will be designed based on the OSDF Borrow Area Sediment Basin Design Criteria. Design Storm-Refer to the OSDF Design Criteria Package.

2. OPTION 2:

Calculate the Capacity of the twin 48" CMP proposed in the 90% EPA Design Review from the Sedimentation Basin to the Outfall Area.

1.3.3.3 The inverts of the Principal Spillway Structure will be set so that the embankment height will not exceed the 10 feet exemption as specified in the Ohio Safe Dam regulations.

1.3.4 A defined emergency spillway for A1PII Sediment Basin will not be constructed. Instead, emergency overflow will flow westerly over the South Access Road. A define emergency spillway requirements for OSDF Sediment Basin will be evaluated by others.

Appendix B

APPENDIX B

PRE-DESIGN INVESTIGATION SUPPORTING INFORMATION

APPENDIX B PRE-DESIGN INVESTIGATION SUPPORTING INFORMATION

Appendix B contains analytical data to support the conclusions about current environmental conditions and remedial alternatives.

APPENDIX B-1

HPGe DATA

APPENDIX B-1
HPGe DATA

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HPGE SAMPLE	NORTHING	EASTING	PARAMETER	RESULT	UNITS
A1P2-INV-100-G	479812.847	1351553.081	Radium-226	0.8	pCi/g
A1P2-INV-101-G	479796.107	1351355.406	Radium-226	1	pCi/g
A1P2-INV-102-2-G	479745.15	1351200.726	Radium-226	1	pCi/g
A1P2-INV-102-3-G	479744.516	1351093.366	Radium-226	1	pCi/g
A1P2-INV-102-4-G	479850.216	1351094.039	Radium-226	1	pCi/g
A1P2-INV-102-5-G	479848.754	1351197.293	Radium-226	1	pCi/g
A1P2-INV-102-G	479796.669	1351146.901	Radium-226	0.9	pCi/g
A1P2-INV-103-2-G	479741.435	1350906.394	Radium-226	1.7	pCi/g
A1P2-INV-103-3-G	479744.029	1350990.063	Radium-226	1.7	pCi/g
A1P2-INV-103-4-G	479841.142	1350912.502	Radium-226	1.9	pCi/g
A1P2-INV-103-5-G	479849.541	1350979.992	Radium-226	1.9	pCi/g
A1P2-INV-103-G	479796.077	1350937.379	Radium-226	1.3	pCi/g
A1P2-INV-104-2-G	479965.341	1350983.733	Radium-226	2.1	pCi/g
A1P2-INV-104-3-G	480059.575	1350911.26	Radium-226	2	pCi/g
A1P2-INV-104-4-G	479943.451	1350908.921	Radium-226	2.1	pCi/g
A1P2-INV-104-5-G	480066.098	1350987.514	Radium-226	2.2	pCi/g
A1P2-INV-104-G	480004.36	1350937.821	Radium-226	1.2	pCi/g
A1P2-INV-105-2-G	480054.371	1351086.908	Radium-226	1.3	pCi/g
A1P2-INV-105-3-G	479946.057	1351081.543	Radium-226	1.2	pCi/g
A1P2-INV-105-4-G	480052.716	1351196.516	Radium-226	1.3	pCi/g
A1P2-INV-105-5-G	479952.569	1351203.087	Radium-226	1.2	pCi/g
A1P2-INV-105-G	480004.27	1351146.148	Radium-226	1.3	pCi/g
A1P2-INV-106-20-	479922.2372	1351407.431	Radium-226	1.6	pCi/g
A1P2-INV-106-21-	479957.5391	1351430.186	Radium-226	1.9	pCi/g
A1P2-INV-106-9-G	479959.5943	1351388.236	Radium-226	2.2	pCi/g
A1P2-INV-109-2-G	480255.409	1351769.202	Radium-226	0.9	pCi/g
A1P2-INV-109-3-G	480253.657	1351695.331	Radium-226	1.1	pCi/g
A1P2-INV-10-G	477055.833	1351065.398	Radium-226	1	pCi/g
A1P2-INV-110-2-G	480258.132	1351510.744	Radium-226	1	pCi/g
A1P2-INV-110-3-G	480253.46	1351604.977	Radium-226	1.1	pCi/g
A1P2-INV-111-28-	480252.2854	1351360.525	Radium-226	1.1	pCi/g
A1P2-INV-111-32-	480216.9835	1351337.77	Radium-226	1.2	pCi/g
A1P2-INV-111-40-	480250	1351319	Radium-226	1.1	pCi/g
A1P2-INV-111-41-	480220	1351287	Radium-226	1.2	pCi/g
A1P2-INV-111-42-	480180	1351319	Radium-226	1.2	pCi/g
A1P2-INV-111-43-	480181	1351280	Radium-226	1.3	pCi/g
A1P2-INV-1-11-G	476995.01	1351804.518	Radium-226	1.7	pCi/g
A1P2-INV-112-2-G	480254.679	1351087.745	Radium-226	1.1	pCi/g
A1P2-INV-112-3-G	480157.899	1351090.203	Radium-226	1.3	pCi/g
A1P2-INV-112-4-G	480162.32	1351184.983	Radium-226	1.3	pCi/g
A1P2-INV-112-5-G	480257.597	1351193.295	Radium-226	1	pCi/g

APPENDIX B-1
HPGe DATA

A1P2-INV-112-G	480212.348	1351146.579	Radium-226	1.3	pCi/g
A1P2-INV-1-12-G	477033.444	1351799.981	Radium-226	1.8	pCi/g
A1P2-INV-113-2-G	480159.335	1350945.07	Radium-226	1.7	pCi/g
A1P2-INV-113-3-G	480162.826	1351006.153	Radium-226	1.3	pCi/g
A1P2-INV-113-4-G	480263.467	1351004.081	Radium-226	1.2	pCi/g
A1P2-INV-113-G	480212.484	1350958.333	Radium-226	1.2	pCi/g
A1P2-INV-114-G	480420.545	1351054.985	Radium-226	1.1	pCi/g
A1P2-INV-115-2-G	480468.58	1351185.968	Radium-226	1	pCi/g
A1P2-INV-115-3-G	480369.534	1351096.317	Radium-226	1	pCi/g
A1P2-INV-115-4-G	480462.312	1351117.284	Radium-226	1	pCi/g
A1P2-INV-115-5-G	480350.407	1351198.603	Radium-226	1	pCi/g
A1P2-INV-115-G	480420.247	1351146.533	Radium-226	1	pCi/g
A1P2-INV-115-G	480420.247	1351146.533	Radium-226	1	pCi/g
A1P2-INV-115-G	480420.247	1351146.533	Radium-226	1	pCi/g
A1P2-INV-116-2-G	480468.376	1351299.865	Radium-226	1.1	pCi/g
A1P2-INV-116-3-G	480361.719	1351299.474	Radium-226	1.1	pCi/g
A1P2-INV-116-4-G	480469.469	1351404.257	Radium-226	1.1	pCi/g
A1P2-INV-116-5-G	480367.183	1351406.325	Radium-226	1.1	pCi/g
A1P2-INV-116-G	480420.03	1351355.284	Radium-226	1.1	pCi/g
A1P2-INV-116-G	480420.03	1351355.284	Radium-226	1	pCi/g
A1P2-INV-116-G	480420.03	1351355.284	Radium-226	0.9	pCi/g
A1P2-INV-117-2-G	480476.643	1351613.798	Radium-226	1.1	pCi/g
A1P2-INV-117-3-G	480370.386	1351621.836	Radium-226	0.9	pCi/g
A1P2-INV-117-4-G	480475.796	1351506.118	Radium-226	1.1	pCi/g
A1P2-INV-117-5-G	480377.439	1351511.382	Radium-226	1	pCi/g
A1P2-INV-117-G	480420.639	1351562.327	Radium-226	1.1	pCi/g
A1P2-INV-117-G	480420.639	1351562.327	Radium-226	1	pCi/g
A1P2-INV-118-2-G	480473.822	1351784.219	Radium-226	1.2	pCi/g
A1P2-INV-118-3-G	480487.415	1351704.606	Radium-226	1.3	pCi/g
A1P2-INV-118-4-G	480379.622	1351755.69	Radium-226	1.2	pCi/g
A1P2-INV-118-5-G	480369.956	1351688.945	Radium-226	1.2	pCi/g
A1P2-INV-118-G	480420.186	1351699.575	Radium-226	0.9	pCi/g
A1P2-INV-119-2-G	480663.585	1351785.28	Radium-226	0.9	pCi/g
A1P2-INV-119-3-G	480667.417	1351714.22	Radium-226	1.3	pCi/g
A1P2-INV-119-4-G	480569.696	1351711.045	Radium-226	1.3	pCi/g
A1P2-INV-119-5-G	480586.656	1351784.019	Radium-226	1.3	pCi/g
A1P2-INV-119-G	480628.686	1351699.344	Radium-226	1.1	pCi/g
A1P2-INV-11-G	477064.286	1351283.131	Radium-226	1.1	pCi/g
A1P2-INV-120-3-G	480566.509	1351497.927	Radium-226	1.6	pCi/g
A1P2-INV-120-4-G	480689.152	1351628.794	Radium-226	1.3	pCi/g
A1P2-INV-120-G	480628.367	1351563.267	Radium-226	1.1	pCi/g
A1P2-INV-120-G	480628.367	1351563.267	Radium-226	1.5	pCi/g

A1P2-INV-121-2-G	480679.013	1351401.353	Radium-226	1.5	pCi/g
A1P2-INV-121-4-G	480557.013	1351378.749	Radium-226	1.7	pCi/g
A1P2-INV-121-5-G	480677.331	1351340.454	Radium-226	1.6	pCi/g
A1P2-INV-121-G	480628.36	1351355.457	Radium-226	1.1	pCi/g
A1P2-INV-122-2-G	480572.39	1351212.681	Radium-226	1.8	pCi/g
A1P2-INV-122-3-G	480648.569	1351251.092	Radium-226	1.8	pCi/g
A1P2-INV-122-G	480628.255	1351208.733	Radium-226	1.1	pCi/g
A1P2-INV-128-3-G	480771.437	1351393.798	Radium-226	1.1	pCi/g
A1P2-INV-128-G	480836.216	1351440.228	Radium-226	1.1	pCi/g
A1P2-INV-129-2-G	480767.485	1351495.638	Radium-226	1.1	pCi/g
A1P2-INV-129-3-G	480879.39	1351520.628	Radium-226	0.8	pCi/g
A1P2-INV-129-4-G	480781.983	1351624.653	Radium-226	1.2	pCi/g
A1P2-INV-129-5-G	480870.747	1351610.577	Radium-226	1.2	pCi/g
A1P2-INV-129-G	480836.145	1351563.759	Radium-226	1.1	pCi/g
A1P2-INV-12-G	477076.743	1351491.463	Radium-226	1	pCi/g
A1P2-INV-1-2-G	476862.001	1351846.584	Radium-226	1	pCi/g
A1P2-INV-130-2-G	480784.293	1351707.189	Radium-226	1.4	pCi/g
A1P2-INV-130-3-G	480837.971	1351711.162	Radium-226	1.4	pCi/g
A1P2-INV-130-4-G	480835.613	1351775.758	Radium-226	1.3	pCi/g
A1P2-INV-130-5-G	480778.264	1351782.208	Radium-226	0.9	pCi/g
A1P2-INV-13-10-G	477181.136	1351785.382	Radium-226	1.6	pCi/g
A1P2-INV-13-11-G	477234.004	1351779.321	Radium-226	1.5	pCi/g
A1P2-INV-13-12-G	477047.377	1351764.905	Radium-226	0.9	pCi/g
A1P2-INV-13-12-G	477047.377	1351764.905	Radium-226	0.8	pCi/g
A1P2-INV-13-13-G	477085.795	1351763.368	Radium-226	0.9	pCi/g
A1P2-INV-13-14-G	477121.394	1351761.044	Radium-226	0.9	pCi/g
A1P2-INV-13-15-G	477157.924	1351758.905	Radium-226	0.9	pCi/g
A1P2-INV-13-16-G	477205.187	1351755.005	Radium-226	0.9	pCi/g
A1P2-INV-13-17-G	477250.597	1351750.605	Radium-226	0.9	pCi/g
A1P2-INV-13-2-G	477054.944	1351829.994	Radium-226	0.9	pCi/g
A1P2-INV-133-10-	477583.328	1351772.14	Radium-226	0.8	pCi/g
A1P2-INV-133-11-	477631.474	1351771.79	Radium-226	0.8	pCi/g
A1P2-INV-133-12-	477668.781	1351770.552	Radium-226	0.9	pCi/g
A1P2-INV-133-13-	477476.865	1351749.874	Radium-226	0.9	pCi/g
A1P2-INV-133-14-	477508.177	1351749.178	Radium-226	1	pCi/g
A1P2-INV-133-15-	477541.121	1351748.824	Radium-226	1	pCi/g
A1P2-INV-133-16-	477580.086	1351748.656	Radium-226	1	pCi/g
A1P2-INV-133-17-	477618.099	1351739.238	Radium-226	1	pCi/g
A1P2-INV-133-2-G	477494.138	1351800.021	Radium-226	1	pCi/g
A1P2-INV-133-3-G	477528.379	1351802.311	Radium-226	0.9	pCi/g
A1P2-INV-133-4-G	477565.848	1351801.22	Radium-226	0.9	pCi/g
A1P2-INV-133-5-G	477611.309	1351798.05	Radium-226	0.9	pCi/g

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A1P2-INV-133-6-G	477651.717	1351795.624	Radium-226	0.8	pCi/g
A1P2-INV-133-7-G	477481.472	1351773.225	Radium-226	0.9	pCi/g
A1P2-INV-133-8-G	477513.058	1351771.777	Radium-226	1.7	pCi/g
A1P2-INV-133-G	477458.157	1351806.325	Radium-226	0.9	pCi/g
A1P2-INV-13-3-G	477089.574	1351828.295	Radium-226	0.9	pCi/g
A1P2-INV-134-10-	477844.195	1351769.567	Radium-226	0.9	pCi/g
A1P2-INV-134-2-G	477722.889	1351794.456	Radium-226	1	pCi/g
A1P2-INV-134-3-G	477765.003	1351790.54	Radium-226	1	pCi/g
A1P2-INV-134-4-G	477796.399	1351788.156	Radium-226	1	pCi/g
A1P2-INV-134-5-G	477830.327	1351786.268	Radium-226	1	pCi/g
A1P2-INV-134-6-G	477702.733	1351768.838	Radium-226	0.9	pCi/g
A1P2-INV-134-7-G	477745.701	1351770.256	Radium-226	0.9	pCi/g
A1P2-INV-134-8-G	477780.021	1351769.506	Radium-226	0.9	pCi/g
A1P2-INV-134-9-G	477811.469	1351768.686	Radium-226	0.8	pCi/g
A1P2-INV-134-G	477686.884	1351794.985	Radium-226	1	pCi/g
A1P2-INV-13-4-G	477129.629	1351825.799	Radium-226	0.9	pCi/g
A1P2-INV-135-10-	478043.493	1351760.661	Radium-226	0.9	pCi/g
A1P2-INV-135-2-G	477908.143	1351784.73	Radium-226	1.1	pCi/g
A1P2-INV-135-3	477943.545	1351781.725	Radium-226	1	pCi/g
A1P2-INV-135-4-G	477983.598	1351780.465	Radium-226	1	pCi/g
A1P2-INV-135-5-G	478020.888	1351778.46	Radium-226	0.9	pCi/g
A1P2-INV-135-6-G	477884.958	1351761.739	Radium-226	0.9	pCi/g
A1P2-INV-135-7-G	477927.352	1351764.339	Radium-226	0.8	pCi/g
A1P2-INV-135-7-G	477927.352	1351764.339	Radium-226	1	pCi/g
A1P2-INV-135-8-G	477966.486	1351763.306	Radium-226	0.9	pCi/g
A1P2-INV-135-9-G	478003.395	1351762.421	Radium-226	1	pCi/g
A1P2-INV-135-G	477864.092	1351788.023	Radium-226	1	pCi/g
A1P2-INV-13-5-G	477167.316	1351821.617	Radium-226	0.9	pCi/g
A1P2-INV-136-10	478231.964	1351758.339	Radium-226	1.1	pCi/g
A1P2-INV-136-2-G	478105.127	1351776.276	Radium-226	0.9	pCi/g
A1P2-INV-136-3-G	478143.626	1351777.493	Radium-226	0.9	pCi/g
A1P2-INV-136-4-G	478182.029	1351779.746	Radium-226	0.9	pCi/g
A1P2-INV-136-5-G	478214.901	1351780.541	Radium-226	1	pCi/g
A1P2-INV-136-6-G	478079.49	1351755.396	Radium-226	0.8	pCi/g
A1P2-INV-136-8-G	478164.426	1351756.384	Radium-226	1	pCi/g
A1P2-INV-136-9-G	478195.033	1351756.563	Radium-226	1.1	pCi/g
A1P2-INV-136-G	478062.844	1351775.307	Radium-226	0.9	pCi/g
A1P2-INV-13-6-G	477213.67	1351816.134	Radium-226	0.9	pCi/g
A1P2-INV-137-G	478263.171	1349814.048	Radium-226	1	pCi/g
A1P2-INV-137-G	478263.171	1349814.048	Radium-226	1	pCi/g
A1P2-INV-13-7-G	477068.687	1351793.82	Radium-226	1.8	pCi/g
A1P2-INV-138-G	478392.042	1349782.583	Radium-226	0.9	pCi/g

A1P2-INV-13-8-G	477106.338	1351792.46	Radium-226	1.8	pCi/g
A1P2-INV-139-G	478547.248	1349756.538	Radium-226	1	pCi/g
A1P2-INV-13-9-G	477142.385	1351788.667	Radium-226	1.8	pCi/g
A1P2-INV-13-G	477082.73	1351772.31	Radium-226	1	pCi/g
A1P2-INV-1-3-G	476894.655	1351845.758	Radium-226	1	pCi/g
A1P2-INV-140-G	478721.19	1349779.232	Radium-226	1.1	pCi/g
A1P2-INV-14-10-G	477394.779	1351774.733	Radium-226	1	pCi/g
A1P2-INV-14-11-G	477430.566	1351771.298	Radium-226	1	pCi/g
A1P2-INV-14-12-G	477297.918	1351746.772	Radium-226	1	pCi/g
A1P2-INV-14-13-G	477331.784	1351744.05	Radium-226	0.9	pCi/g
A1P2-INV-14-14-G	477374.577	1351741.078	Radium-226	1	pCi/g
A1P2-INV-14-15-G	477413.126	1351738.019	Radium-226	1.1	pCi/g
A1P2-INV-14-16-G	477448.929	1351735.001	Radium-226	0.9	pCi/g
A1P2-INV-14-2-G	477259.399	1351816.551	Radium-226	0.9	pCi/g
A1P2-INV-14-3-G	477303.995	1351815.161	Radium-226	0.9	pCi/g
A1P2-INV-14-4-G	477340.901	1351813.502	Radium-226	0.9	pCi/g
A1P2-INV-14-5-G	477383.635	1351810.829	Radium-226	0.9	pCi/g
A1P2-INV-14-6-G	477425.851	1351807.184	Radium-226	1	pCi/g
A1P2-INV-14-7-G	477271.412	1351776.096	Radium-226	1	pCi/g
A1P2-INV-14-8-G	477315.502	1351777.712	Radium-226	1	pCi/g
A1P2-INV-14-9-G	477358.977	1351775.692	Radium-226	1	pCi/g
A1P2-INV-14-G	477290.735	1351772.31	Radium-226	1.1	pCi/g
A1P2-INV-1-4-G	476934.145	1351841.969	Radium-226	0.9	pCi/g
A1P2-INV-15-G	477291.69	1351536.483	Radium-226	1	pCi/g
A1P2-INV-1-5-G	476981.829	1351835.025	Radium-226	0.9	pCi/g
A1P2-INV-1-5-G	476981.829	1351835.025	Radium-226	0.9	pCi/g
A1P2-INV-16-G	477329.124	1351326.408	Radium-226	1.5	pCi/g
A1P2-INV-1-6-G	477017.829	1351832.08	Radium-226	0.9	pCi/g
A1P2-INV-17-G	477320.536	1351117.234	Radium-226	1.5	pCi/g
A1P2-INV-1-7-G	476844.02	1351825.489	Radium-226	1	pCi/g
A1P2-INV-18-G	477311.299	1350896.917	Radium-226	1.5	pCi/g
A1P2-INV-1-8-G	476875.986	1351822.365	Radium-226	2	pCi/g
A1P2-INV-19-G	477292.221	1350708.619	Radium-226	1.6	pCi/g
A1P2-INV-1-9-G	476912.497	1351817.414	Radium-226	1.8	pCi/g
A1P2-INV-1-9-G	476912.497	1351817.414	Radium-226	1.9	pCi/g
A1P2-INV-1-G	476857.791	1351777.248	Radium-226	1.2	pCi/g
A1P2-INV-20-G	477284.524	1350492.934	Radium-226	1.5	pCi/g
A1P2-INV-21-G	477489.063	1350468.915	Radium-226	1.4	pCi/g
A1P2-INV-22-G	477501.904	1350695.369	Radium-226	1.3	pCi/g
A1P2-INV-23-G	477490.651	1350882.652	Radium-226	1	pCi/g
A1P2-INV-24-G	477497.289	1351122.982	Radium-226	1	pCi/g
A1P2-INV-25-G	477517.579	1351331.148	Radium-226	1	pCi/g

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A1P2-INV-26-G	477512.968	1351526.705	Radium-226	1	pCi/g
A1P2-INV-27-G	477697.382	1351552.022	Radium-226	1	pCi/g
A1P2-INV-28-G	477677.577	1351331.386	Radium-226	1	pCi/g
A1P2-INV-29-G	477672.572	1351157.092	Radium-226	2.2	pCi/g
A1P2-INV-2-G	476938.598	1351529.296	Radium-226	1.1	pCi/g
A1P2-INV-30-G	477657.343	1350880.878	Radium-226	2	pCi/g
A1P2-INV-31-G	477654.116	1350669.858	Radium-226	2.2	pCi/g
A1P2-INV-32-G	477669.96	1350493.814	Radium-226	2.3	pCi/g
A1P2-INV-33-2-G	477751.57	1350261.57	Radium-226	1	pCi/g
A1P2-INV-33-G	477674.317	1350315.977	Radium-226	2.1	pCi/g
A1P2-INV-34-G	477860.998	1350279.91	Radium-226	1	pCi/g
A1P2-INV-35-G	477880.983	1350540.107	Radium-226	1.1	pCi/g
A1P2-INV-36-G	477885.139	1350667.188	Radium-226	1	pCi/g
A1P2-INV-37-G	477872.218	1350872.978	Radium-226	1	pCi/g
A1P2-INV-38-G	477918.741	1351151.547	Radium-226	1	pCi/g
A1P2-INV-39-G	477887.701	1351356.568	Radium-226	1	pCi/g
A1P2-INV-3-G	476927.261	1351355.551	Radium-226	1.2	pCi/g
A1P2-INV-40-G	477892.252	1351574.243	Radium-226	1.1	pCi/g
A1P2-INV-41-G	478126.016	1351574.744	Radium-226	1.3	pCi/g
A1P2-INV-41-G	478126.016	1351574.744	Radium-226	1.2	pCi/g
A1P2-INV-42-G	478125.003	1351363.032	Radium-226	1.2	pCi/g
A1P2-INV-43-G	478117.397	1351161.298	Radium-226	1	pCi/g
A1P2-INV-44-G	478118.287	1350946.606	Radium-226	1.1	pCi/g
A1P2-INV-45-G	478126.071	1350729.546	Radium-226	0.9	pCi/g
A1P2-INV-46-G	478126.164	1350519.073	Radium-226	1	pCi/g
A1P2-INV-47-G	478126.321	1350310.369	Radium-226	1.1	pCi/g
A1P2-INV-48-G	478126.065	1350200.568	Radium-226	1	pCi/g
A1P2-INV-49-G	478335.161	1350101.803	Radium-226	1	pCi/g
A1P2-INV-4-G	476842.57	1351185.447	Radium-226	1.1	pCi/g
A1P2-INV-50-G	478335.491	1350310.214	Radium-226	1.1	pCi/g
A1P2-INV-51-G	478335.459	1350519.13	Radium-226	1.1	pCi/g
A1P2-INV-52-G	478335.868	1350729.541	Radium-226	1	pCi/g
A1P2-INV-53-G	478335.891	1350937.658	Radium-226	1	pCi/g
A1P2-INV-54-G	478335.105	1351146.613	Radium-226	1	pCi/g
A1P2-INV-55-G	478335.066	1351355.269	Radium-226	1.1	pCi/g
A1P2-INV-56-G	478335.626	1351564.4	Radium-226	1.2	pCi/g
A1P2-INV-57-2-G	478254.725	1351780.969	Radium-226	0.9	pCi/g
A1P2-INV-57-3-G	478294.255	1351783.225	Radium-226	1.2	pCi/g
A1P2-INV-57-G	478335.163	1351699.12	Radium-226	1	pCi/g
A1P2-INV-58-G	478544.636	1351698.732	Radium-226	1.1	pCi/g
A1P2-INV-59-G	478544.146	1351564.59	Radium-226	1.1	pCi/g
A1P2-INV-5-G	476849.2	1350949.788	Radium-226	1.2	pCi/g

A1P2-INV-60-G	478544.837	1351355.76	Radium-226	1.1	pCi/g
A1P2-INV-61-G	478544.715	1351146.107	Radium-226	1	pCi/g
A1P2-INV-62-G	478544.054	1350937.473	Radium-226	1	pCi/g
A1P2-INV-63-G	478544.29	1350729.666	Radium-226	1.1	pCi/g
A1P2-INV-64-G	478544.637	1350519.372	Radium-226	1.1	pCi/g
A1P2-INV-65-G	478544.53	1350310.914	Radium-226	1.2	pCi/g
A1P2-INV-66-G	478547.58	1350105.01	Radium-226	0.9	pCi/g
A1P2-INV-67-G	478632.709	1350081.094	Radium-226	1.1	pCi/g
A1P2-INV-68-G	478753.125	1350310.828	Radium-226	1	pCi/g
A1P2-INV-69-G	478752.484	1350519.547	Radium-226	1.1	pCi/g
A1P2-INV-6-G	476828.706	1350645.206	Radium-226	1.1	pCi/g
A1P2-INV-70-G	478752.188	1350720.026	Radium-226	1	pCi/g
A1P2-INV-71-G	478752.467	1350937.041	Radium-226	1.1	pCi/g
A1P2-INV-72-G	478752.166	1351146.698	Radium-226	1.1	pCi/g
A1P2-INV-7-2-G	476785.77	1351045.92	Radium-226	0.7	pCi/g
A1P2-INV-73-G	478752.147	1351355.494	Radium-226	1.4	pCi/g
A1P2-INV-7-3-G	476716.06	1350699.81	Radium-226	0.9	pCi/g
A1P2-INV-74-G	478752.54	1351564.545	Radium-226	1.2	pCi/g
A1P2-INV-7-4-G	476806.42	1350584.56	Radium-226	0.9	pCi/g
A1P2-INV-75-G	478751.92	1351699.057	Radium-226	1.1	pCi/g
A1P2-INV-76-G	478961.563	1351699.476	Radium-226	1.2	pCi/g
A1P2-INV-77-G	478961.195	1351564.309	Radium-226	1.4	pCi/g
A1P2-INV-78-G	478961.543	1351355.679	Radium-226	1.4	pCi/g
A1P2-INV-79-G	478961.85	1351146.783	Radium-226	1.4	pCi/g
A1P2-INV-7-G	476705.012	1350712.945	Radium-226	1	pCi/g
A1P2-INV-80-G	478961.038	1350937.187	Radium-226	1.2	pCi/g
A1P2-INV-81-G	478960.925	1350732.619	Radium-226	1.1	pCi/g
A1P2-INV-82-G	478961.392	1350519.063	Radium-226	1.1	pCi/g
A1P2-INV-83-G	479170.207	1350729.574	Radium-226	1	pCi/g
A1P2-INV-84-G	479170.486	1350937.885	Radium-226	0.9	pCi/g
A1P2-INV-85-G	479170.588	1351146.975	Radium-226	1	pCi/g
A1P2-INV-86-G	479170.341	1351355.519	Radium-226	1	pCi/g
A1P2-INV-87-G	479170.254	1351563.332	Radium-226	1	pCi/g
A1P2-INV-88-G	479170.776	1351716.309	Radium-226	1.1	pCi/g
A1P2-INV-89-G	479379.064	1351699.374	Radium-226	0.9	pCi/g
A1P2-INV-8-G	477034.896	1350657.89	Radium-226	1	pCi/g
A1P2-INV-90-G	479379.033	1351564.107	Radium-226	1	pCi/g
A1P2-INV-91-G	479379.079	1351355.098	Radium-226	1	pCi/g
A1P2-INV-92-G	479379.075	1351146.076	Radium-226	1.1	pCi/g
A1P2-INV-93-G	479379.269	1350938.509	Radium-226	1	pCi/g
A1P2-INV-94-2-G	479536.014	1350989.625	Radium-226	1.1	pCi/g
A1P2-INV-94-3-G	479534.675	1350903.69	Radium-226	1	pCi/g

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A1P2-INV-94-4-G	479638.598	1350905.352	Radium-226	1.1	pCi/g
A1P2-INV-94-5-G	479638.29	1350988.193	Radium-226	1.1	pCi/g
A1P2-INV-94-G	479587.417	1350938.588	Radium-226	1.1	pCi/g
A1P2-INV-95-2-G	479537.818	1351199.496	Radium-226	1	pCi/g
A1P2-INV-95-3-G	479533.824	1351092.146	Radium-226	1	pCi/g
A1P2-INV-95-4-G	479638.73	1351092.875	Radium-226	1	pCi/g
A1P2-INV-95-5-G	479640.567	1351197.316	Radium-226	1	pCi/g
A1P2-INV-95-G	479587.921	1351146.806	Radium-226	0.9	pCi/g
A1P2-INV-96-G	479587.292	1351355.576	Radium-226	1.1	pCi/g
A1P2-INV-97-G	479588.003	1351564.215	Radium-226	0.9	pCi/g
A1P2-INV-98-G	479587.254	1351699.047	Radium-226	1	pCi/g
A1P2-INV-99-2-G	479736.86	1351777.34	Radium-226	0.9	pCi/g
A1P2-INV-99-3-G	479740.23	1351691.21	Radium-226	0.9	pCi/g
A1P2-INV-99-4-G	479833.07	1351773.98	Radium-226	1	pCi/g
A1P2-INV-99-5-G	479839.45	1351690.84	Radium-226	1	pCi/g
A1P2-INV-99-G	479797.947	1351709.831	Radium-226	1.2	pCi/g
A1P2-INV-9-G	477048.504	1350858.01	Radium-226	1.1	pCi/g
A1P2-INV-100-G	479812.847	1351553.081	Thorium-232	0.3	pCi/g
A1P2-INV-101-G	479796.107	1351355.406	Thorium-232	0.7	pCi/g
A1P2-INV-102-2-G	479745.15	1351200.726	Thorium-232	1	pCi/g
A1P2-INV-102-3-G	479744.516	1351093.366	Thorium-232	1	pCi/g
A1P2-INV-102-4-G	479850.216	1351094.039	Thorium-232	1	pCi/g
A1P2-INV-102-5-G	479848.754	1351197.293	Thorium-232	1	pCi/g
A1P2-INV-102-G	479796.669	1351146.901	Thorium-232	0.9	pCi/g
A1P2-INV-103-2-G	479741.435	1350906.394	Thorium-232	1	pCi/g
A1P2-INV-103-3-G	479744.029	1350990.063	Thorium-232	1	pCi/g
A1P2-INV-103-4-G	479841.142	1350912.502	Thorium-232	1.1	pCi/g
A1P2-INV-103-5-G	479849.541	1350979.992	Thorium-232	1	pCi/g
A1P2-INV-103-G	479796.077	1350937.379	Thorium-232	1	pCi/g
A1P2-INV-104-2-G	479965.341	1350983.733	Thorium-232	1	pCi/g
A1P2-INV-104-3-G	480059.575	1350911.26	Thorium-232	1.1	pCi/g
A1P2-INV-104-4-G	479943.451	1350908.921	Thorium-232	1	pCi/g
A1P2-INV-104-5-G	480066.098	1350987.514	Thorium-232	1.1	pCi/g
A1P2-INV-104-G	480004.36	1350937.821	Thorium-232	1.1	pCi/g
A1P2-INV-105-2-G	480054.371	1351086.908	Thorium-232	1.1	pCi/g
A1P2-INV-105-3-G	479946.057	1351081.543	Thorium-232	0.9	pCi/g
A1P2-INV-105-4-G	480052.716	1351196.516	Thorium-232	1.1	pCi/g
A1P2-INV-105-5-G	479952.569	1351203.087	Thorium-232	1	pCi/g
A1P2-INV-105-G	480004.27	1351146.148	Thorium-232	1	pCi/g
A1P2-INV-106-20-	479922.2372	1351407.431	Thorium-232	0.7	pCi/g
A1P2-INV-106-21-	479957.5391	1351430.186	Thorium-232	1.1	pCi/g
A1P2-INV-106-9-G	479959.5943	1351388.236	Thorium-232	1	pCi/g

A1P2-INV-109-2-G	480255.409	1351769.202	Thorium-232	0.7	pCi/g
A1P2-INV-109-3-G	480253.657	1351695.331	Thorium-232	1.3	pCi/g
A1P2-INV-10-G	477055.833	1351065.398	Thorium-232	0.9	pCi/g
A1P2-INV-110-2-G	480258.132	1351510.744	Thorium-232	1.1	pCi/g
A1P2-INV-110-3-G	480253.46	1351604.977	Thorium-232	1.1	pCi/g
A1P2-INV-111-28-	480252.2854	1351360.525	Thorium-232	1	pCi/g
A1P2-INV-111-32-	480216.9835	1351337.77	Thorium-232	1.1	pCi/g
A1P2-INV-111-40-	480250	1351319	Thorium-232	0.9	pCi/g
A1P2-INV-111-41-	480220	1351287	Thorium-232	0.9	pCi/g
A1P2-INV-111-42-	480180	1351319	Thorium-232	1	pCi/g
A1P2-INV-111-43-	480181	1351280	Thorium-232	1	pCi/g
A1P2-INV-1-11-G	476995.01	1351804.518	Thorium-232	0.9	pCi/g
A1P2-INV-112-2-G	480254.679	1351087.745	Thorium-232	1.2	pCi/g
A1P2-INV-112-3-G	480157.899	1351090.203	Thorium-232	1.1	pCi/g
A1P2-INV-112-4-G	480162.32	1351184.983	Thorium-232	1.1	pCi/g
A1P2-INV-112-5-G	480257.597	1351193.295	Thorium-232	2	pCi/g
A1P2-INV-112-G	480212.348	1351146.579	Thorium-232	1.1	pCi/g
A1P2-INV-1-12-G	477033.444	1351799.981	Thorium-232	0.9	pCi/g
A1P2-INV-113-2-G	480159.335	1350945.07	Thorium-232	1.1	pCi/g
A1P2-INV-113-3-G	480162.826	1351006.153	Thorium-232	1.1	pCi/g
A1P2-INV-113-4-G	480263.467	1351004.081	Thorium-232	1	pCi/g
A1P2-INV-113-G	480212.484	1350958.333	Thorium-232	1.1	pCi/g
A1P2-INV-114-G	480420.545	1351054.985	Thorium-232	1.2	pCi/g
A1P2-INV-115-2-G	480468.58	1351185.968	Thorium-232	1.1	pCi/g
A1P2-INV-115-3-G	480369.534	1351096.317	Thorium-232	1.1	pCi/g
A1P2-INV-115-4-G	480462.312	1351117.284	Thorium-232	1.1	pCi/g
A1P2-INV-115-5-G	480350.407	1351198.603	Thorium-232	1.1	pCi/g
A1P2-INV-115-G	480420.247	1351146.533	Thorium-232	1	pCi/g
A1P2-INV-115-G	480420.247	1351146.533	Thorium-232	1.1	pCi/g
A1P2-INV-115-G	480420.247	1351146.533	Thorium-232	1.1	pCi/g
A1P2-INV-116-2-G	480468.376	1351299.865	Thorium-232	1.1	pCi/g
A1P2-INV-116-3-G	480361.719	1351299.474	Thorium-232	1.1	pCi/g
A1P2-INV-116-4-G	480469.469	1351404.257	Thorium-232	1.3	pCi/g
A1P2-INV-116-5-G	480367.183	1351406.325	Thorium-232	1.2	pCi/g
A1P2-INV-116-G	480420.03	1351355.284	Thorium-232	1.2	pCi/g
A1P2-INV-116-G	480420.03	1351355.284	Thorium-232	1.2	pCi/g
A1P2-INV-116-G	480420.03	1351355.284	Thorium-232	1.1	pCi/g
A1P2-INV-117-2-G	480476.643	1351613.798	Thorium-232	1.3	pCi/g
A1P2-INV-117-3-G	480370.386	1351621.836	Thorium-232	0.8	pCi/g
A1P2-INV-117-4-G	480475.796	1351506.118	Thorium-232	1.2	pCi/g
A1P2-INV-117-5-G	480377.439	1351511.382	Thorium-232	1.1	pCi/g
A1P2-INV-117-G	480420.639	1351562.327	Thorium-232	1.3	pCi/g

A1P2-INV-117-G	480420.639	1351562.327	Thorium-232	1.2	pCi/g
A1P2-INV-118-2-G	480473.822	1351784.219	Thorium-232	1.1	pCi/g
A1P2-INV-118-3-G	480487.415	1351704.606	Thorium-232	1.1	pCi/g
A1P2-INV-118-4-G	480379.622	1351755.69	Thorium-232	1.1	pCi/g
A1P2-INV-118-5-G	480369.956	1351688.945	Thorium-232	1.1	pCi/g
A1P2-INV-118-G	480420.186	1351699.575	Thorium-232	0.8	pCi/g
A1P2-INV-119-2-G	480663.585	1351785.28	Thorium-232	0.4	pCi/g
A1P2-INV-119-3-G	480667.417	1351714.22	Thorium-232	1.1	pCi/g
A1P2-INV-119-4-G	480569.696	1351711.045	Thorium-232	1.2	pCi/g
A1P2-INV-119-5-G	480586.656	1351784.019	Thorium-232	1.2	pCi/g
A1P2-INV-119-G	480628.686	1351699.344	Thorium-232	1.2	pCi/g
A1P2-INV-11-G	477064.286	1351283.131	Thorium-232	0.9	pCi/g
A1P2-INV-120-3-G	480566.509	1351497.927	Thorium-232	1.2	pCi/g
A1P2-INV-120-4-G	480689.152	1351628.794	Thorium-232	1.1	pCi/g
A1P2-INV-120-G	480628.367	1351563.267	Thorium-232	1.2	pCi/g
A1P2-INV-120-G	480628.367	1351563.267	Thorium-232	1.2	pCi/g
A1P2-INV-121-2-G	480679.013	1351401.353	Thorium-232	1.2	pCi/g
A1P2-INV-121-4-G	480557.013	1351378.749	Thorium-232	1.1	pCi/g
A1P2-INV-121-5-G	480677.331	1351340.454	Thorium-232	1.2	pCi/g
A1P2-INV-121-G	480628.36	1351355.457	Thorium-232	1.1	pCi/g
A1P2-INV-122-2-G	480572.39	1351212.681	Thorium-232	1.1	pCi/g
A1P2-INV-122-3-G	480648.569	1351251.092	Thorium-232	1.1	pCi/g
A1P2-INV-122-G	480628.255	1351208.733	Thorium-232	1.1	pCi/g
A1P2-INV-128-3-G	480771.437	1351393.798	Thorium-232	1.2	pCi/g
A1P2-INV-128-G	480836.216	1351440.228	Thorium-232	1.2	pCi/g
A1P2-INV-129-2-G	480767.485	1351495.638	Thorium-232	1.1	pCi/g
A1P2-INV-129-3-G	480879.39	1351520.628	Thorium-232	0.8	pCi/g
A1P2-INV-129-4-G	480781.983	1351624.653	Thorium-232	1.2	pCi/g
A1P2-INV-129-5-G	480870.747	1351610.577	Thorium-232	1.2	pCi/g
A1P2-INV-129-G	480836.145	1351563.759	Thorium-232	1.1	pCi/g
A1P2-INV-12-G	477076.743	1351491.463	Thorium-232	0.9	pCi/g
A1P2-INV-1-2-G	476862.001	1351846.584	Thorium-232	0.9	pCi/g
A1P2-INV-130-2-G	480784.293	1351707.189	Thorium-232	1.2	pCi/g
A1P2-INV-130-3-G	480837.971	1351711.162	Thorium-232	1.2	pCi/g
A1P2-INV-130-4-G	480835.613	1351775.758	Thorium-232	1.1	pCi/g
A1P2-INV-130-5-G	480778.264	1351782.208	Thorium-232	0.4	pCi/g
A1P2-INV-13-10-G	477181.136	1351785.382	Thorium-232	1	pCi/g
A1P2-INV-13-11-G	477234.004	1351779.321	Thorium-232	0.9	pCi/g
A1P2-INV-13-12-G	477047.377	1351764.905	Thorium-232	0.8	pCi/g
A1P2-INV-13-12-G	477047.377	1351764.905	Thorium-232	0.8	pCi/g
A1P2-INV-13-13-G	477085.795	1351763.368	Thorium-232	1	pCi/g
A1P2-INV-13-14-G	477121.394	1351761.044	Thorium-232	0.9	pCi/g

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A1P2-INV-13-15-G	477157.924	1351758.905	Thorium-232	0.9	pCi/g
A1P2-INV-13-16-G	477205.187	1351755.005	Thorium-232	0.8	pCi/g
A1P2-INV-13-17-G	477250.597	1351750.605	Thorium-232	0.8	pCi/g
A1P2-INV-13-2-G	477054.944	1351829.994	Thorium-232	0.9	pCi/g
A1P2-INV-133-10-	477583.328	1351772.14	Thorium-232	0.8	pCi/g
A1P2-INV-133-11-	477631.474	1351771.79	Thorium-232	0.8	pCi/g
A1P2-INV-133-12-	477668.781	1351770.552	Thorium-232	0.7	pCi/g
A1P2-INV-133-13-	477476.865	1351749.874	Thorium-232	0.5	pCi/g
A1P2-INV-133-14-	477508.177	1351749.178	Thorium-232	0.6	pCi/g
A1P2-INV-133-15-	477541.121	1351748.824	Thorium-232	0.6	pCi/g
A1P2-INV-133-16-	477580.086	1351748.656	Thorium-232	0.7	pCi/g
A1P2-INV-133-17-	477618.099	1351739.238	Thorium-232	0.5	pCi/g
A1P2-INV-133-2-G	477494.138	1351800.021	Thorium-232	0.9	pCi/g
A1P2-INV-133-3-G	477528.379	1351802.311	Thorium-232	0.8	pCi/g
A1P2-INV-133-4-G	477565.848	1351801.22	Thorium-232	0.7	pCi/g
A1P2-INV-133-5-G	477611.309	1351798.05	Thorium-232	0.7	pCi/g
A1P2-INV-133-6-G	477651.717	1351795.624	Thorium-232	0.7	pCi/g
A1P2-INV-133-7-G	477481.472	1351773.225	Thorium-232	0.7	pCi/g
A1P2-INV-133-8-G	477513.058	1351771.777	Thorium-232	0.8	pCi/g
A1P2-INV-133-G	477458.157	1351806.325	Thorium-232	0.8	pCi/g
A1P2-INV-13-3-G	477089.574	1351828.295	Thorium-232	0.9	pCi/g
A1P2-INV-134-10-	477844.195	1351769.567	Thorium-232	0.8	pCi/g
A1P2-INV-134-2-G	477722.889	1351794.456	Thorium-232	0.8	pCi/g
A1P2-INV-134-3-G	477765.003	1351790.54	Thorium-232	0.8	pCi/g
A1P2-INV-134-4-G	477796.399	1351788.156	Thorium-232	0.9	pCi/g
A1P2-INV-134-5-G	477830.327	1351786.268	Thorium-232	0.8	pCi/g
A1P2-INV-134-6-G	477702.733	1351768.838	Thorium-232	0.8	pCi/g
A1P2-INV-134-7-G	477745.701	1351770.256	Thorium-232	0.9	pCi/g
A1P2-INV-134-8-G	477780.021	1351769.506	Thorium-232	0.9	pCi/g
A1P2-INV-134-9-G	477811.469	1351768.686	Thorium-232	0.9	pCi/g
A1P2-INV-134-G	477686.884	1351794.985	Thorium-232	0.8	pCi/g
A1P2-INV-13-4-G	477129.629	1351825.799	Thorium-232	0.9	pCi/g
A1P2-INV-135-10-	478043.493	1351760.661	Thorium-232	0.8	pCi/g
A1P2-INV-135-2-G	477908.143	1351784.73	Thorium-232	0.9	pCi/g
A1P2-INV-135-3	477943.545	1351781.725	Thorium-232	0.9	pCi/g
A1P2-INV-135-4-G	477983.598	1351780.465	Thorium-232	0.8	pCi/g
A1P2-INV-135-5-G	478020.888	1351778.46	Thorium-232	0.8	pCi/g
A1P2-INV-135-6-G	477884.958	1351761.739	Thorium-232	0.9	pCi/g
A1P2-INV-135-7-G	477927.352	1351764.339	Thorium-232	0.9	pCi/g
A1P2-INV-135-7-G	477927.352	1351764.339	Thorium-232	0.9	pCi/g
A1P2-INV-135-8-G	477966.486	1351763.306	Thorium-232	0.9	pCi/g
A1P2-INV-135-9-G	478003.395	1351762.421	Thorium-232	0.8	pCi/g

A1P2-INV-135-G	477864.092	1351788.023	Thorium-232	0.9	pCi/g
A1P2-INV-13-5-G	477167.316	1351821.617	Thorium-232	0.9	pCi/g
A1P2-INV-136-10	478231.964	1351758.339	Thorium-232	0.8	pCi/g
A1P2-INV-136-2-G	478105.127	1351776.276	Thorium-232	0.8	pCi/g
A1P2-INV-136-3-G	478143.626	1351777.493	Thorium-232	0.9	pCi/g
A1P2-INV-136-4-G	478182.029	1351779.746	Thorium-232	0.8	pCi/g
A1P2-INV-136-5-G	478214.901	1351780.541	Thorium-232	0.9	pCi/g
A1P2-INV-136-6-G	478079.49	1351755.396	Thorium-232	0.8	pCi/g
A1P2-INV-136-8-G	478164.426	1351756.384	Thorium-232	0.8	pCi/g
A1P2-INV-136-9-G	478195.033	1351756.563	Thorium-232	0.8	pCi/g
A1P2-INV-136-G	478062.844	1351775.307	Thorium-232	0.8	pCi/g
A1P2-INV-13-6-G	477213.67	1351816.134	Thorium-232	0.9	pCi/g
A1P2-INV-137-G	478263.171	1349814.048	Thorium-232	1	pCi/g
A1P2-INV-137-G	478263.171	1349814.048	Thorium-232	1	pCi/g
A1P2-INV-13-7-G	477068.687	1351793.82	Thorium-232	0.9	pCi/g
A1P2-INV-138-G	478392.042	1349782.583	Thorium-232	1.1	pCi/g
A1P2-INV-13-8-G	477106.338	1351792.46	Thorium-232	1	pCi/g
A1P2-INV-139-G	478547.248	1349756.538	Thorium-232	0.9	pCi/g
A1P2-INV-13-9-G	477142.385	1351788.667	Thorium-232	1	pCi/g
A1P2-INV-13-G	477082.73	1351772.31	Thorium-232	0.9	pCi/g
A1P2-INV-1-3-G	476894.655	1351845.758	Thorium-232	0.9	pCi/g
A1P2-INV-140-G	478721.19	1349779.232	Thorium-232	1	pCi/g
A1P2-INV-14-10-G	477394.779	1351774.733	Thorium-232	1	pCi/g
A1P2-INV-14-11-G	477430.566	1351771.298	Thorium-232	0.9	pCi/g
A1P2-INV-14-12-G	477297.918	1351746.772	Thorium-232	0.9	pCi/g
A1P2-INV-14-13-G	477331.784	1351744.05	Thorium-232	0.9	pCi/g
A1P2-INV-14-14-G	477374.577	1351741.078	Thorium-232	0.8	pCi/g
A1P2-INV-14-15-G	477413.126	1351738.019	Thorium-232	0.7	pCi/g
A1P2-INV-14-16-G	477448.929	1351735.001	Thorium-232	0.7	pCi/g
A1P2-INV-14-2-G	477259.399	1351816.551	Thorium-232	0.8	pCi/g
A1P2-INV-14-3-G	477303.995	1351815.161	Thorium-232	0.9	pCi/g
A1P2-INV-14-4-G	477340.901	1351813.502	Thorium-232	0.8	pCi/g
A1P2-INV-14-5-G	477383.635	1351810.829	Thorium-232	0.8	pCi/g
A1P2-INV-14-6-G	477425.851	1351807.184	Thorium-232	0.9	pCi/g
A1P2-INV-14-7-G	477271.412	1351776.096	Thorium-232	0.9	pCi/g
A1P2-INV-14-8-G	477315.502	1351777.712	Thorium-232	0.9	pCi/g
A1P2-INV-14-9-G	477358.977	1351775.692	Thorium-232	1	pCi/g
A1P2-INV-14-G	477290.735	1351772.31	Thorium-232	1	pCi/g
A1P2-INV-1-4-G	476934.145	1351841.969	Thorium-232	0.8	pCi/g
A1P2-INV-15-G	477291.69	1351536.483	Thorium-232	0.9	pCi/g
A1P2-INV-1-5-G	476981.829	1351835.025	Thorium-232	0.9	pCi/g
A1P2-INV-1-5-G	476981.829	1351835.025	Thorium-232	0.9	pCi/g

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A1P2-INV-16-G	477329.124	1351326.408	Thorium-232	0.8	pCi/g
A1P2-INV-1-6-G	477017.829	1351832.08	Thorium-232	0.9	pCi/g
A1P2-INV-17-G	477320.536	1351117.234	Thorium-232	0.9	pCi/g
A1P2-INV-1-7-G	476844.02	1351825.489	Thorium-232	0.9	pCi/g
A1P2-INV-18-G	477311.299	1350896.917	Thorium-232	1	pCi/g
A1P2-INV-1-8-G	476875.986	1351822.365	Thorium-232	1	pCi/g
A1P2-INV-19-G	477292.221	1350708.619	Thorium-232	0.9	pCi/g
A1P2-INV-1-9-G	476912.497	1351817.414	Thorium-232	0.8	pCi/g
A1P2-INV-1-9-G	476912.497	1351817.414	Thorium-232	0.8	pCi/g
A1P2-INV-1-G	476857.791	1351777.248	Thorium-232	0.9	pCi/g
A1P2-INV-20-G	477284.524	1350492.934	Thorium-232	0.8	pCi/g
A1P2-INV-21-G	477489.063	1350468.915	Thorium-232	1	pCi/g
A1P2-INV-22-G	477501.904	1350695.369	Thorium-232	0.9	pCi/g
A1P2-INV-23-G	477490.651	1350882.652	Thorium-232	1	pCi/g
A1P2-INV-24-G	477497.289	1351122.982	Thorium-232	1	pCi/g
A1P2-INV-25-G	477517.579	1351331.148	Thorium-232	0.9	pCi/g
A1P2-INV-26-G	477512.968	1351526.705	Thorium-232	0.9	pCi/g
A1P2-INV-27-G	477697.382	1351552.022	Thorium-232	0.9	pCi/g
A1P2-INV-28-G	477677.577	1351331.386	Thorium-232	0.9	pCi/g
A1P2-INV-29-G	477672.572	1351157.092	Thorium-232	1	pCi/g
A1P2-INV-2-G	476938.598	1351529.296	Thorium-232	0.8	pCi/g
A1P2-INV-30-G	477657.343	1350880.878	Thorium-232	0.9	pCi/g
A1P2-INV-31-G	477654.116	1350669.858	Thorium-232	1	pCi/g
A1P2-INV-32-G	477669.96	1350493.814	Thorium-232	1	pCi/g
A1P2-INV-33-2-G	477751.57	1350261.57	Thorium-232	0.8	pCi/g
A1P2-INV-33-G	477674.317	1350315.977	Thorium-232	1	pCi/g
A1P2-INV-34-G	477860.998	1350279.91	Thorium-232	1	pCi/g
A1P2-INV-35-G	477880.983	1350540.107	Thorium-232	1	pCi/g
A1P2-INV-36-G	477885.139	1350667.188	Thorium-232	0.9	pCi/g
A1P2-INV-37-G	477872.218	1350872.978	Thorium-232	0.9	pCi/g
A1P2-INV-38-G	477918.741	1351151.547	Thorium-232	0.9	pCi/g
A1P2-INV-39-G	477887.701	1351356.568	Thorium-232	1	pCi/g
A1P2-INV-3-G	476927.261	1351355.551	Thorium-232	0.9	pCi/g
A1P2-INV-40-G	477892.252	1351574.243	Thorium-232	0.6	pCi/g
A1P2-INV-41-G	478126.016	1351574.744	Thorium-232	0.9	pCi/g
A1P2-INV-41-G	478126.016	1351574.744	Thorium-232	0.9	pCi/g
A1P2-INV-42-G	478125.003	1351363.032	Thorium-232	0.9	pCi/g
A1P2-INV-43-G	478117.397	1351161.298	Thorium-232	1	pCi/g
A1P2-INV-44-G	478118.287	1350946.606	Thorium-232	1	pCi/g
A1P2-INV-45-G	478126.071	1350729.546	Thorium-232	0.8	pCi/g
A1P2-INV-46-G	478126.164	1350519.073	Thorium-232	0.9	pCi/g
A1P2-INV-47-G	478126.321	1350310.369	Thorium-232	1	pCi/g

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A1P2-INV-48-G	478126.065	1350200.568	Thorium-232	1	pCi/g
A1P2-INV-49-G	478335.161	1350101.803	Thorium-232	1	pCi/g
A1P2-INV-4-G	476842.57	1351185.447	Thorium-232	0.9	pCi/g
A1P2-INV-50-G	478335.491	1350310.214	Thorium-232	0.9	pCi/g
A1P2-INV-51-G	478335.459	1350519.13	Thorium-232	1	pCi/g
A1P2-INV-52-G	478335.868	1350729.541	Thorium-232	1	pCi/g
A1P2-INV-53-G	478335.891	1350937.658	Thorium-232	0.9	pCi/g
A1P2-INV-54-G	478335.105	1351146.613	Thorium-232	0.9	pCi/g
A1P2-INV-55-G	478335.066	1351355.269	Thorium-232	0.9	pCi/g
A1P2-INV-56-G	478335.626	1351564.4	Thorium-232	1	pCi/g
A1P2-INV-57-2-G	478254.725	1351780.969	Thorium-232	0.9	pCi/g
A1P2-INV-57-3-G	478294.255	1351783.225	Thorium-232	0.9	pCi/g
A1P2-INV-57-G	478335.163	1351699.12	Thorium-232	0.9	pCi/g
A1P2-INV-58-G	478544.636	1351698.732	Thorium-232	0.9	pCi/g
A1P2-INV-59-G	478544.146	1351564.59	Thorium-232	1	pCi/g
A1P2-INV-5-G	476849.2	1350949.788	Thorium-232	0.9	pCi/g
A1P2-INV-60-G	478544.837	1351355.76	Thorium-232	1	pCi/g
A1P2-INV-61-G	478544.715	1351146.107	Thorium-232	1	pCi/g
A1P2-INV-62-G	478544.054	1350937.473	Thorium-232	0.9	pCi/g
A1P2-INV-63-G	478544.29	1350729.666	Thorium-232	0.9	pCi/g
A1P2-INV-64-G	478544.637	1350519.372	Thorium-232	0.9	pCi/g
A1P2-INV-65-G	478544.53	1350310.914	Thorium-232	1	pCi/g
A1P2-INV-66-G	478547.58	1350105.01	Thorium-232	0.8	pCi/g
A1P2-INV-67-G	478632.709	1350081.094	Thorium-232	0.9	pCi/g
A1P2-INV-68-G	478753.125	1350310.828	Thorium-232	0.9	pCi/g
A1P2-INV-69-G	478752.484	1350519.547	Thorium-232	0.9	pCi/g
A1P2-INV-6-G	476828.706	1350645.206	Thorium-232	0.9	pCi/g
A1P2-INV-70-G	478752.188	1350720.026	Thorium-232	0.8	pCi/g
A1P2-INV-71-G	478752.467	1350937.041	Thorium-232	0.9	pCi/g
A1P2-INV-72-G	478752.166	1351146.698	Thorium-232	1	pCi/g
A1P2-INV-7-2-G	476785.77	1351045.92	Thorium-232	0.6	pCi/g
A1P2-INV-73-G	478752.147	1351355.494	Thorium-232	0.9	pCi/g
A1P2-INV-7-3-G	476716.06	1350699.81	Thorium-232	0.7	pCi/g
A1P2-INV-74-G	478752.54	1351564.545	Thorium-232	1	pCi/g
A1P2-INV-7-4-G	476806.42	1350584.56	Thorium-232	0.8	pCi/g
A1P2-INV-75-G	478751.92	1351699.057	Thorium-232	0.9	pCi/g
A1P2-INV-76-G	478961.563	1351699.476	Thorium-232	0.8	pCi/g
A1P2-INV-77-G	478961.195	1351564.309	Thorium-232	0.9	pCi/g
A1P2-INV-78-G	478961.543	1351355.679	Thorium-232	0.9	pCi/g
A1P2-INV-79-G	478961.85	1351146.783	Thorium-232	1	pCi/g
A1P2-INV-7-G	476705.012	1350712.945	Thorium-232	0.8	pCi/g
A1P2-INV-80-G	478961.038	1350937.187	Thorium-232	0.9	pCi/g

A1P2-INV-81-G	478960.925	1350732.619	Thorium-232	0.8	pCi/g
A1P2-INV-82-G	478961.392	1350519.063	Thorium-232	0.8	pCi/g
A1P2-INV-83-G	479170.207	1350729.574	Thorium-232	0.9	pCi/g
A1P2-INV-84-G	479170.486	1350937.885	Thorium-232	0.8	pCi/g
A1P2-INV-85-G	479170.588	1351146.975	Thorium-232	1	pCi/g
A1P2-INV-86-G	479170.341	1351355.519	Thorium-232	0.8	pCi/g
A1P2-INV-87-G	479170.254	1351563.332	Thorium-232	0.7	pCi/g
A1P2-INV-88-G	479170.776	1351716.309	Thorium-232	0.7	pCi/g
A1P2-INV-89-G	479379.064	1351699.374	Thorium-232	0.7	pCi/g
A1P2-INV-8-G	477034.896	1350657.89	Thorium-232	0.9	pCi/g
A1P2-INV-90-G	479379.033	1351564.107	Thorium-232	0.8	pCi/g
A1P2-INV-91-G	479379.079	1351355.098	Thorium-232	0.8	pCi/g
A1P2-INV-92-G	479379.075	1351146.076	Thorium-232	1	pCi/g
A1P2-INV-93-G	479379.269	1350938.509	Thorium-232	0.9	pCi/g
A1P2-INV-94-2-G	479536.014	1350989.625	Thorium-232	1	pCi/g
A1P2-INV-94-3-G	479534.675	1350903.69	Thorium-232	0.9	pCi/g
A1P2-INV-94-4-G	479638.598	1350905.352	Thorium-232	1	pCi/g
A1P2-INV-94-5-G	479638.29	1350988.193	Thorium-232	0.9	pCi/g
A1P2-INV-94-G	479587.417	1350938.588	Thorium-232	1	pCi/g
A1P2-INV-95-2-G	479537.818	1351199.496	Thorium-232	1	pCi/g
A1P2-INV-95-3-G	479533.824	1351092.146	Thorium-232	1	pCi/g
A1P2-INV-95-4-G	479638.73	1351092.875	Thorium-232	0.9	pCi/g
A1P2-INV-95-5-G	479640.567	1351197.316	Thorium-232	0.9	pCi/g
A1P2-INV-95-G	479587.921	1351146.806	Thorium-232	0.8	pCi/g
A1P2-INV-96-G	479587.292	1351355.576	Thorium-232	0.9	pCi/g
A1P2-INV-97-G	479588.003	1351564.215	Thorium-232	0.7	pCi/g
A1P2-INV-98-G	479587.254	1351699.047	Thorium-232	0.8	pCi/g
A1P2-INV-99-2-G	479736.86	1351777.34	Thorium-232	0.9	pCi/g
A1P2-INV-99-3-G	479740.23	1351691.21	Thorium-232	0.9	pCi/g
A1P2-INV-99-4-G	479833.07	1351773.98	Thorium-232	0.9	pCi/g
A1P2-INV-99-5-G	479839.45	1351690.84	Thorium-232	1	pCi/g
A1P2-INV-99-G	479797.947	1351709.831	Thorium-232	0.9	pCi/g
A1P2-INV-9-G	477048.504	1350858.01	Thorium-232	0.9	pCi/g
A1P2-INV-100-G	479812.847	1351553.081	Total Uranium	11.6	ppm
A1P2-INV-101-G	479796.107	1351355.406	Total Uranium	23.3	ppm
A1P2-INV-102-2-G	479745.15	1351200.726	Total Uranium	28.8	ppm
A1P2-INV-102-3-G	479744.516	1351093.366	Total Uranium	37.2	ppm
A1P2-INV-102-4-G	479850.216	1351094.039	Total Uranium	40.8	ppm
A1P2-INV-102-5-G	479848.754	1351197.293	Total Uranium	38.3	ppm
A1P2-INV-102-G	479796.669	1351146.901	Total Uranium	32.8	ppm
A1P2-INV-103-2-G	479741.435	1350906.394	Total Uranium	34.9	ppm
A1P2-INV-103-3-G	479744.029	1350990.063	Total Uranium	32.2	ppm

A1P2-INV-103-4-G	479841.142	1350912.502	Total Uranium	46.3	ppm
A1P2-INV-103-5-G	479849.541	1350979.992	Total Uranium	36.8	ppm
A1P2-INV-103-G	479796.077	1350937.379	Total Uranium	40.3	ppm
A1P2-INV-104-2-G	479965.341	1350983.733	Total Uranium	44.8	ppm
A1P2-INV-104-3-G	480059.575	1350911.26	Total Uranium	69.4	ppm
A1P2-INV-104-4-G	479943.451	1350908.921	Total Uranium	47.6	ppm
A1P2-INV-104-5-G	480066.098	1350987.514	Total Uranium	64.9	ppm
A1P2-INV-104-G	480004.36	1350937.821	Total Uranium	46	ppm
A1P2-INV-105-2-G	480054.371	1351086.908	Total Uranium	82.5	ppm
A1P2-INV-105-3-G	479946.057	1351081.543	Total Uranium	38.2	ppm
A1P2-INV-105-4-G	480052.716	1351196.516	Total Uranium	64.6	ppm
A1P2-INV-105-5-G	479952.569	1351203.087	Total Uranium	39.2	ppm
A1P2-INV-105-G	480004.27	1351146.148	Total Uranium	45	ppm
A1P2-INV-106-20-	479922.2372	1351407.431	Total Uranium	28.7	ppm
A1P2-INV-106-21-	479957.5391	1351430.186	Total Uranium	34.2	ppm
A1P2-INV-106-9-G	479959.5943	1351388.236	Total Uranium	22.9	ppm
A1P2-INV-109-2-G	480255.409	1351769.202	Total Uranium	33.2	ppm
A1P2-INV-109-3-G	480253.657	1351695.331	Total Uranium	95.4	ppm
A1P2-INV-10-G	477055.833	1351065.398	Total Uranium	10.4	ppm
A1P2-INV-110-2-G	480258.132	1351510.744	Total Uranium	37.3	ppm
A1P2-INV-110-3-G	480253.46	1351604.977	Total Uranium	36	ppm
A1P2-INV-111-28-	480252.2854	1351360.525	Total Uranium	74	ppm
A1P2-INV-111-32-	480216.9835	1351337.77	Total Uranium	47	ppm
A1P2-INV-111-40-	480250	1351319	Total Uranium	72.4	ppm
A1P2-INV-111-41-	480220	1351287	Total Uranium	63	ppm
A1P2-INV-111-42-	480180	1351319	Total Uranium	45.6	ppm
A1P2-INV-111-43-	480181	1351280	Total Uranium	113.3	ppm
A1P2-INV-1-11-G	476995.01	1351804.518	Total Uranium	13	ppm
A1P2-INV-112-2-G	480254.679	1351087.745	Total Uranium	69.3	ppm
A1P2-INV-112-3-G	480157.899	1351090.203	Total Uranium	65.9	ppm
A1P2-INV-112-4-G	480162.32	1351184.983	Total Uranium	63	ppm
A1P2-INV-112-5-G	480257.597	1351193.295	Total Uranium	68.1	ppm
A1P2-INV-112-G	480212.348	1351146.579	Total Uranium	64.3	ppm
A1P2-INV-1-12-G	477033.444	1351799.981	Total Uranium	11.9	ppm
A1P2-INV-113-2-G	480159.335	1350945.07	Total Uranium	65.7	ppm
A1P2-INV-113-3-G	480162.826	1351006.153	Total Uranium	66.4	ppm
A1P2-INV-113-4-G	480263.467	1351004.081	Total Uranium	55.1	ppm
A1P2-INV-113-G	480212.484	1350958.333	Total Uranium	71.7	ppm
A1P2-INV-114-G	480420.545	1351054.985	Total Uranium	55.4	ppm
A1P2-INV-115-2-G	480468.58	1351185.968	Total Uranium	55	ppm
A1P2-INV-115-3-G	480369.534	1351096.317	Total Uranium	66.3	ppm
A1P2-INV-115-4-G	480462.312	1351117.284	Total Uranium	55.3	ppm

A1P2-INV-115-5-G	480350.407	1351198.603	Total Uranium	65.9	ppm
A1P2-INV-115-G	480420.247	1351146.533	Total Uranium	60.9	ppm
A1P2-INV-115-G	480420.247	1351146.533	Total Uranium	63.9	ppm
A1P2-INV-115-G	480420.247	1351146.533	Total Uranium	60.3	ppm
A1P2-INV-116-2-G	480468.376	1351299.865	Total Uranium	60.4	ppm
A1P2-INV-116-3-G	480361.719	1351299.474	Total Uranium	58.3	ppm
A1P2-INV-116-4-G	480469.469	1351404.257	Total Uranium	63.3	ppm
A1P2-INV-116-5-G	480367.183	1351406.325	Total Uranium	59.4	ppm
A1P2-INV-116-G	480420.03	1351355.284	Total Uranium	63.3	ppm
A1P2-INV-116-G	480420.03	1351355.284	Total Uranium	59.9	ppm
A1P2-INV-116-G	480420.03	1351355.284	Total Uranium	56.6	ppm
A1P2-INV-117-2-G	480476.643	1351613.798	Total Uranium	91.6	ppm
A1P2-INV-117-3-G	480370.386	1351621.836	Total Uranium	60.4	ppm
A1P2-INV-117-4-G	480475.796	1351506.118	Total Uranium	63.7	ppm
A1P2-INV-117-5-G	480377.439	1351511.382	Total Uranium	57.6	ppm
A1P2-INV-117-G	480420.639	1351562.327	Total Uranium	80.5	ppm
A1P2-INV-117-G	480420.639	1351562.327	Total Uranium	80.1	ppm
A1P2-INV-118-2-G	480473.822	1351784.219	Total Uranium	68.6	ppm
A1P2-INV-118-3-G	480487.415	1351704.606	Total Uranium	73.5	ppm
A1P2-INV-118-4-G	480379.622	1351755.69	Total Uranium	53.2	ppm
A1P2-INV-118-5-G	480369.956	1351688.945	Total Uranium	92.2	ppm
A1P2-INV-118-G	480420.186	1351699.575	Total Uranium	47.5	ppm
A1P2-INV-119-2-G	480663.585	1351785.28	Total Uranium	11.1	ppm
A1P2-INV-119-3-G	480667.417	1351714.22	Total Uranium	55.1	ppm
A1P2-INV-119-4-G	480569.696	1351711.045	Total Uranium	71.9	ppm
A1P2-INV-119-5-G	480586.656	1351784.019	Total Uranium	71.6	ppm
A1P2-INV-119-G	480628.686	1351699.344	Total Uranium	61.7	ppm
A1P2-INV-11-G	477064.286	1351283.131	Total Uranium	12.5	ppm
A1P2-INV-120-3-G	480566.509	1351497.927	Total Uranium	59.9	ppm
A1P2-INV-120-4-G	480689.152	1351628.794	Total Uranium	56.2	ppm
A1P2-INV-120-G	480628.367	1351563.267	Total Uranium	46.9	ppm
A1P2-INV-120-G	480628.367	1351563.267	Total Uranium	59.4	ppm
A1P2-INV-121-2-G	480679.013	1351401.353	Total Uranium	56.6	ppm
A1P2-INV-121-4-G	480557.013	1351378.749	Total Uranium	52.8	ppm
A1P2-INV-121-5-G	480677.331	1351340.454	Total Uranium	58	ppm
A1P2-INV-121-G	480628.36	1351355.457	Total Uranium	59.1	ppm
A1P2-INV-122-2-G	480572.39	1351212.681	Total Uranium	67.8	ppm
A1P2-INV-122-3-G	480648.569	1351251.092	Total Uranium	59	ppm
A1P2-INV-122-G	480628.255	1351208.733	Total Uranium	60.7	ppm
A1P2-INV-128-3-G	480771.437	1351393.798	Total Uranium	52.2	ppm
A1P2-INV-128-G	480836.216	1351440.228	Total Uranium	38.6	ppm
A1P2-INV-129-2-G	480767.485	1351495.638	Total Uranium	17.7	ppm

A1P2-INV-129-3-G	480879.39	1351520.628	Total Uranium	19.3	ppm
A1P2-INV-129-4-G	480781.983	1351624.653	Total Uranium	23.4	ppm
A1P2-INV-129-5-G	480870.747	1351610.577	Total Uranium	37.8	ppm
A1P2-INV-129-G	480836.145	1351563.759	Total Uranium	13.7	ppm
A1P2-INV-12-G	477076.743	1351491.463	Total Uranium	10	ppm
A1P2-INV-1-2-G	476862.001	1351846.584	Total Uranium	8.4	ppm
A1P2-INV-130-2-G	480784.293	1351707.189	Total Uranium	48.4	ppm
A1P2-INV-130-3-G	480837.971	1351711.162	Total Uranium	46	ppm
A1P2-INV-130-4-G	480835.613	1351775.758	Total Uranium	30.5	ppm
A1P2-INV-130-5-G	480778.264	1351782.208	Total Uranium	11.7	ppm
A1P2-INV-13-10-G	477181.136	1351785.382	Total Uranium	11.2	ppm
A1P2-INV-13-11-G	477234.004	1351779.321	Total Uranium	12	ppm
A1P2-INV-13-12-G	477047.377	1351764.905	Total Uranium	10.5	ppm
A1P2-INV-13-12-G	477047.377	1351764.905	Total Uranium	13.7	ppm
A1P2-INV-13-13-G	477085.795	1351763.368	Total Uranium	10.2	ppm
A1P2-INV-13-14-G	477121.394	1351761.044	Total Uranium	13.5	ppm
A1P2-INV-13-15-G	477157.924	1351758.905	Total Uranium	12.1	ppm
A1P2-INV-13-16-G	477205.187	1351755.005	Total Uranium	11.3	ppm
A1P2-INV-13-17-G	477250.597	1351750.605	Total Uranium	10.8	ppm
A1P2-INV-13-2-G	477054.944	1351829.994	Total Uranium	13.4	ppm
A1P2-INV-133-10-	477583.328	1351772.14	Total Uranium	12.9	ppm
A1P2-INV-133-11-	477631.474	1351771.79	Total Uranium	9.6	ppm
A1P2-INV-133-12-	477668.781	1351770.552	Total Uranium	9.7	ppm
A1P2-INV-133-13-	477476.865	1351749.874	Total Uranium	6.7	ppm
A1P2-INV-133-14-	477508.177	1351749.178	Total Uranium	7.8	ppm
A1P2-INV-133-15-	477541.121	1351748.824	Total Uranium	7.2	ppm
A1P2-INV-133-16-	477580.086	1351748.656	Total Uranium	6.6	ppm
A1P2-INV-133-17-	477618.099	1351739.238	Total Uranium	5.5	ppm
A1P2-INV-133-2-G	477494.138	1351800.021	Total Uranium	5.7	ppm
A1P2-INV-133-3-G	477528.379	1351802.311	Total Uranium	6.6	ppm
A1P2-INV-133-4-G	477565.848	1351801.22	Total Uranium	10.6	ppm
A1P2-INV-133-5-G	477611.309	1351798.05	Total Uranium	9.3	ppm
A1P2-INV-133-6-G	477651.717	1351795.624	Total Uranium	10.4	ppm
A1P2-INV-133-7-G	477481.472	1351773.225	Total Uranium	8.3	ppm
A1P2-INV-133-8-G	477513.058	1351771.777	Total Uranium	6	ppm
A1P2-INV-133-G	477458.157	1351806.325	Total Uranium	7.8	ppm
A1P2-INV-13-3-G	477089.574	1351828.295	Total Uranium	11.6	ppm
A1P2-INV-134-10-	477844.195	1351769.567	Total Uranium	13.3	ppm
A1P2-INV-134-2-G	477722.889	1351794.456	Total Uranium	12.2	ppm
A1P2-INV-134-3-G	477765.003	1351790.54	Total Uranium	11.6	ppm
A1P2-INV-134-4-G	477796.399	1351788.156	Total Uranium	13	ppm
A1P2-INV-134-5-G	477830.327	1351786.268	Total Uranium	10.5	ppm

A1P2-INV-134-6-G	477702.733	1351768.838	Total Uranium	9.7	ppm
A1P2-INV-134-7-G	477745.701	1351770.256	Total Uranium	10.6	ppm
A1P2-INV-134-8-G	477780.021	1351769.506	Total Uranium	14.3	ppm
A1P2-INV-134-9-G	477811.469	1351768.686	Total Uranium	10.9	ppm
A1P2-INV-134-G	477686.884	1351794.985	Total Uranium	9.5	ppm
A1P2-INV-13-4-G	477129.629	1351825.799	Total Uranium	11.1	ppm
A1P2-INV-135-10-	478043.493	1351760.661	Total Uranium	15	ppm
A1P2-INV-135-2-G	477908.143	1351784.73	Total Uranium	15.1	ppm
A1P2-INV-135-3	477943.545	1351781.725	Total Uranium	15.8	ppm
A1P2-INV-135-4-G	477983.598	1351780.465	Total Uranium	13.2	ppm
A1P2-INV-135-5-G	478020.888	1351778.46	Total Uranium	10.8	ppm
A1P2-INV-135-6-G	477884.958	1351761.739	Total Uranium	12.1	ppm
A1P2-INV-135-7-G	477927.352	1351764.339	Total Uranium	12	ppm
A1P2-INV-135-7-G	477927.352	1351764.339	Total Uranium	14.1	ppm
A1P2-INV-135-8-G	477966.486	1351763.306	Total Uranium	15.6	ppm
A1P2-INV-135-9-G	478003.395	1351762.421	Total Uranium	12.6	ppm
A1P2-INV-135-G	477864.092	1351788.023	Total Uranium	12.3	ppm
A1P2-INV-13-5-G	477167.316	1351821.617	Total Uranium	10.1	ppm
A1P2-INV-136-10	478231.964	1351758.339	Total Uranium	11.7	ppm
A1P2-INV-136-2-G	478105.127	1351776.276	Total Uranium	9.8	ppm
A1P2-INV-136-3-G	478143.626	1351777.493	Total Uranium	15.2	ppm
A1P2-INV-136-4-G	478182.029	1351779.746	Total Uranium	13.6	ppm
A1P2-INV-136-5-G	478214.901	1351780.541	Total Uranium	14.8	ppm
A1P2-INV-136-6-G	478079.49	1351755.396	Total Uranium	15.2	ppm
A1P2-INV-136-8-G	478164.426	1351756.384	Total Uranium	16.3	ppm
A1P2-INV-136-9-G	478195.033	1351756.563	Total Uranium	12.8	ppm
A1P2-INV-136-G	478062.844	1351775.307	Total Uranium	12.1	ppm
A1P2-INV-13-6-G	477213.67	1351816.134	Total Uranium	12.3	ppm
A1P2-INV-137-G	478263.171	1349814.048	Total Uranium	17.7	ppm
A1P2-INV-137-G	478263.171	1349814.048	Total Uranium	19.8	ppm
A1P2-INV-13-7-G	477068.687	1351793.82	Total Uranium	12.2	ppm
A1P2-INV-138-G	478392.042	1349782.583	Total Uranium	23.4	ppm
A1P2-INV-13-8-G	477106.338	1351792.46	Total Uranium	11.8	ppm
A1P2-INV-139-G	478547.248	1349756.538	Total Uranium	21.2	ppm
A1P2-INV-13-9-G	477142.385	1351788.667	Total Uranium	9.2	ppm
A1P2-INV-13-G	477082.73	1351772.31	Total Uranium	9.8	ppm
A1P2-INV-1-3-G	476894.655	1351845.758	Total Uranium	11.2	ppm
A1P2-INV-140-G	478721.19	1349779.232	Total Uranium	22.5	ppm
A1P2-INV-14-10-G	477394.779	1351774.733	Total Uranium	9.1	ppm
A1P2-INV-14-11-G	477430.566	1351771.298	Total Uranium	9.9	ppm
A1P2-INV-14-12-G	477297.918	1351746.772	Total Uranium	10.8	ppm
A1P2-INV-14-13-G	477331.784	1351744.05	Total Uranium	15	ppm

A1P2-INV-14-14-G	477374.577	1351741.078	Total Uranium	10.3	ppm
A1P2-INV-14-15-G	477413.126	1351738.019	Total Uranium	7.3	ppm
A1P2-INV-14-16-G	477448.929	1351735.001	Total Uranium	4.7	ppm
A1P2-INV-14-2-G	477259.399	1351816.551	Total Uranium	9.6	ppm
A1P2-INV-14-3-G	477303.995	1351815.161	Total Uranium	14.2	ppm
A1P2-INV-14-4-G	477340.901	1351813.502	Total Uranium	9.2	ppm
A1P2-INV-14-5-G	477383.635	1351810.829	Total Uranium	10.7	ppm
A1P2-INV-14-6-G	477425.851	1351807.184	Total Uranium	7.8	ppm
A1P2-INV-14-7-G	477271.412	1351776.096	Total Uranium	9.8	ppm
A1P2-INV-14-8-G	477315.502	1351777.712	Total Uranium	12.3	ppm
A1P2-INV-14-9-G	477358.977	1351775.692	Total Uranium	10.8	ppm
A1P2-INV-14-G	477290.735	1351772.31	Total Uranium	12.4	ppm
A1P2-INV-1-4-G	476934.145	1351841.969	Total Uranium	10.8	ppm
A1P2-INV-15-G	477291.69	1351536.483	Total Uranium	12.6	ppm
A1P2-INV-1-5-G	476981.829	1351835.025	Total Uranium	12.2	ppm
A1P2-INV-1-5-G	476981.829	1351835.025	Total Uranium	12.4	ppm
A1P2-INV-16-G	477329.124	1351326.408	Total Uranium	12	ppm
A1P2-INV-1-6-G	477017.829	1351832.08	Total Uranium	12.9	ppm
A1P2-INV-17-G	477320.536	1351117.234	Total Uranium	11	ppm
A1P2-INV-1-7-G	476844.02	1351825.489	Total Uranium	13.1	ppm
A1P2-INV-18-G	477311.299	1350896.917	Total Uranium	13.9	ppm
A1P2-INV-1-8-G	476875.986	1351822.365	Total Uranium	9	ppm
A1P2-INV-19-G	477292.221	1350708.619	Total Uranium	9.1	ppm
A1P2-INV-1-9-G	476912.497	1351817.414	Total Uranium	8.5	ppm
A1P2-INV-1-9-G	476912.497	1351817.414	Total Uranium	11.5	ppm
A1P2-INV-1-G	476857.791	1351777.248	Total Uranium	12.4	ppm
A1P2-INV-20-G	477284.524	1350492.934	Total Uranium	12.7	ppm
A1P2-INV-21-G	477489.063	1350468.915	Total Uranium	14.2	ppm
A1P2-INV-22-G	477501.904	1350695.369	Total Uranium	12.9	ppm
A1P2-INV-23-G	477490.651	1350882.652	Total Uranium	12.7	ppm
A1P2-INV-24-G	477497.289	1351122.982	Total Uranium	12.6	ppm
A1P2-INV-25-G	477517.579	1351331.148	Total Uranium	12	ppm
A1P2-INV-26-G	477512.968	1351526.705	Total Uranium	10.9	ppm
A1P2-INV-27-G	477697.382	1351552.022	Total Uranium	14.1	ppm
A1P2-INV-28-G	477677.577	1351331.386	Total Uranium	12.7	ppm
A1P2-INV-29-G	477672.572	1351157.092	Total Uranium	13.7	ppm
A1P2-INV-2-G	476938.598	1351529.296	Total Uranium	9.3	ppm
A1P2-INV-30-G	477657.343	1350880.878	Total Uranium	11.8	ppm
A1P2-INV-31-G	477654.116	1350669.858	Total Uranium	13.9	ppm
A1P2-INV-32-G	477669.96	1350493.814	Total Uranium	13.5	ppm
A1P2-INV-33-2-G	477751.57	1350261.57	Total Uranium	15.9	ppm
A1P2-INV-33-G	477674.317	1350315.977	Total Uranium	15.4	ppm

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A1P2-INV-34-G	477860.998	1350279.91	Total Uranium	16.6	ppm
A1P2-INV-35-G	477880.983	1350540.107	Total Uranium	14.6	ppm
A1P2-INV-36-G	477885.139	1350667.188	Total Uranium	16.3	ppm
A1P2-INV-37-G	477872.218	1350872.978	Total Uranium	16.4	ppm
A1P2-INV-38-G	477918.741	1351151.547	Total Uranium	11.9	ppm
A1P2-INV-39-G	477887.701	1351356.568	Total Uranium	14.7	ppm
A1P2-INV-3-G	476927.261	1351355.551	Total Uranium	9.9	ppm
A1P2-INV-40-G	477892.252	1351574.243	Total Uranium	11.9	ppm
A1P2-INV-41-G	478126.016	1351574.744	Total Uranium	13.2	ppm
A1P2-INV-41-G	478126.016	1351574.744	Total Uranium	13.4	ppm
A1P2-INV-42-G	478125.003	1351363.032	Total Uranium	14.3	ppm
A1P2-INV-43-G	478117.397	1351161.298	Total Uranium	19.7	ppm
A1P2-INV-44-G	478118.287	1350946.606	Total Uranium	13.8	ppm
A1P2-INV-45-G	478126.071	1350729.546	Total Uranium	15.6	ppm
A1P2-INV-46-G	478126.164	1350519.073	Total Uranium	13.7	ppm
A1P2-INV-47-G	478126.321	1350310.369	Total Uranium	17.1	ppm
A1P2-INV-48-G	478126.065	1350200.568	Total Uranium	18.4	ppm
A1P2-INV-49-G	478335.161	1350101.803	Total Uranium	21.1	ppm
A1P2-INV-4-G	476842.57	1351185.447	Total Uranium	11.5	ppm
A1P2-INV-50-G	478335.491	1350310.214	Total Uranium	21.4	ppm
A1P2-INV-51-G	478335.459	1350519.13	Total Uranium	19.4	ppm
A1P2-INV-52-G	478335.868	1350729.541	Total Uranium	24.4	ppm
A1P2-INV-53-G	478335.891	1350937.658	Total Uranium	14.4	ppm
A1P2-INV-54-G	478335.105	1351146.613	Total Uranium	16.6	ppm
A1P2-INV-55-G	478335.066	1351355.269	Total Uranium	12.4	ppm
A1P2-INV-56-G	478335.626	1351564.4	Total Uranium	13.1	ppm
A1P2-INV-57-2-G	478254.725	1351780.969	Total Uranium	15.2	ppm
A1P2-INV-57-3-G	478294.255	1351783.225	Total Uranium	11.4	ppm
A1P2-INV-57-G	478335.163	1351699.12	Total Uranium	14.6	ppm
A1P2-INV-58-G	478544.636	1351698.732	Total Uranium	16.4	ppm
A1P2-INV-59-G	478544.146	1351564.59	Total Uranium	13.3	ppm
A1P2-INV-5-G	476849.2	1350949.788	Total Uranium	11	ppm
A1P2-INV-60-G	478544.837	1351355.76	Total Uranium	13.6	ppm
A1P2-INV-61-G	478544.715	1351146.107	Total Uranium	18.6	ppm
A1P2-INV-62-G	478544.054	1350937.473	Total Uranium	17.8	ppm
A1P2-INV-63-G	478544.29	1350729.666	Total Uranium	21.4	ppm
A1P2-INV-64-G	478544.637	1350519.372	Total Uranium	24.3	ppm
A1P2-INV-65-G	478544.53	1350310.914	Total Uranium	28.8	ppm
A1P2-INV-66-G	478547.58	1350105.01	Total Uranium	18.4	ppm
A1P2-INV-67-G	478632.709	1350081.094	Total Uranium	21.3	ppm
A1P2-INV-68-G	478753.125	1350310.828	Total Uranium	14.7	ppm
A1P2-INV-69-G	478752.484	1350519.547	Total Uranium	25	ppm

A1P2-INV-6-G	476828.706	1350645.206	Total Uranium	14.6	ppm
A1P2-INV-70-G	478752.188	1350720.026	Total Uranium	30.4	ppm
A1P2-INV-71-G	478752.467	1350937.041	Total Uranium	21.1	ppm
A1P2-INV-72-G	478752.166	1351146.698	Total Uranium	28	ppm
A1P2-INV-7-2-G	476785.77	1351045.92	Total Uranium	7	ppm
A1P2-INV-73-G	478752.147	1351355.494	Total Uranium	13.4	ppm
A1P2-INV-7-3-G	476716.06	1350699.81	Total Uranium	10.1	ppm
A1P2-INV-74-G	478752.54	1351564.545	Total Uranium	14.3	ppm
A1P2-INV-7-4-G	476806.42	1350584.56	Total Uranium	12.2	ppm
A1P2-INV-75-G	478751.92	1351699.057	Total Uranium	12.8	ppm
A1P2-INV-76-G	478961.563	1351699.476	Total Uranium	12	ppm
A1P2-INV-77-G	478961.195	1351564.309	Total Uranium	13.4	ppm
A1P2-INV-78-G	478961.543	1351355.679	Total Uranium	13.4	ppm
A1P2-INV-79-G	478961.85	1351146.783	Total Uranium	22.6	ppm
A1P2-INV-7-G	476705.012	1350712.945	Total Uranium	9.7	ppm
A1P2-INV-80-G	478961.038	1350937.187	Total Uranium	17.1	ppm
A1P2-INV-81-G	478960.925	1350732.619	Total Uranium	30.6	ppm
A1P2-INV-82-G	478961.392	1350519.063	Total Uranium	8	ppm
A1P2-INV-83-G	479170.207	1350729.574	Total Uranium	11	ppm
A1P2-INV-84-G	479170.486	1350937.885	Total Uranium	13.2	ppm
A1P2-INV-85-G	479170.588	1351146.975	Total Uranium	24.8	ppm
A1P2-INV-86-G	479170.341	1351355.519	Total Uranium	15.5	ppm
A1P2-INV-87-G	479170.254	1351563.332	Total Uranium	7	ppm
A1P2-INV-88-G	479170.776	1351716.309	Total Uranium	12.8	ppm
A1P2-INV-89-G	479379.064	1351699.374	Total Uranium	8.8	ppm
A1P2-INV-8-G	477034.896	1350657.89	Total Uranium	12.3	ppm
A1P2-INV-90-G	479379.033	1351564.107	Total Uranium	9.8	ppm
A1P2-INV-91-G	479379.079	1351355.098	Total Uranium	13.3	ppm
A1P2-INV-92-G	479379.075	1351146.076	Total Uranium	31.3	ppm
A1P2-INV-93-G	479379.269	1350938.509	Total Uranium	19.4	ppm
A1P2-INV-94-2-G	479536.014	1350989.625	Total Uranium	35.1	ppm
A1P2-INV-94-3-G	479534.675	1350903.69	Total Uranium	36.5	ppm
A1P2-INV-94-4-G	479638.598	1350905.352	Total Uranium	51.5	ppm
A1P2-INV-94-5-G	479638.29	1350988.193	Total Uranium	29.8	ppm
A1P2-INV-94-G	479587.417	1350938.588	Total Uranium	36.8	ppm
A1P2-INV-95-2-G	479537.818	1351199.496	Total Uranium	40.7	ppm
A1P2-INV-95-3-G	479533.824	1351092.146	Total Uranium	28.5	ppm
A1P2-INV-95-4-G	479638.73	1351092.875	Total Uranium	21.8	ppm
A1P2-INV-95-5-G	479640.567	1351197.316	Total Uranium	27.1	ppm
A1P2-INV-95-G	479587.921	1351146.806	Total Uranium	17.9	ppm
A1P2-INV-96-G	479587.292	1351355.576	Total Uranium	29.9	ppm
A1P2-INV-97-G	479588.003	1351564.215	Total Uranium	7.4	ppm

A1P2-INV-98-G	479587.254	1351699.047	Total Uranium	11.6	ppm
A1P2-INV-99-2-G	479736.86	1351777.34	Total Uranium	11.7	ppm
A1P2-INV-99-3-G	479740.23	1351691.21	Total Uranium	19.9	ppm
A1P2-INV-99-4-G	479833.07	1351773.98	Total Uranium	33.1	ppm
A1P2-INV-99-5-G	479839.45	1351690.84	Total Uranium	34.7	ppm
A1P2-INV-99-G	479797.947	1351709.831	Total Uranium	30.5	ppm
A1P2-INV-9-G	477048.504	1350858.01	Total Uranium	12.7	ppm

APPENDIX B-2

WASTE MANAGEMENT AND COMPARABILITY STUDY DATA

APPENDIX B-2
WASTE MANAGEMENT AND COMPARABILITY STUDY DATA

This table presents the data associated with sampling conducted in support of Waste Management Activities.

WM Project ID	Data Sampled	Release	Sample ID	Parameter	Results	UNITS	Qualifier
95-1150	9/21/95	1000008521	95-1150-1	ALPHA	1500	pCi/g	N/A
95-1151	9/21/95	1000008521	95-1150-1	BETA	5500	pCi/g	N/A
95-1152	9/21/95	1000008521	95-1150-3	ALPHA	370	pCi/g	N/A
95-1153	9/21/95	1000008521	95-1150-3	BETA	2900	pCi/g	N/A
95-1154	9/21/95	1000008521	95-1150-4	ALPHA	470	pCi/g	N/A
95-1155	9/21/95	1000008521	95-1150-4	BETA	2400	pCi/g	N/A
95-1156	9/21/95	1000008521	95-1150-5	ALPHA	1400	pCi/g	N/A
95-1157	9/21/95	1000008521	95-1150-5	BETA	5800	pCi/g	N/A
95-1158	9/21/95	1000008521	95-1150-2	ALPHA	1500	pCi/g	N/A
95-1159	9/21/95	1000008521	95-1150-2	BETA	9100	pCi/g	N/A
95-1160	9/21/95	1000008521	95-1150-1	MOISTURE	41.32	wt %	N/A
95-1161	9/21/95	1000008521	95-1150-1	LIQUIDS	ABSENT	PRESENT/ABSENT	N/A
95-1162	9/21/95	1000008521	95-1150-1	% LIQUIDS	NR	PERCENT	N/A
95-1163	9/21/95	1000008521	95-1150-2	MOISTURE	70.78	wt %	N/A
95-1164	9/21/95	1000008521	95-1150-2	LIQUIDS	ABSENT	PRESENT/ABSENT	N/A
95-1165	9/21/95	1000008521	95-1150-2	% LIQUIDS	NR	PERCENT	N/A
95-1166	9/21/95	1000008521	95-1150-3	MOISTURE	33.50	wt %	N/A
95-1167	9/21/95	1000008521	95-1150-3	LIQUIDS	ABSENT	PRESENT/ABSENT	N/A
95-1168	9/21/95	1000008521	95-1150-3	% LIQUIDS	NR	PERCENT	N/A
95-1169	9/21/95	1000008521	95-1150-5	MOISTURE	26.69	wt %	N/A
95-1170	9/21/95	1000008521	95-1150-5	LIQUIDS	ABSENT	PRESENT/ABSENT	N/A
95-1171	9/21/95	1000008521	95-1150-5	% LIQUIDS	NR	PERCENT	N/A
95-1172	9/21/95	1000008521	95-1150-4	MOISTURE	31.00	wt %	N/A
95-1173	9/21/95	1000008521	95-1150-4	LIQUIDS	ABSENT	PRESENT/ABSENT	N/A
95-1174	9/21/95	1000008521	95-1150-4	% LIQUIDS	NR	PERCENT	N/A
95-1175	9/21/95	1000008521	95-1150-1	VINYL CHLORIDE	50	ug/L	U
95-1176	9/21/95	1000008521	95-1150-1	1,1-DICHLOROETHYLENE	25	ug/L	U
95-1177	9/21/95	1000008521	95-1150-1	2-BUTANONE	50	ug/L	U
95-1178	9/21/95	1000008521	95-1150-1	CHLOROFORM	25	ug/L	U
95-1179	9/21/95	1000008521	95-1150-1	1,2-DICHLOROETHANE	25	ug/L	U
95-1180	9/21/95	1000008521	95-1150-1	CARBON TETRACHLORIDE	25	ug/L	U
95-1181	9/21/95	1000008521	95-1150-1	BENZENE	25	ug/L	U
95-1182	9/21/95	1000008521	95-1150-1	TRICHLOROETHYLENE	25	ug/L	U
95-1183	9/21/95	1000008521	95-1150-1	TETRACHLOROETHYLENE	25	ug/L	U
95-1184	9/21/95	1000008521	95-1150-1	CHLOROBENZENE	25	ug/L	U

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APPENDIX B-2
WASTE MANAGEMENT AND COMPARABILITY STUDY DATA

WM Project ID	Data Sampled	Release	Sample ID	Parameter	Results	UNITS	Qualifier
95-1185	9/21/95	1000008521	95-1150-1	SILVER	50.0	ug/L	U
95-1186	9/21/95	1000008521	95-1150-1	ARSENIC	708	ug/L	-
95-1187	9/21/95	1000008521	95-1150-1	BARIUM	519	ug/L	-
95-1188	9/21/95	1000008521	95-1150-1	CADMIUM	148	ug/L	-
95-1189	9/21/95	1000008521	95-1150-1	CHROMIUM	51.7	ug/L	-
95-1190	9/21/95	1000008521	95-1150-1	LEAD	245	ug/L	-
95-1191	9/21/95	1000008521	95-1150-1	SELENIUM	455	ug/L	-
95-1192	9/21/95	1000008521	95-1150-1	MERCURY	0.50	ug/L	U
95-1193	9/21/95	1000008521	95-1150-2	VINYL CHLORIDE	50	ug/L	U
95-1194	9/21/95	1000008521	95-1150-2	1,1-DICHLOROETHYLENE	25	ug/L	U
95-1195	9/21/95	1000008521	95-1150-2	2-BUTANONE	50	ug/L	U
95-1196	9/21/95	1000008521	95-1150-2	CHLOROFORM	25	ug/L	U
95-1197	9/21/95	1000008521	95-1150-2	1,2-DICHLOROETHANE	25	ug/L	U
95-1198	9/21/95	1000008521	95-1150-2	CARBON TETRACHLORIDE	25	ug/L	U
95-1199	9/21/95	1000008521	95-1150-2	BENZENE	25	ug/L	U
95-1200	9/21/95	1000008521	95-1150-2	TRICHLOROETHYLENE	25	ug/L	U
95-1201	9/21/95	1000008521	95-1150-2	TETRACHLOROETHYLENE	25	ug/L	U
95-1202	9/21/95	1000008521	95-1150-2	CHLOROBENZENE	25	ug/L	U
95-1203	9/21/95	1000008521	95-1150-2	SILVER	50.0	ug/L	U
95-1204	9/21/95	1000008521	95-1150-2	ARSENIC	641	ug/L	-
95-1205	9/21/95	1000008521	95-1150-2	BARIUM	202	ug/L	-
95-1206	9/21/95	1000008521	95-1150-2	CADMIUM	48.2	ug/L	-
95-1207	9/21/95	1000008521	95-1150-2	CHROMIUM	20.0	ug/L	-
95-1208	9/21/95	1000008521	95-1150-2	LEAD	245	ug/L	-
95-1209	9/21/95	1000008521	95-1150-2	SELENIUM	455	ug/L	-
95-1210	9/21/95	1000008521	95-1150-2	MERCURY	0.50	ug/L	U
95-1211	9/21/95	1000008521	95-1150-3	VINYL CHLORIDE	50	ug/L	U
95-1212	9/21/95	1000008521	95-1150-3	1,1-DICHLOROETHYLENE	25	ug/L	U
95-1213	9/21/95	1000008521	95-1150-3	2-BUTANONE	50	ug/L	U
95-1214	9/21/95	1000008521	95-1150-3	CHLOROFORM	25	ug/L	U
95-1215	9/21/95	1000008521	95-1150-3	1,2-DICHLOROETHANE	25	ug/L	U
95-1216	9/21/95	1000008521	95-1150-3	CARBON TETRACHLORIDE	25	ug/L	U
95-1217	9/21/95	1000008521	95-1150-3	BENZENE	25	ug/L	U
95-1218	9/21/95	1000008521	95-1150-3	TRICHLOROETHYLENE	25	ug/L	U
95-1219	9/21/95	1000008521	95-1150-3	TETRACHLOROETHYLENE	25	ug/L	U
95-1220	9/21/95	1000008521	95-1150-3	CHLOROBENZENE	25	ug/L	U
95-1221	9/21/95	1000008521	95-1150-3	SILVER	50.0	ug/L	U

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APPENDIX B-2
WASTE MANAGEMENT AND COMPARABILITY STUDY DATA

WM Project ID	Data Sampled	Release	Sample ID	Parameter	Results	UNITS	Qualifier
95-1222	9/21/95	1000008521	95-1150-3	ARSENIC	590	ug/L	-
95-1223	9/21/95	1000008521	95-1150-3	BARIUM	420	ug/L	-
95-1224	9/21/95	1000008521	95-1150-3	CADMIUM	72.3	ug/L	-
95-1225	9/21/95	1000008521	95-1150-3	CHROMIUM	20.0	ug/L	-
95-1226	9/21/95	1000008521	95-1150-3	LEAD	245	ug/L	-
95-1227	9/21/95	1000008521	95-1150-3	SELENIUM	455	ug/L	-
95-1228	9/21/95	1000008521	95-1150-3	MERCURY	0.50	ug/L	U
95-1229	9/21/95	1000008521	95-1150-4	VINYL CHLORIDE	50	ug/L	U
95-1230	9/21/95	1000008521	95-1150-4	1,1-DICHLOROETHYLENE	25	ug/L	U
95-1231	9/21/95	1000008521	95-1150-4	2-BUTANONE	50	ug/L	U
95-1232	9/21/95	1000008521	95-1150-4	CHLOROFORM	25	ug/L	U
95-1233	9/21/95	1000008521	95-1150-4	1,2-DICHLOROETHANE	25	ug/L	U
95-1234	9/21/95	1000008521	95-1150-4	CARBON TETRACHLORIDE	25	ug/L	U
95-1235	9/21/95	1000008521	95-1150-4	BENZENE	25	ug/L	U
95-1236	9/21/95	1000008521	95-1150-4	TRICHLOROETHYLENE	25	ug/L	U
95-1237	9/21/95	1000008521	95-1150-4	TETRACHLOROETHYLENE	25	ug/L	U
95-1238	9/21/95	1000008521	95-1150-4	CHLOROBENZENE	25	ug/L	U
95-1239	9/21/95	1000008521	95-1150-4	SILVER	50.0	ug/L	U
95-1240	9/21/95	1000008521	95-1150-4	ARSENIC	784	ug/L	-
95-1241	9/21/95	1000008521	95-1150-4	BARIUM	286	ug/L	-
95-1242	9/21/95	1000008521	95-1150-4	CADMIUM	26.7	ug/L	-
95-1243	9/21/95	1000008521	95-1150-4	CHROMIUM	20.0	ug/L	-
95-1244	9/21/95	1000008521	95-1150-4	LEAD	245	ug/L	-
95-1245	9/21/95	1000008521	95-1150-4	SELENIUM	455	ug/L	-
95-1246	9/21/95	1000008521	95-1150-4	MERCURY	0.50	ug/L	U
95-1247	9/21/95	1000008521	95-1150-5	VINYL CHLORIDE	50	ug/L	U
95-1248	9/21/95	1000008521	95-1150-5	1,1-DICHLOROETHYLENE	25	ug/L	U
95-1249	9/21/95	1000008521	95-1150-5	2-BUTANONE	50	ug/L	U
95-1250	9/21/95	1000008521	95-1150-5	CHLOROFORM	25	ug/L	U
95-1251	9/21/95	1000008521	95-1150-5	1,2-DICHLOROETHANE	25	ug/L	U
95-1252	9/21/95	1000008521	95-1150-5	CARBON TETRACHLORIDE	25	ug/L	U
95-1253	9/21/95	1000008521	95-1150-5	BENZENE	25	ug/L	U
95-1254	9/21/95	1000008521	95-1150-5	TRICHLOROETHYLENE	25	ug/L	U
95-1255	9/21/95	1000008521	95-1150-5	TETRACHLOROETHYLENE	25	ug/L	U
95-1256	9/21/95	1000008521	95-1150-5	CHLOROBENZENE	25	ug/L	U
95-1257	9/21/95	1000008521	95-1150-5	SILVER	50.0	ug/L	U
95-1258	9/21/95	1000008521	95-1150-5	ARSENIC	610	ug/L	-

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APPENDIX B-2
WASTE MANAGEMENT AND COMPARABILITY STUDY DATA

WM Project ID	Data Sampled	Release	Sample ID	Parameter	Results	UNITS	Qualifier
95-1259	9/21/95	1000008521	95-1150-5	BARIUM	316	ug/L	-
95-1260	9/21/95	1000008521	95-1150-5	CADMIUM	31.3	ug/L	-
95-1261	9/21/95	1000008521	95-1150-5	CHROMIUM	20.0	ug/L	-
95-1262	9/21/95	1000008521	95-1150-5	LEAD	245	ug/L	-
95-1263	9/21/95	1000008521	95-1150-5	SELENIUM	455	ug/L	-
95-1264	9/21/95	1000008521	95-1150-5	MERCURY	0.50	ug/L	U
95-1265	9/21/95	1000008521	95-1150-TB	VINYL CHLORIDE	50	ug/L	U
95-1266	9/21/95	1000008521	95-1150-TB	1,1-DICHLOROETHYLENE	25	ug/L	U
95-1267	9/21/95	1000008521	95-1150-TB	2-BUTANONE	50	ug/L	U
95-1268	9/21/95	1000008521	95-1150-TB	CHLOROFORM	25	ug/L	U
95-1269	9/21/95	1000008521	95-1150-TB	1,2-DICHLOROETHANE	25	ug/L	U
95-1270	9/21/95	1000008521	95-1150-TB	CARBON TETRACHLORIDE	25	ug/L	U
95-1271	9/21/95	1000008521	95-1150-TB	BENZENE	25	ug/L	U
95-1272	9/21/95	1000008521	95-1150-TB	TRICHLOROETHYLENE	25	ug/L	U
95-1273	9/21/95	1000008521	95-1150-TB	TETRACHLOROETHYLENE	25	ug/L	U
95-1274	9/21/95	1000008521	95-1150-TB	CHLOROBENZENE	25	ug/L	U

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APPENDIX B-2
WASTE MANAGEMENT AND COMPARABILITY STUDY DATA

This table presents the data associated with sampling conducted in the Sludge Drying Beds as part of Part B of the Comparability Study. The locations are all within the Sludge Drying Beds confirming that the Sludge is above WAC.

Sample ID	Location ID	Sample Date	Depth (inches)	Northing	Easting	Parameter	Result	Qualifier	Units
PBC-18-1	PBC-18-1	14-May-97	0 - 4	480061.6	1351774	Radium-226	2.1	NV	pCi/g
PBC-18-1	PBC-18-1	14-May-97	0 - 4	480061.6	1351774	Thorium-232	4.8	NV	pCi/g
PBC-18-1	PBC-18-1	14-May-97	0 - 4	480061.6	1351774	Uranium, Total	1400	NV	mg/kg
PBC-18-1	PBC-18-1	14-May-97	0 - 4	480061.6	1351774	Uranium, Total	1240	NV	mg/kg
PBC-18-1	PBC-18-1	14-May-97	0 - 4	480061.6	1351774	Uranium, Total	1300	NV	mg/kg
PBC-18-1	PBC-18-1	14-May-97	0 - 4	480061.6	1351774	Uranium, Total	1260	NV	mg/kg
PBC-18-2	PBC-18-2	14-May-97	0 - 4	480065.5	1351775	Radium-226	2.3	NV	pCi/g
PBC-18-2	PBC-18-2	14-May-97	0 - 4	480065.5	1351775	Thorium-232	2.5	NV	pCi/g
PBC-18-2	PBC-18-2	14-May-97	0 - 4	480065.5	1351775	Uranium, Total	350	NV	mg/kg
PBC-18-2	PBC-18-2	14-May-97	0 - 4	480065.5	1351775	Uranium, Total	670	NV	mg/kg
PBC-18-2	PBC-18-2	14-May-97	0 - 4	480065.5	1351775	Uranium, Total	610	NV	mg/kg
PBC-18-2	PBC-18-2	14-May-97	0 - 4	480065.5	1351775	Uranium, Total	610	NV	mg/kg
PBC-18-3	PBC-18-3	14-May-97	0 - 4	480061.3	1351778	Radium-226	2.4	NV	pCi/g
PBC-18-3	PBC-18-3	14-May-97	0 - 4	480061.3	1351778	Thorium-232	2.9	NV	pCi/g
PBC-18-3	PBC-18-3	14-May-97	0 - 4	480061.3	1351778	Uranium, Total	550	NV	mg/kg
PBC-18-3	PBC-18-3	14-May-97	0 - 4	480061.3	1351778	Uranium, Total	680	NV	mg/kg
PBC-18-3	PBC-18-3	14-May-97	0 - 4	480061.3	1351778	Uranium, Total	750	NV	mg/kg
PBC-18-3	PBC-18-3	14-May-97	0 - 4	480061.3	1351778	Uranium, Total	670	NV	mg/kg
PBC-18-4	PBC-18-4	14-May-97	0 - 4	480057.9	1351774	Radium-226	2	NV	pCi/L
PBC-18-4	PBC-18-4	14-May-97	0 - 4	480057.9	1351774	Thorium-232	3	NV	pCi/L
PBC-18-4	PBC-18-4	14-May-97	0 - 4	480057.9	1351774	Uranium, Total	520	NV	mg/kg
PBC-18-4	PBC-18-4	14-May-97	0 - 4	480057.9	1351774	Uranium, Total	710	NV	mg/kg
PBC-18-4	PBC-18-4	14-May-97	0 - 4	480057.9	1351774	Uranium, Total	640	NV	mg/kg
PBC-18-4	PBC-18-4	14-May-97	0 - 4	480057.9	1351774	Uranium, Total	660	NV	mg/kg
PBC-18-5	PBC-18-5	14-May-97	0 - 4	480062.2	1351771	Radium-226	2.7	NV	pCi/g
PBC-18-5	PBC-18-5	14-May-97	0 - 4	480062.2	1351771	Thorium-232	5.4	NV	pCi/g
PBC-18-5	PBC-18-5	14-May-97	0 - 4	480062.2	1351771	Uranium, Total	1600	NV	mg/kg
PBC-18-5	PBC-18-5	14-May-97	0 - 4	480062.2	1351771	Uranium, Total	1390	NV	mg/kg

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APPENDIX B-2
WASTE MANAGEMENT AND COMPARABILITY STUDY DATA

Sample ID	Location ID	Sample Date	Depth (inches)	Northing	Easting	Parameter	Result	Qualifier	Units
PBC-18-5	PBC-18-5	14-May-97	0 - 4	480062.2	1351771	Uranium, Total	1500	NV	mg/kg
PBC-18-5	PBC-18-5	14-May-97	0 - 4	480062.2	1351771	Uranium, Total	1520	NV	mg/kg
PBC-18-6	PBC-18-6	14-May-97	0 - 4	480071.4	1351775	Radium-226	2.1	NV	pCi/g
PBC-18-6	PBC-18-6	14-May-97	0 - 4	480071.4	1351775	Thorium-232	3.1	NV	pCi/g
PBC-18-6	PBC-18-6	14-May-97	0 - 4	480071.4	1351775	Uranium, Total	750	NV	mg/kg
PBC-18-6	PBC-18-6	14-May-97	0 - 4	480071.4	1351775	Uranium, Total	650	NV	mg/kg
PBC-18-6	PBC-18-6	14-May-97	0 - 4	480071.4	1351775	Uranium, Total	810	NV	mg/kg
PBC-18-6	PBC-18-6	14-May-97	0 - 4	480071.4	1351775	Uranium, Total	750	NV	mg/kg
PBC-18-7	PBC-18-7	14-May-97	0 - 4	480068.9	1351781	Radium-226	2.7	NV	pCi/g
PBC-18-7	PBC-18-7	14-May-97	0 - 4	480068.9	1351781	Thorium-232	3.8	NV	pCi/g
PBC-18-7	PBC-18-7	14-May-97	0 - 4	480068.9	1351781	Uranium, Total	1950	NV	mg/kg
PBC-18-7	PBC-18-7	14-May-97	0 - 4	480068.9	1351781	Uranium, Total	1700	NV	mg/kg
PBC-18-7	PBC-18-7	14-May-97	0 - 4	480068.9	1351781	Uranium, Total	1960	NV	mg/kg
PBC-18-7	PBC-18-7	14-May-97	0 - 4	480068.9	1351781	Uranium, Total	1800	NV	mg/kg
PBC-18-8	PBC-18-8	14-May-97	0 - 4	480063.7	1351784	Radium-226	3.2	NV	pCi/g
PBC-18-8	PBC-18-8	14-May-97	0 - 4	480063.7	1351784	Thorium-232	6.4	NV	pCi/g
PBC-18-8	PBC-18-8	14-May-97	0 - 4	480063.7	1351784	Uranium, Total	1500	NV	mg/kg
PBC-18-8	PBC-18-8	14-May-97	0 - 4	480063.7	1351784	Uranium, Total	1700	NV	mg/kg
PBC-18-8	PBC-18-8	14-May-97	0 - 4	480063.7	1351784	Uranium, Total	1730	NV	mg/kg
PBC-18-8	PBC-18-8	14-May-97	0 - 4	480063.7	1351784	Uranium, Total	1480	NV	mg/kg
PBC-18-9	PBC-18-9	14-May-97	0 - 4	480057.6	1351783	Radium-226	2.1	NV	pCi/g
PBC-18-9	PBC-18-9	14-May-97	0 - 4	480057.6	1351783	Thorium-232	3.2	NV	pCi/g
PBC-18-9	PBC-18-9	14-May-97	0 - 4	480057.6	1351783	Uranium, Total	570	NV	mg/kg
PBC-18-9	PBC-18-9	14-May-97	0 - 4	480057.6	1351783	Uranium, Total	880	NV	mg/kg
PBC-18-9	PBC-18-9	14-May-97	0 - 4	480057.6	1351783	Uranium, Total	720	NV	mg/kg
PBC-18-9	PBC-18-9	14-May-97	0 - 4	480057.6	1351783	Uranium, Total	860	NV	mg/kg
PBC-18-10	PBC-18-10	14-May-97	0 - 4	480053.2	1351779	Radium-226	2.8	NV	pCi/g
PBC-18-10	PBC-18-10	14-May-97	0 - 4	480053.2	1351779	Thorium-232	3.7	NV	pCi/g
PBC-18-10	PBC-18-10	14-May-97	0 - 4	480053.2	1351779	Uranium, Total	740	NV	mg/kg
PBC-18-10	PBC-18-10	14-May-97	0 - 4	480053.2	1351779	Uranium, Total	890	NV	mg/kg
PBC-18-10	PBC-18-10	14-May-97	0 - 4	480053.2	1351779	Uranium, Total	850	NV	mg/kg

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APPENDIX B-2
WASTE MANAGEMENT AND COMPARABILITY STUDY DATA

Sample ID	Location ID	Sample Date	Depth (inches)	Northing	Easting	Parameter	Result	Qualifier	Units
PBC-18-10	PBC-18-10	14-May-97	0 - 4	480053.2	1351779	Uranium, Total	760	NV	mg/kg
PBC-18-11	PBC-18-11	14-May-97	0 - 4	480051.9	1351774	Cesium-137	2.2	NV	pCi/g
PBC-18-11	PBC-18-11	14-May-97	0 - 4	480051.9	1351774	Radium-226	6.2	NV	pCi/g
PBC-18-11	PBC-18-11	14-May-97	0 - 4	480051.9	1351774	Thorium-232	9	NV	pCi/g
PBC-18-11	PBC-18-11	14-May-97	0 - 4	480051.9	1351774	Uranium, Total	1600	NV	mg/kg
PBC-18-11	PBC-18-11	14-May-97	0 - 4	480051.9	1351774	Uranium, Total	2000	NV	mg/kg
PBC-18-11	PBC-18-11	14-May-97	0 - 4	480051.9	1351774	Uranium, Total	1760	NV	mg/kg
PBC-18-11	PBC-18-11	14-May-97	0 - 4	480051.9	1351774	Uranium, Total	1460	NV	mg/kg
PBC-18-12	PBC-18-12	14-May-97	0 - 4	480054.4	1351768	Radium-226	3.8	NV	pCi/g
PBC-18-12	PBC-18-12	14-May-97	0 - 4	480054.4	1351768	Thorium-232	6.9	NV	pCi/g
PBC-18-12	PBC-18-12	14-May-97	0 - 4	480054.4	1351768	Uranium, Total	1500	NV	mg/kg
PBC-18-12	PBC-18-12	14-May-97	0 - 4	480054.4	1351768	Uranium, Total	1400	NV	mg/kg
PBC-18-12	PBC-18-12	14-May-97	0 - 4	480054.4	1351768	Uranium, Total	1700	NV	mg/kg
PBC-18-12	PBC-18-12	14-May-97	0 - 4	480054.4	1351768	Uranium, Total	1550	NV	mg/kg
PBC-18-13	PBC-18-13	14-May-97	0 - 4	480059.5	1351765	Radium-226	3.1	NV	pCi/g
PBC-18-13	PBC-18-13	14-May-97	0 - 4	480059.5	1351765	Thorium-232	7.8	NV	pCi/g
PBC-18-13	PBC-18-13	14-May-97	0 - 4	480059.5	1351765	Uranium, Total	2200	NV	mg/kg
PBC-18-13	PBC-18-13	14-May-97	0 - 4	480059.5	1351765	Uranium, Total	2000	NV	mg/kg
PBC-18-13	PBC-18-13	14-May-97	0 - 4	480059.5	1351765	Uranium, Total	1930	NV	mg/kg
PBC-18-13	PBC-18-13	14-May-97	0 - 4	480059.5	1351765	Uranium, Total	1870	NV	mg/kg
PBC-18-14	PBC-18-14	14-May-97	0 - 4	480065.6	1351765	Radium-226	2.7	NV	pCi/g
PBC-18-14	PBC-18-14	14-May-97	0 - 4	480065.6	1351765	Thorium-232	4.5	NV	pCi/g
PBC-18-14	PBC-18-14	14-May-97	0 - 4	480065.6	1351765	Uranium, Total	810	NV	mg/kg
PBC-18-14	PBC-18-14	14-May-97	0 - 4	480065.6	1351765	Uranium, Total	1100	NV	mg/kg
PBC-18-14	PBC-18-14	14-May-97	0 - 4	480065.6	1351765	Uranium, Total	890	NV	mg/kg
PBC-18-14	PBC-18-14	14-May-97	0 - 4	480065.6	1351765	Uranium, Total	930	NV	mg/kg
PBC-18-15	PBC-18-15	14-May-97	0 - 4	480070.4	1351769	Radium-226	2.9	NV	pCi/g
PBC-18-15	PBC-18-15	14-May-97	0 - 4	480070.4	1351769	Thorium-232	3.8	NV	pCi/g
PBC-18-15	PBC-18-15	14-May-97	0 - 4	480070.4	1351769	Uranium, Total	860	NV	mg/kg
PBC-18-15	PBC-18-15	14-May-97	0 - 4	480070.4	1351769	Uranium, Total	980	NV	mg/kg
PBC-18-15	PBC-18-15	14-May-97	0 - 4	480070.4	1351769	Uranium, Total	850	NV	mg/kg

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APPENDIX B-2
WASTE MANAGEMENT AND COMPARABILITY STUDY DATA

Sample ID	Location ID	Sample Date	Depth (inches)	Northing	Easting	Parameter	Result	Qualifier	Units
PBC-18-15	PBC-18-15	14-May-97	0 - 4	480070.4	1351769	Uranium, Total	780	NV	mg/kg
PBC-18-16	PBC-18-16	14-May-97	0 - 4	480062.2	1351771	Radium-226	3.2	NV	pCi/g
PBC-18-16	PBC-18-16	14-May-97	0 - 4	480062.2	1351771	Thorium-232	6.3	NV	pCi/g
PBC-18-16	PBC-18-16	14-May-97	0 - 4	480062.2	1351771	Uranium, Total	1300	NV	mg/kg
PBC-18-16	PBC-18-16	14-May-97	0 - 4	480062.2	1351771	Uranium, Total	1700	NV	mg/kg
PBC-18-16	PBC-18-16	14-May-97	0 - 4	480062.2	1351771	Uranium, Total	1480	NV	mg/kg
PBC-18-16	PBC-18-16	14-May-97	0 - 4	480062.2	1351771	Uranium, Total	1380	NV	mg/kg
PBC-19-2	PBC-19-2	14-May-97	0 - 4	480077.8	1351776	Radium-226	2.3	NV	pCi/g
PBC-19-2	PBC-19-2	14-May-97	0 - 4	480077.8	1351776	Thorium-232	2.7	NV	pCi/g
PBC-19-2	PBC-19-2	14-May-97	0 - 4	480077.8	1351776	Uranium, Total	590	NV	mg/kg
PBC-19-2	PBC-19-2	14-May-97	0 - 4	480077.8	1351776	Uranium, Total	670	NV	mg/kg
PBC-19-2	PBC-19-2	14-May-97	0 - 4	480077.8	1351776	Uranium, Total	590	NV	mg/kg
PBC-19-2	PBC-19-2	14-May-97	0 - 4	480077.8	1351776	Uranium, Total	560	NV	mg/kg
PBC-19-3	PBC-19-3	14-May-97	0 - 4	480082.4	1351773	Thorium-232	3	NV	pCi/g
PBC-19-3	PBC-19-3	14-May-97	0 - 4	480082.4	1351773	Uranium, Total	1500	NV	mg/kg
PBC-19-3	PBC-19-3	14-May-97	0 - 4	480082.4	1351773	Uranium, Total	1800	NV	mg/kg
PBC-19-3	PBC-19-3	14-May-97	0 - 4	480082.4	1351773	Uranium, Total	2040	NV	mg/kg
PBC-19-3	PBC-19-3	14-May-97	0 - 4	480082.4	1351773	Uranium, Total	1780	NV	mg/kg
PBC-19-4	PBC-19-4	14-May-97	0 - 4	480085.8	1351777	Radium-226	2.1	NV	pCi/g
PBC-19-4	PBC-19-4	14-May-97	0 - 4	480085.8	1351777	Thorium-232	3.4	NV	pCi/g
PBC-19-4	PBC-19-4	14-May-97	0 - 4	480085.8	1351777	Uranium, Total	800	NV	mg/kg
PBC-19-4	PBC-19-4	14-May-97	0 - 4	480085.8	1351777	Uranium, Total	860	NV	mg/kg
PBC-19-4	PBC-19-4	14-May-97	0 - 4	480085.8	1351777	Uranium, Total	730	NV	mg/kg
PBC-19-4	PBC-19-4	14-May-97	0 - 4	480085.8	1351777	Uranium, Total	790	NV	mg/kg
PBC-19-5	PBC-19-5	14-May-97	0 - 4	480081.5	1351776	Radium-226	2.5	NV	pCi/g
PBC-19-5	PBC-19-5	14-May-97	0 - 4	480081.5	1351776	Thorium-232	4.7	NV	pCi/g
PBC-19-5	PBC-19-5	14-May-97	0 - 4	480081.5	1351776	Uranium, Total	590	NV	mg/kg
PBC-19-5	PBC-19-5	14-May-97	0 - 4	480081.5	1351776	Uranium, Total	870	NV	mg/kg
PBC-19-5	PBC-19-5	14-May-97	0 - 4	480081.5	1351776	Uranium, Total	570	NV	mg/kg
PBC-19-5	PBC-19-5	14-May-97	0 - 4	480081.5	1351776	Uranium, Total	680	NV	mg/kg
PBC-19-6	PBC-19-6	14-May-97	0 - 4	480072.1	1351776	Radium-226	2.1	NV	pCi/g

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APPENDIX B-2
WASTE MANAGEMENT AND COMPARABILITY STUDY DATA

Sample ID	Location ID	Sample Date	Depth (inches)	Northing	Easting	Parameter	Result	Qualifier	Units
PBC-19-6	PBC-19-6	14-May-97	0 - 4	480072.1	1351776	Thorium-232	2.2	NV	pCi/g
PBC-19-6	PBC-19-6	14-May-97	0 - 4	480072.1	1351776	Uranium, Total	460	NV	mg/kg
PBC-19-6	PBC-19-6	14-May-97	0 - 4	480072.1	1351776	Uranium, Total	530	NV	mg/kg
PBC-19-6	PBC-19-6	14-May-97	0 - 4	480072.1	1351776	Uranium, Total	580	NV	mg/kg
PBC-19-6	PBC-19-6	14-May-97	0 - 4	480072.1	1351776	Uranium, Total	410	NV	mg/kg
PBC-19-7	PBC-19-7	14-May-97	0 - 4	480074.6	1351770	Radium-226	2.2	NV	pCi/g
PBC-19-7	PBC-19-7	14-May-97	0 - 4	480074.6	1351770	Thorium-232	2.3	NV	pCi/g
PBC-19-7	PBC-19-7	14-May-97	0 - 4	480074.6	1351770	Uranium, Total	500	NV	mg/kg
PBC-19-7	PBC-19-7	14-May-97	0 - 4	480074.6	1351770	Uranium, Total	640	NV	mg/kg
PBC-19-7	PBC-19-7	14-May-97	0 - 4	480074.6	1351770	Uranium, Total	600	NV	mg/kg
PBC-19-7	PBC-19-7	14-May-97	0 - 4	480074.6	1351770	Uranium, Total	520	NV	mg/kg
PBC-19-8	PBC-19-8	14-May-97	0 - 4	480079.9	1351767	Radium-226	2.6	NV	pCi/g
PBC-19-8	PBC-19-8	14-May-97	0 - 4	480079.9	1351767	Thorium-232	6.2	NV	pCi/g
PBC-19-8	PBC-19-8	14-May-97	0 - 4	480079.9	1351767	Uranium, Total	1000	NV	mg/kg
PBC-19-8	PBC-19-8	14-May-97	0 - 4	480079.9	1351767	Uranium, Total	1600	NV	mg/kg
PBC-19-8	PBC-19-8	14-May-97	0 - 4	480079.9	1351767	Uranium, Total	1360	NV	mg/kg
PBC-19-8	PBC-19-8	14-May-97	0 - 4	480079.9	1351767	Uranium, Total	1220	NV	mg/kg
PBC-19-9	PBC-19-9	14-May-97	0 - 4	480085.8	1351767	Radium-226	1.9	NV	pCi/g
PBC-19-9	PBC-19-9	14-May-97	0 - 4	480085.8	1351767	Thorium-232	4.3	NV	pCi/g
PBC-19-9	PBC-19-9	14-May-97	0 - 4	480085.8	1351767	Uranium, Total	840	NV	mg/kg
PBC-19-9	PBC-19-9	14-May-97	0 - 4	480085.8	1351767	Uranium, Total	1000	NV	mg/kg
PBC-19-9	PBC-19-9	14-May-97	0 - 4	480085.8	1351767	Uranium, Total	990	NV	mg/kg
PBC-19-9	PBC-19-9	14-May-97	0 - 4	480085.8	1351767	Uranium, Total	770	NV	mg/kg
PBC-19-10	PBC-19-10	14-May-97	0 - 4	480090.1	1351771	Radium-226	2	NV	pCi/g
PBC-19-10	PBC-19-10	14-May-97	0 - 4	480090.1	1351771	Thorium-232	3.1	NV	pCi/g
PBC-19-10	PBC-19-10	14-May-97	0 - 4	480090.1	1351771	Uranium, Total	500	NV	mg/kg
PBC-19-10	PBC-19-10	14-May-97	0 - 4	480090.1	1351771	Uranium, Total	620	NV	mg/kg
PBC-19-10	PBC-19-10	14-May-97	0 - 4	480090.1	1351771	Uranium, Total	630	NV	mg/kg
PBC-19-10	PBC-19-10	14-May-97	0 - 4	480090.1	1351771	Uranium, Total	560	NV	mg/kg
PBC-19-11	PBC-19-11	14-May-97	0 - 4	480091.6	1351777	Radium-226	2.4	NV	pCi/g
PBC-19-11	PBC-19-11	14-May-97	0 - 4	480091.6	1351777	Thorium-232	4.2	NV	pCi/g

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APPENDIX B-2
WASTE MANAGEMENT AND COMPARABILITY STUDY DATA

Sample ID	Location ID	Sample Date	Depth (inches)	Northing	Easting	Parameter	Result	Qualifier	Units
PBC-19-11	PBC-19-11	14-May-97	0 - 4	480091.6	1351777	Uranium, Total	600	NV	mg/kg
PBC-19-11	PBC-19-11	14-May-97	0 - 4	480091.6	1351777	Uranium, Total	670	NV	mg/kg
PBC-19-11	PBC-19-11	14-May-97	0 - 4	480091.6	1351777	Uranium, Total	630	NV	mg/kg
PBC-19-11	PBC-19-11	14-May-97	0 - 4	480091.6	1351777	Uranium, Total	570	NV	mg/kg
PBC-19-12	PBC-19-12	14-May-97	0 - 4	480089.2	1351783	Thorium-232	3.1	NV	pCi/g
PBC-19-12	PBC-19-12	14-May-97	0 - 4	480089.2	1351783	Uranium, Total	440	NV	mg/kg
PBC-19-12	PBC-19-12	14-May-97	0 - 4	480089.2	1351783	Uranium, Total	480	NV	mg/kg
PBC-19-12	PBC-19-12	14-May-97	0 - 4	480089.2	1351783	Uranium, Total	480	NV	mg/kg
PBC-19-12	PBC-19-12	14-May-97	0 - 4	480089.2	1351783	Uranium, Total	390	NV	mg/kg
PBC-19-13	PBC-19-13	14-May-97	0 - 4	480084	1351786	Thorium-232	2.8	NV	pCi/g
PBC-19-13	PBC-19-13	14-May-97	0 - 4	480084	1351786	Uranium, Total	340	NV	mg/kg
PBC-19-13	PBC-19-13	14-May-97	0 - 4	480084	1351786	Uranium, Total	630	NV	mg/kg
PBC-19-13	PBC-19-13	14-May-97	0 - 4	480084	1351786	Uranium, Total	610	NV	mg/kg
PBC-19-13	PBC-19-13	14-May-97	0 - 4	480084	1351786	Uranium, Total	500	NV	mg/kg
PBC-19-14	PBC-19-14	14-May-97	0 - 4	480077.8	1351785	Radium-226	3.7	NV	pCi/g
PBC-19-14	PBC-19-14	14-May-97	0 - 4	480077.8	1351785	Thorium-232	2.7	NV	pCi/g
PBC-19-14	PBC-19-14	14-May-97	0 - 4	480077.8	1351785	Uranium, Total	880	NV	mg/kg
PBC-19-14	PBC-19-14	14-May-97	0 - 4	480077.8	1351785	Uranium, Total	860	NV	mg/kg
PBC-19-14	PBC-19-14	14-May-97	0 - 4	480077.8	1351785	Uranium, Total	900	NV	mg/kg
PBC-19-14	PBC-19-14	14-May-97	0 - 4	480077.8	1351785	Uranium, Total	730	NV	mg/kg
PBC-19-15	PBC-19-15	14-May-97	0 - 4	480073.3	1351781	Radium-226	2.2	NV	pCi/g
PBC-19-15	PBC-19-15	14-May-97	0 - 4	480073.3	1351781	Thorium-232	2	NV	pCi/g
PBC-19-15	PBC-19-15	14-May-97	0 - 4	480073.3	1351781	Uranium, Total	900	NV	mg/kg
PBC-19-15	PBC-19-15	14-May-97	0 - 4	480073.3	1351781	Uranium, Total	890	NV	mg/kg
PBC-19-15	PBC-19-15	14-May-97	0 - 4	480073.3	1351781	Uranium, Total	940	NV	mg/kg
PBC-19-15	PBC-19-15	14-May-97	0 - 4	480073.3	1351781	Uranium, Total	750	NV	mg/kg
PBC-19-16	PBC-19-16	14-May-97	0 - 4	480089.2	1351783	Thorium-232	4.1	NV	pCi/g
PBC-19-16	PBC-19-16	14-May-97	0 - 4	480089.2	1351783	Uranium, Total	500	NV	mg/kg
PBC-19-16	PBC-19-16	14-May-97	0 - 4	480089.2	1351783	Uranium, Total	610	NV	mg/kg
PBC-19-16	PBC-19-16	14-May-97	0 - 4	480089.2	1351783	Uranium, Total	480	NV	mg/kg
PBC-19-16	PBC-19-16	14-May-97	0 - 4	480089.2	1351783	Uranium, Total	340	NV	mg/kg

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APPENDIX B-3

TOTAL URANIUM INVESTIGATION IN THE STP AREA

APPENDIX B-3
TOTAL URANIUM INVESTIGATION IN THE STP AREA

SAMPLE POINT	FACTS #	Release	Date	Total U (ppm)	Th228 (pCi/g)	Th232 (pCi/g)	Ra226 (pCi/g)	Ra228 (pCi/g)
A1P2STP-12277-12-R	200307227	14876	4-Sep	1.52	0.59	0.58	0.73	0.58
A1P2STP-12277-16-R	200307228	14876	4-Sep	1.35	0.57	0.58	0.9	0.58
A1P2STP-12277-4-R	200307225	14876	4-Sep	2.54	1.1	1.1	1.2	1.1
A1P2STP-12277-8-R	200307226	14876	4-Sep	1.71	0.62	0.63	0.79	0.63
A1P2STP-12279-16-R-D	200307235	14880	5-Sep	1.56	0.67	0.62	0.8	0.62
A1P2STP-12279-24-R	200307236	14880	5-Sep	1.67	0.68	0.61	0.68	0.61
A1P2STP-12279-8-R	200307233	14880	5-Sep	1.42	0.77	0.79	0.7	0.79
A1P2STP-12280-16-R	200307238	14984	11-Sep	0.997	0.78	0.82	0.95	0.82
A1P2STP-12280-24-R	200307239	14984	11-Sep	1.28	0.85	0.83	1	0.83
A1P2STP-12280-32-R	200307240	14984	12-Sep	1.41	0.63	0.64	0.98	0.64
A1P2STP-12280-8-R	200307237	14984	11-Sep	1.98	1.3	1.2	1.5	1.2
A1P2STP-12281-12-R	200307243	14983	11-Sep	1.03	0.85	0.83	0.83	0.83
A1P2STP-12281-16-R	200307244	14983	11-Sep	1.02	0.57	0.56	0.97	0.56
A1P2STP-12281-4-R	200307241	14983	11-Sep	2.34	1.2	1.1	1.4	1.1
A1P2STP-12281-8-R	200307242	14983	11-Sep	1.49	1.1	1	1.2	1
A1P2STP-12282-16-R	200307247	14982	11-Sep	1.03	0.7	0.75	0.75	0.75
A1P2STP-12282-24-R	200307248	14982	11-Sep	1.55	0.59	0.63	0.95	0.63
A1P2STP-12282-32-R	200307249	14982	11-Sep	3.84	0.64	0.55	0.85	0.55
A1P2STP-12282-40-R	200307250	14982	11-Sep	2.35	0.73	0.76	0.87	0.76
A1P2STP-12282-48-R	200307251	14982	11-Sep	2.85	0.61	0.6	0.92	0.6
A1P2STP-12282-8-R-D	200307246	14982	11-Sep	1.68	1.2	1.1	1.4	1.1
A1P2STP-12283-16-R	200307253	14985	12-Sep	1.18	0.71	0.72	0.99	0.72
A1P2STP-12283-24-R	200307254	14985	12-Sep	1.13	0.46	0.49	0.76	0.49
A1P2STP-12283-32-R	200307255	14985	12-Sep	3.11	0.59	0.61	0.87	0.61
A1P2STP-12283-40-R-D	200307257	14985	12-Sep	0.781	0.25	0.23	0.87	0.23
A1P2STP-12283-50-R	200307258	14985	12-Sep	0.966	0.64	0.67	0.93	0.67
A1P2STP-12283-8-R	200307252	14985	12-Sep	3.56	1.1	1.1	1.3	1.1
A1P2STP-12285-16-R	200307266	15006	8-Sep	1.59	0.58	0.6	0.85	0.6
A1P2STP-12285-25-R-D	200307268	15006	8-Sep	1.39	0.69	0.6	0.84	0.6

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APPENDIX B-3
TOTAL URANIUM INVESTIGATION IN THE STP AREA

SAMPLE POINT	FACTS #	Release	Date	Total U (ppm)	Th228 (pCi/g)	Th232 (pCi/g)	Ra226 (pCi/g)	Ra228 (pCi/g)
A1P2STP-12285-31-R	200307269	15006	8-Sep	1.32	0.48	0.54	0.74	0.54
A1P2STP-12285-40-R	200307270	15006	8-Sep	1.43	0.43	0.45	0.7	0.45
A1P2STP-12285-50-R	200307271	15006	8-Sep	1.61	0.34	0.34	0.67	0.34
A1P2STP-12285-8-R	200307265	15006	8-Sep	1.48	0.88	0.89	0.91	0.89
A1P2STP-12286-16-R	200307273	14963	10-Sep	1.57	0.74	0.74	0.84	0.74
A1P2STP-12286-24-R	200307274	14963	10-Sep	1.75	0.52	0.57	0.79	0.57
A1P2STP-12286-32-R	200307275	14963	10-Sep	1.52	0.58	0.6	0.87	0.6
A1P2STP-12286-40-R	200307276	14963	10-Sep	1.27	0.68	0.59	0.79	0.59
A1P2STP-12286-50-R	200307277	14963	10-Sep	1.57	0.65	0.63	0.88	0.63
A1P2STP-12286-8-R	200307272	14963	10-Sep	3.06	0.84	0.85	1.1	0.85
A1P2STP-12287-16-R	200307280	14979	12-Sep	1.21	0.7	0.74	0.77	0.74
A1P2STP-12287-24-R	200307281	14979	12-Sep	1.34	0.63	0.67	0.82	0.67
A1P2STP-12287-32R	200307282	14979	12-Sep	1.79	0.45	0.49	0.8	0.49
A1P2STP-12287-40-R	200307283	14979	12-Sep	1.64	0.43	0.46	0.82	0.46
A1P2STP-12287-50-R	200307284	14979	12-Sep	1.69	0.5	0.53	0.76	0.53
A1P2STP-12287-8-R-D	200307279	14979	12-Sep	3.45	0.82	0.87	0.8	0.87
A1P2STP-12289-16-R	200307293	14963	10-Sep	2.23	1.1	1	0.71	1
A1P2STP-12289-24-R	200307294	14963	10-Sep	1.46	0.6	0.64	0.92	0.64
A1P2STP-12289-32-R	200307295	14963	10-Sep	2.46	0.61	0.61	0.83	0.61
A1P2STP-12289-40-R	200307296	14963	10-Sep	1.41	0.62	0.66	0.88	0.66
A1P2STP-12289-50-R	200307297	14963	10-Sep	1.41	0.57	0.54	0.69	0.54
A1P2STP-12289-8-R	200307292	14963	9-Sep	2.58	1.3	1.2	1.5	1.2
A1P2STP-12290-16-R	200307299	14996	15-Sep	3.05	0.89	0.89	1.1	0.89
A1P2STP-12290-24-R	200307300	14996	15-Sep	1.06	1.2	1.2	1.8	1.2
A1P2STP-12290-32-R-D	200307302	14996	15-Sep	1.78	0.68	0.7	0.93	0.7
A1P2STP-12290-8-R	200307298	14996	15-Sep	6.94	0.68	0.75	0.88	0.75
A1P2STP-12292-16-R-D	200307313	14880	3-Sep	2.32	0.79	0.87	1	0.87
A1P2STP-12292-24-R	200307314	14880	3-Sep	1.4	0.74	0.81	0.83	0.81
A1P2STP-12292-32-R	200307315	14880	4-Sep	2.49	0.47	0.46	0.76	0.46

000363

APPENDIX B-3
TOTAL URANIUM INVESTIGATION IN THE STP AREA

SAMPLE POINT	FACTS #	Release	Date	Total U (ppm)	Th228 (pCi/g)	Th232 (pCi/g)	Ra226 (pCi/g)	Ra228 (pCi/g)
A1P2STP-12292-41-R	200307316	14880	5-Sep	1.86	0.58	0.61	0.85	0.61
A1P2STP-12292-50-R	200307317	14880	5-Sep	1.71	0.63	0.64	0.97	0.64
A1P2STP-12292-7-R	200307311	14880	3-Sep	7.3	1	1	1.3	1
A1P2STP-12293-16-R	200307319	14996	15-Sep	7.54	1.1	1.2	1.8	1.2
A1P2STP-12293-24-R	200307320	14996	15-Sep	0.723	0.81	0.82	1.1	0.82
A1P2STP-12293-32-R	200307321	14996	15-Sep	0.99	0.67	0.66	0.89	0.66
A1P2STP-12293-40-R	200307322	14996	15-Sep	1.16	0.64	0.65	0.99	0.65
A1P2STP-12293-50-R-D	200307324	14996	15-Sep	1.26	0.67	0.69	0.95	0.69
A1P2STP-12293-8-R	200307318	14996	15-Sep	14.1	0.17	0.18	0.79	0.18
A1P2STP-12295-16-R	200307332	15010	7-Sep	14.1	0.68	0.7	0.76	0.7
A1P2STP-12295-24-R	200307333	15010	10-Sep	1.37	0.64	0.67	0.8	0.67
A1P2STP-12295-32-R-D	200307335	15010	10-Sep	1.32	0.7	0.69	0.94	0.69
A1P2STP-12295-40-R	200307336	15010	10-Sep	1.22	0.7	0.69	0.78	0.69
A1P2STP-12295-50-R	200307337	15010	10-Sep	1.46	0.64	0.66	0.66	0.66
A1P2STP-12295-8-R	200307331	15010	9-Sep	1.16	0.73	0.75	0.74	0.75
A1P2STP-12296-16-R	200307339	14976	11-Sep	1.82	0.79	0.78	0.95	0.78
A1P2STP-12296-24-R	200307340	14976	11-Sep	1.42	0.6	0.54	0.76	0.54
A1P2STP-12296-32R	200307341	14976	11-Sep	1.39	0.46	0.48	0.74	0.48
A1P2STP-12296-40-R	200307343	14976	11-Sep	1.72	0.66	0.65	0.76	0.65
A1P2STP-12296-50-R	200307345	14976	11-Sep	1.2	0.62	0.62	0.83	0.62
A1P2STP-12296-8-R	200307338	14976	11-Sep	1.72	0.99	1	1.1	1

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1728

APPENDIX B-4

TECHNETIUM-99 INVESTIGATION DATA

APPENDIX B-4
Technetium-99 Investigation Data

1728

Tc-99 Contamination Area in STP	Sample ID	Technetium-99 (pCi/g)
Area in Northeastern Corner; not excavated during Removal Action 14	A1P2TC-44-1-R	1.57
	A1P2TC-44-1-R-D	2.46
	A1P2TC-44-2-R	0.554
	A1P2TC-45-1-R	4.91
	A1P2TC-45-2-R	1.28
	A1P2TC-46-1-R	4.14
	A1P2TC-46-2-R	0.533
	A1P2TC-47-1-R	1.49
	A1P2TC-47-2-R	0.358
	A1P2TC-48-1-R	1.29
	A1P2TC-48-2-R	0.474
	A1P2TC-49-1-R	1.53
	A1P2TC-49-1-R-D	2.63
	A1P2TC-49-2-R	0.366
Area in Northern Edge of STP; area not excavated during Removal Action 14	A1P2TC-50-1-R	1.05
	A1P2TC-50-2-R	0.669 (<MDL)
	A1P2TC-51-1-R	1.50
	A1P2TC-51-2-R	1.29
	A1P2TC-52-1-R	2.26
	A1P2TC-52-2-R	1.21
	A1P2TC-53-1-R	0.369 (<MDC)
	A1P2TC-53-2-R	0.937
	A1P2TC-54-1-R	2.71
	A1P2TC-54-2-R	0.73
	A1P2TC-55-1-R	0.98

APPENDIX B-4
Technetium-99 Investigation Data

Tc-99 Contamination Area in STP	Sample ID	Technetium-99 (pCi/g)
	A1P2TC-55-1-R-D	1.42
	A1P2TC-55-2-R	0.94
North Trickling Filter	A1P2TC-56-1-R	**48.3 +/- 9.9**
	A1P2TC-56-2-R	6.56
	A1P2TC-57-1-R	**27.4 +/- 5.7**
	A1P2TC-57-2-R	5.27
	A1P2TC-58-1-R	13.8
	A1P2TC-58-2-R	8.60
	A1P2TC-59-1-R	**40.0 +/- 8.2** **37.6 +/- 7.8 (lab dup)**
	A1P2TC-59-2-R	6.11
	A1P2TC-59-2-R-D	6.51
	A1P2T-C-60-1-R	<0.72
	A1P2TC-61-1-R	23.0 +/- 4.8
	A1P2TC-61-2-R	4.22
	A1P2TC-62-1-R	**22.4 +/- 4.6**
South Trickling Filter	A1P2TC-62-2-R	8.04
	A1P2TC-63-1-R	**39.1 +/- 8.2**
	A1P2TC-63-2-R	12.8
	A1P2TC-64-1-R	**39.0 +/-8.0**
	A1P2TC-64-2-R	*12.1 +/- 2.7*
	A1P2TC-65-1-R	**28.6 +/- 5.9**
	A1P2TC-65-1-R-D	**46.8 +/- 9.7**
	A1P2TC-66-1-R	9.05
	A1P2TC-66-2-R	5.69
	A1P2TC-67-1-R	9.84

APPENDIX B-4
Technetium-99 Investigation Data

Tc-99 Contamination Area in STP	Sample ID	Technetium-99 (pCi/g)
	A1P2TC-67-2-R	4.99
	A1P2TC-68-1-R	5.85
	A1P2TC-68-2-R	4.42
	A1P2TC-69-1-R	21.3 +/- 4.5
	A1P2TC-69-2-R	4.66
	A1P2TC-70-1-R	7.33
	A1P2TC-70-1-R-D	4.37
West of the Primary Settling Basin	A1P2TC-70-2-R	1.62
	A1P2TC-71-1-R	1.76
	A1P2TC-71-2-R	1.38
	A1P2TC-72-1-R	3.29
	A1P2TC-72-2-R	1.21
	A1P2TC-73-1-R	2.26
	A1P2TC-73-2-R	0.662 (<MDC)
	A1P2TC-74-1-R	1.43
	A1P2TC-74-2-R	0.553 (<MDC)
	A1P2TC-75-1-R	2.15
	A1P2TC-75-1-R-D	2.50
	A1P2TC-75-2-R	1.72
	A1P2TC-76-1-R	5.13
	A1P2TC-76-2-R	1.39
	A1P2TC-77-1-R	8.16
	A1P2TC-78-1-R	0.615
Various Areas for STP Area Coverage	A1P2TC-78-2-R	0.803
	A1P2TC-79-1-R	3.53
	A1P2TC-79-2-R	0.434

APPENDIX B-4
Technetium-99 Investigation Data

Tc-99 Contamination Area in STP	Sample ID	Technetium-99 (pCi/g)
	A1P2TC-80-1-R	1.09
	A1P2TC-80-2-R	0.383 (<MDC)
	A1P2TC-81-1-R	1.79
	A1P2TC-81-2-R	1.43
	A1P2TC-82-1-R	0.124 (<MDC)
	A1P2TC-82-2-R	0.150 (<MDC)
	A1P2TC-83-1-R	1.17
	A1P2TC-83-1-R-D	1.52
	A1P2TC-83-2-R	0.731
	A1P2TC-84-1-R	0.0744 (<MDC)
	A1P2TC-84-2-R	0.258 (<MDC)
	A1P2TC-85-1-R	5.74
	A1P2TC-85-2-R	1.23
	A1P2TC-86-1-R	2.62
	A1P2TC-86-2-R	0.875
	A1P2TC-87-1-R	< 0.73
	A1P2TC-87-1-R-D	*<0.76*
	A1P2TC-88-1-R	4.26
	A1P2TC-88-2-R	0.70
	A1P2TC-89-1-R	0.88
	A1P2TC-89-2-R	1.65

APPENDIX B-5

VOC ANALYTES

APPENDIX B-5
PERCHED WATER DATA
SAMPLE IDENTIFIERS, LOCATIONS, DEPTHS, AND ANALYSES

Boring ID Number	Sample ID Number	Easting	Northing	Sample Interval (feet)	Total Uranium (ppm)	Volatile Organic Compounds (ppb)
12118	NA	1351670	480025	NA	NA	NA
12119	A1P2STP-12119-11.5	1351641	480106	11.5-15.5	ND (<9.8)	Acetone 6
	A1P2-12119-11.5-D					ND (<10)
12120	A1P2STP-12120-8	1351725	480115	8.0-12.0	ND (<7.3)	ND (<10)
NA	A1P2STP-12119-T	NA	NA	NA	NA	2-Butanone 6
NA	A1P2STP-12119-X	NA	NA	NA	NA	2-Butanone 6
NA	A1P2STP-12120-T	NA	NA	NA	NA	ND (<10)

APPENDIX B-5
VOC ANALYTES

Analytes	
Chloromethane	Trichloroethene
Vinyl Choride	1,2-Dichloropropane
Bromomethane	Bromodichloromethane
Chloroethane	cis-1,3-Dichloropropene
1,1-Dichloroethene	4-Methyl-2-pentanone
Carbon Disulfide	Toluene
Acetone	trans-1,3-Dichloropropene
Methylene Chloride	1,1,2-Trichloroethane
1,1-Dichloroethane	Tetrachloroethene
1,2-Dichloroethene (total)	2-Hexanone
2-Butanone	Dibromochloromethane
Chloroform	Chlorobenzene
1,1,1-Trichloroethane	Ethylbenzene
Carbon Tetrachloride	Xylene (Total)
Benzene	Styrene
1,2-Dichloroethane	Bromoform
1,1,2,2-Tetrachloroethane	

Note: The detection limit for all of the above compounds is 10 ppb.

APPENDIX B-6

MISCELLANEOUS AREAS INVESTIGATIONS

APPENDIX B-6
MISCELLANEOUS AREAS INVESTIGATIONS

SAMPLE ID	PARAMETER	UNITS	RESULT	UNITS	QUALIFIER
A1P2MIS-114-1-1K	Moisture Content	PERCENT	16.2	PERCENT	
A1P2MIS-114-1-1K	Uranium, Total	ppm dry	6.07	ppm dry	
A1P2MIS-114-1-2K	Moisture Content	PERCENT	15.2	PERCENT	
A1P2MIS-114-1-2K	Uranium, Total	ppm dry	5.16	ppm dry	
A1P2MIS-118-1-1K	Moisture Content	PERCENT	27.8	PERCENT	
A1P2MIS-118-1-1K	Uranium, Total	ppm dry	90.4	ppm dry	
A1P2MIS-118-1-2K	Moisture Content	PERCENT	24.3	PERCENT	
A1P2MIS-118-1-2K	Uranium, Total	ppm dry	52.3	ppm dry	
A1P2MIS-118-1-3K	Moisture Content	PERCENT	29.2	PERCENT	
A1P2MIS-118-1-3K	Uranium, Total	ppm dry	111	ppm dry	
A1P2MIS-118-1-4K	Moisture Content	PERCENT	33	PERCENT	
A1P2MIS-118-1-4K	Uranium, Total	ppm dry	75.1	ppm dry	
A1P2MIS-12310-12-AB	Gross Alpha	pCi/g	4.3	pCi/g	U
A1P2MIS-12310-12-AB	Gross Beta	pCi/g	3.4	pCi/g	U
A1P2MIS-12310-12-M	Antimony	mg/kg	18	mg/kg	U
A1P2MIS-12310-12-M	Arsenic	mg/kg	3.3	mg/kg	
A1P2MIS-12310-12-M	Beryllium	mg/kg	1	mg/kg	
A1P2MIS-12310-12-M	Cadmium	mg/kg	0.5	mg/kg	
A1P2MIS-12310-12-M	Chromium	mg/kg	13	mg/kg	
A1P2MIS-12310-12-M	Copper	mg/kg	19.6	mg/kg	
A1P2MIS-12310-12-M	Lead	mg/kg	7	mg/kg	U
A1P2MIS-12310-12-M	Manganese	mg/kg	398	mg/kg	
A1P2MIS-12310-12-M	Mercury	mg/kg	0.02	mg/kg	
A1P2MIS-12310-12-M	Nickel	mg/kg	18.5	mg/kg	
A1P2MIS-12310-12-M	Zinc	mg/kg	39.5	mg/kg	
A1P2MIS-12310-12-R	Moisture Content	PERCENT	13.5	PERCENT	
A1P2MIS-12310-12-R	Radium-226	pCi/g dry	0.77	pCi/g dry	
A1P2MIS-12310-12-R	Radium-228	pCi/g dry	0.69	pCi/g dry	
A1P2MIS-12310-12-R	Thorium-228	pCi/g	0.41	pCi/g	
A1P2MIS-12310-12-R	Thorium-230	pCi/g	0.34	pCi/g	
A1P2MIS-12310-12-R	Thorium-232	pCi/g	0.37	pCi/g	
A1P2MIS-12310-12-R	Uranium, Total	ppm dry	3.4	ppm dry	
A1P2MIS-12310-15-R	Moisture Content	PERCENT	21.8	PERCENT	
A1P2MIS-12310-15-R	Uranium, Total	ppm dry	1.55	ppm dry	
A1P2MIS-12310-18-R	Moisture Content	PERCENT	15.1	PERCENT	
A1P2MIS-12310-18-R	Uranium, Total	ppm dry	1.35	ppm dry	
A1P2MIS-12310-6-R	Moisture Content	PERCENT	13.1	PERCENT	
A1P2MIS-12310-6-R	Uranium, Total	ppm dry	1.56	ppm dry	
A1P2MIS-12310-9-AB	Gross Alpha	pCi/g	6.1	pCi/g	U
A1P2MIS-12310-9-AB	Gross Beta	pCi/g	13	pCi/g	U
A1P2MIS-12310-9-L	1,1,1-Trichloroethan	ug/L	12	ug/L	U
A1P2MIS-12310-9-L	1,1,2,2-Tetrachloroe	ug/L	12	ug/L	U

APPENDIX B-6
MISCELLANEOUS AREAS INVESTIGATIONS

SAMPLE ID	PARAMETER	UNITS	RESULT	UNITS	QUALIFIER
A1P2MIS-12310-9-L	1,1,2-Trichloroethan	ug/L	12	ug/L	U
A1P2MIS-12310-9-L	1,1-Dichloroethane	ug/L	12	ug/L	U
A1P2MIS-12310-9-L	1,1-Dichloroethene	ug/L	12	ug/L	U
A1P2MIS-12310-9-L	1,2-Dichloroethane	ug/L	12	ug/L	U
A1P2MIS-12310-9-L	1,2-Dichloroethene (	ug/L	12	ug/L	U
A1P2MIS-12310-9-L	1,2-Dichloropropane	ug/L	12	ug/L	U
A1P2MIS-12310-9-L	2-Butanone	ug/L	12	ug/L	U
A1P2MIS-12310-9-L	2-Hexanone	ug/L	12	ug/L	U
A1P2MIS-12310-9-L	4-Methyl-2-pentanon	ug/L	12	ug/L	U
A1P2MIS-12310-9-L	Acetone	ug/L	12	ug/L	U
A1P2MIS-12310-9-L	Benzene	ug/L	12	ug/L	U
A1P2MIS-12310-9-L	Bromodichlorometha	ug/L	12	ug/L	U
A1P2MIS-12310-9-L	Bromoform	ug/L	12	ug/L	U
A1P2MIS-12310-9-L	Bromomethane	ug/L	12	ug/L	U
A1P2MIS-12310-9-L	Carbon disulfide	ug/L	12	ug/L	U
A1P2MIS-12310-9-L	Carbon Tetrachloride	ug/L	12	ug/L	U
A1P2MIS-12310-9-L	Chlorobenzene	ug/L	12	ug/L	U
A1P2MIS-12310-9-L	Chloroethane	ug/L	12	ug/L	U
A1P2MIS-12310-9-L	Chloroform	ug/L	12	ug/L	U
A1P2MIS-12310-9-L	Chloromethane	ug/L	12	ug/L	U
A1P2MIS-12310-9-L	cis-1,3-Dichloroprop	ug/L	12	ug/L	U
A1P2MIS-12310-9-L	Dibromochlorometha	ug/L	12	ug/L	U
A1P2MIS-12310-9-L	Ethylbenzene	ug/L	12	ug/L	U
A1P2MIS-12310-9-L	Methylene chloride	ug/L	12	ug/L	U
A1P2MIS-12310-9-L	Styrene	ug/L	12	ug/L	U
A1P2MIS-12310-9-L	Tetrachloroethene	ug/L	12	ug/L	U
A1P2MIS-12310-9-L	Toluene	ug/L	12	ug/L	U
A1P2MIS-12310-9-L	trans-1,3-Dichloropr	ug/L	12	ug/L	U
A1P2MIS-12310-9-L	Trichloroethene	ug/L	12	ug/L	U
A1P2MIS-12310-9-L	Vinyl chloride	ug/L	12	ug/L	U
A1P2MIS-12310-9-L	Xylenes, Total	ug/L	12	ug/L	U
A1P2MIS-12310-9-M	Antimony	mg/kg	18	mg/kg	U
A1P2MIS-12310-9-M	Arsenic	mg/kg	4.1	mg/kg	
A1P2MIS-12310-9-M	Beryllium	mg/kg	1.2	mg/kg	
A1P2MIS-12310-9-M	Cadmium	mg/kg	0.3	mg/kg	U
A1P2MIS-12310-9-M	Chromium	mg/kg	14.4	mg/kg	
A1P2MIS-12310-9-M	Copper	mg/kg	19.7	mg/kg	
A1P2MIS-12310-9-M	Lead	mg/kg	13.4	mg/kg	
A1P2MIS-12310-9-M	Manganese	mg/kg	441	mg/kg	
A1P2MIS-12310-9-M	Mercury	mg/kg	0.04	mg/kg	
A1P2MIS-12310-9-M	Nickel	mg/kg	22.4	mg/kg	
A1P2MIS-12310-9-M	Zinc	mg/kg	42.7	mg/kg	

SAMPLE ID	PARAMETER	UNITS	RESULT	UNITS	QUALIFIER
A1P2MIS-12310-9-R	Moisture Content	PERCENT	15.5	PERCENT	
A1P2MIS-12310-9-R	Radium-226	pCi/g dry	0.93	pCi/g dry	
A1P2MIS-12310-9-R	Radium-228	pCi/g dry	0.69	pCi/g dry	
A1P2MIS-12310-9-R	Thorium-228	pCi/g	0.51	pCi/g	
A1P2MIS-12310-9-R	Thorium-230	pCi/g	0.46	pCi/g	
A1P2MIS-12310-9-R	Thorium-232	pCi/g	0.45	pCi/g	
A1P2MIS-12311-10-R	Moisture Content	PERCENT	15.3	PERCENT	
A1P2MIS-12311-10-R	Uranium, Total	ppm dry	1.57	ppm dry	
A1P2MIS-12311-13-AB	Gross Alpha	pCi/g	5	pCi/g	U
A1P2MIS-12311-13-AB	Gross Beta	pCi/g	8.9	pCi/g	U
A1P2MIS-12311-13-L	1,1,1-Trichloroethan	ug/kg	12	ug/kg	U
A1P2MIS-12311-13-L	1,1,2,2-Tetrachloroe	ug/kg	12	ug/kg	U
A1P2MIS-12311-13-L	1,1,2-Trichloroethan	ug/kg	12	ug/kg	U
A1P2MIS-12311-13-L	1,1-Dichloroethane	ug/kg	12	ug/kg	U
A1P2MIS-12311-13-L	1,1-Dichloroethene	ug/kg	12	ug/kg	U
A1P2MIS-12311-13-L	1,2-Dichloroethane	ug/kg	12	ug/kg	U
A1P2MIS-12311-13-L	1,2-Dichloroethene (	ug/kg	12	ug/kg	U
A1P2MIS-12311-13-L	1,2-Dichloropropane	ug/kg	12	ug/kg	U
A1P2MIS-12311-13-L	2-Butanone	ug/kg	12	ug/kg	U
A1P2MIS-12311-13-L	2-Hexanone	ug/kg	12	ug/kg	U
A1P2MIS-12311-13-L	4-Methyl-2-pentanon	ug/kg	12	ug/kg	U
A1P2MIS-12311-13-L	Acetone	ug/kg	12	ug/kg	U
A1P2MIS-12311-13-L	Benzene	ug/kg	12	ug/kg	U
A1P2MIS-12311-13-L	Bromodichlorometha	ug/kg	12	ug/kg	U
A1P2MIS-12311-13-L	Bromoform	ug/kg	12	ug/kg	U
A1P2MIS-12311-13-L	Bromomethane	ug/kg	12	ug/kg	U
A1P2MIS-12311-13-L	Carbon disulfide	ug/kg	12	ug/kg	U
A1P2MIS-12311-13-L	Carbon Tetrachloride	ug/kg	12	ug/kg	U
A1P2MIS-12311-13-L	Chlorobenzene	ug/kg	12	ug/kg	U
A1P2MIS-12311-13-L	Chloroethane	ug/kg	12	ug/kg	U
A1P2MIS-12311-13-L	Chloroform	ug/kg	12	ug/kg	U
A1P2MIS-12311-13-L	Chloromethane	ug/kg	12	ug/kg	U
A1P2MIS-12311-13-L	cis-1,3-Dichloroprop	ug/kg	12	ug/kg	U
A1P2MIS-12311-13-L	Dibromochlorometha	ug/kg	12	ug/kg	U
A1P2MIS-12311-13-L	Ethylbenzene	ug/kg	12	ug/kg	U
A1P2MIS-12311-13-L	Methylene chloride	ug/kg	12	ug/kg	U
A1P2MIS-12311-13-L	Styrene	ug/kg	12	ug/kg	U
A1P2MIS-12311-13-L	Tetrachloroethene	ug/kg	12	ug/kg	U
A1P2MIS-12311-13-L	Toluene	ug/kg	12	ug/kg	U
A1P2MIS-12311-13-L	trans-1,3-Dichloropr	ug/kg	12	ug/kg	U
A1P2MIS-12311-13-L	Trichloroethene	ug/kg	12	ug/kg	U
A1P2MIS-12311-13-L	Vinyl chloride	ug/kg	12	ug/kg	U

APPENDIX B-6
MISCELLANEOUS AREAS INVESTIGATIONS

SAMPLE ID	PARAMETER	UNITS	RESULT	UNITS	QUALIFIER
A1P2MIS-12311-13-L	Xylenes, Total	ug/kg	12	ug/kg	U
A1P2MIS-12311-13-M	Antimony	mg/kg	18	mg/kg	U
A1P2MIS-12311-13-M	Arsenic	mg/kg	4.1	mg/kg	
A1P2MIS-12311-13-M	Beryllium	mg/kg	1	mg/kg	
A1P2MIS-12311-13-M	Cadmium	mg/kg	0.5	mg/kg	
A1P2MIS-12311-13-M	Chromium	mg/kg	14.4	mg/kg	
A1P2MIS-12311-13-M	Copper	mg/kg	18.7	mg/kg	
A1P2MIS-12311-13-M	Lead	mg/kg	7.8	mg/kg	
A1P2MIS-12311-13-M	Manganese	mg/kg	540	mg/kg	
A1P2MIS-12311-13-M	Mercury	mg/kg	0.02	mg/kg	
A1P2MIS-12311-13-M	Nickel	mg/kg	16.9	mg/kg	
A1P2MIS-12311-13-M	Zinc	mg/kg	42.9	mg/kg	
A1P2MIS-12311-13-R	Moisture Content	PERCENT	13.3	PERCENT	
A1P2MIS-12311-13-R	Radium-226	pCi/g dry	0.88	pCi/g dry	
A1P2MIS-12311-13-R	Radium-228	pCi/g dry	0.81	pCi/g dry	
A1P2MIS-12311-13-R	Thorium-228	pCi/g	0.51	pCi/g	
A1P2MIS-12311-13-R	Thorium-230	pCi/g	0.49	pCi/g	
A1P2MIS-12311-13-R	Thorium-232	pCi/g	0.49	pCi/g	
A1P2MIS-12311-13-R	Uranium, Total	ppm dry	3	ppm dry	
A1P2MIS-12311-16-AB	Gross Alpha	pCi/g	2	pCi/g	U
A1P2MIS-12311-16-AB	Gross Beta	pCi/g	16	pCi/g	
A1P2MIS-12311-16-L	1,1,1-Trichloroethan	ug/kg	11	ug/kg	U
A1P2MIS-12311-16-L	1,1,2,2-Tetrachloroe	ug/kg	11	ug/kg	U
A1P2MIS-12311-16-L	1,1,2-Trichloroethan	ug/kg	11	ug/kg	U
A1P2MIS-12311-16-L	1,1-Dichloroethane	ug/kg	11	ug/kg	U
A1P2MIS-12311-16-L	1,1-Dichloroethene	ug/kg	11	ug/kg	U
A1P2MIS-12311-16-L	1,2-Dichloroethane	ug/kg	11	ug/kg	U
A1P2MIS-12311-16-L	1,2-Dichloroethene (T	ug/kg	11	ug/kg	U
A1P2MIS-12311-16-L	1,2-Dichloropropane	ug/kg	11	ug/kg	U
A1P2MIS-12311-16-L	2-Butanone	ug/kg	11	ug/kg	U
A1P2MIS-12311-16-L	2-Hexanone	ug/kg	11	ug/kg	U
A1P2MIS-12311-16-L	4-Methyl-2-pentanon	ug/kg	11	ug/kg	U
A1P2MIS-12311-16-L	Acetone	ug/kg	11	ug/kg	U
A1P2MIS-12311-16-L	Benzene	ug/kg	11	ug/kg	U
A1P2MIS-12311-16-L	Bromodichlorometha	ug/kg	11	ug/kg	U
A1P2MIS-12311-16-L	Bromoform	ug/kg	11	ug/kg	U
A1P2MIS-12311-16-L	Bromomethane	ug/kg	11	ug/kg	U
A1P2MIS-12311-16-L	Carbon disulfide	ug/kg	11	ug/kg	U
A1P2MIS-12311-16-L	Carbon Tetrachloride	ug/kg	11	ug/kg	U
A1P2MIS-12311-16-L	Chlorobenzene	ug/kg	11	ug/kg	U
A1P2MIS-12311-16-L	Chloroethane	ug/kg	11	ug/kg	U
A1P2MIS-12311-16-L	Chloroform	ug/kg	11	ug/kg	U

APPENDIX B-6
MISCELLANEOUS AREAS INVESTIGATIONS

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SAMPLE ID	PARAMETER	UNITS	RESULT	UNITS	QUALIFIER
A1P2MIS-12311-16-L	Chloromethane	ug/kg	11	ug/kg	U
A1P2MIS-12311-16-L	cis-1,3-Dichloroprop	ug/kg	11	ug/kg	U
A1P2MIS-12311-16-L	Dibromochlorometha	ug/kg	11	ug/kg	U
A1P2MIS-12311-16-L	Ethylbenzene	ug/kg	11	ug/kg	U
A1P2MIS-12311-16-L	Methylene chloride	ug/kg	11	ug/kg	U
A1P2MIS-12311-16-L	Styrene	ug/kg	11	ug/kg	U
A1P2MIS-12311-16-L	Tetrachloroethene	ug/kg	11	ug/kg	U
A1P2MIS-12311-16-L	Toluene	ug/kg	11	ug/kg	U
A1P2MIS-12311-16-L	trans-1,3-Dichloropr	ug/kg	11	ug/kg	U
A1P2MIS-12311-16-L	Trichloroethene	ug/kg	11	ug/kg	U
A1P2MIS-12311-16-L	Vinyl chloride	ug/kg	11	ug/kg	U
A1P2MIS-12311-16-L	Xylenes, Total	ug/kg	11	ug/kg	U
A1P2MIS-12311-16-M	Antimony	mg/kg	18	mg/kg	U
A1P2MIS-12311-16-M	Arsenic	mg/kg	3	mg/kg	
A1P2MIS-12311-16-M	Beryllium	mg/kg	1.2	mg/kg	
A1P2MIS-12311-16-M	Cadmium	mg/kg	0.6	mg/kg	
A1P2MIS-12311-16-M	Chromium	mg/kg	15.8	mg/kg	
A1P2MIS-12311-16-M	Copper	mg/kg	18.1	mg/kg	
A1P2MIS-12311-16-M	Lead	mg/kg	11.2	mg/kg	
A1P2MIS-12311-16-M	Manganese	mg/kg	472	mg/kg	
A1P2MIS-12311-16-M	Mercury	mg/kg	0.02	mg/kg	
A1P2MIS-12311-16-M	Nickel	mg/kg	20.1	mg/kg	
A1P2MIS-12311-16-M	Zinc	mg/kg	44.1	mg/kg	
A1P2MIS-12311-16-R	Moisture Content	PERCENT	12.3	PERCENT	
A1P2MIS-12311-16-R	Radium-226	pCi/g dry	0.78	pCi/g dry	
A1P2MIS-12311-16-R	Radium-228	pCi/g dry	0.85	pCi/g dry	
A1P2MIS-12311-16-R	Thorium-228	pCi/g	0.53	pCi/g	
A1P2MIS-12311-16-R	Thorium-230	pCi/g	0.51	pCi/g	
A1P2MIS-12311-16-R	Thorium-232	pCi/g	0.51	pCi/g	
A1P2MIS-12311-16-R	Uranium, Total	ppm dry	3.1	ppm dry	
A1P2MIS-12311-19-R	Moisture Content	PERCENT	11.3	PERCENT	
A1P2MIS-12311-19-R	Uranium, Total	ppm dry	1.52	ppm dry	
A1P2MIS-12311-22-R	Moisture Content	PERCENT	10.5	PERCENT	
A1P2MIS-12311-22-R	Uranium, Total	ppm dry	1.83	ppm dry	
A1P2MIS-123-1-1K	Moisture Content	PERCENT	18.4	PERCENT	
A1P2MIS-123-1-1K	Uranium, Total	ppm dry	7.6	ppm dry	
A1P2MIS-12312-14-R	Moisture Content	PERCENT	18.7	PERCENT	
A1P2MIS-12312-14-R	Uranium, Total	ppm dry	1.51	ppm dry	
A1P2MIS-12312-17-R	Moisture Content	PERCENT	13.7	PERCENT	
A1P2MIS-12312-17-R	Uranium, Total	ppm dry	1.75	ppm dry	
A1P2MIS-12312-20-AB	Gross Alpha	pCi/g	20	pCi/g	
A1P2MIS-12312-20-AB	Gross Beta	pCi/g	34	pCi/g	

APPENDIX B-6
MISCELLANEOUS AREAS INVESTIGATIONS

SAMPLE ID	PARAMETER	UNITS	RESULT	UNITS	QUALIFIER
A1P2MIS-12312-20-L	1,1,1-Trichloroethan	ug/kg	12	ug/kg	U
A1P2MIS-12312-20-L	1,1,2,2-Tetrachloroe	ug/kg	12	ug/kg	U
A1P2MIS-12312-20-L	1,1,2-Trichloroethan	ug/kg	12	ug/kg	U
A1P2MIS-12312-20-L	1,1-Dichloroethane	ug/kg	12	ug/kg	U
A1P2MIS-12312-20-L	1,1-Dichloroethene	ug/kg	12	ug/kg	U
A1P2MIS-12312-20-L	1,2-Dichloroethane	ug/kg	12	ug/kg	U
A1P2MIS-12312-20-L	1,2-Dichloroethene (	ug/kg	12	ug/kg	U
A1P2MIS-12312-20-L	1,2-Dichloropropane	ug/kg	12	ug/kg	U
A1P2MIS-12312-20-L	2-Butanone	ug/kg	12	ug/kg	U
A1P2MIS-12312-20-L	2-Hexanone	ug/kg	12	ug/kg	U
A1P2MIS-12312-20-L	4-Methyl-2-pentanon	ug/kg	12	ug/kg	U
A1P2MIS-12312-20-L	Acetone	ug/kg	12	ug/kg	U
A1P2MIS-12312-20-L	Benzene	ug/kg	12	ug/kg	U
A1P2MIS-12312-20-L	Bromodichlorometha	ug/kg	12	ug/kg	U
A1P2MIS-12312-20-L	Bromoform	ug/kg	12	ug/kg	U
A1P2MIS-12312-20-L	Bromomethane	ug/kg	12	ug/kg	U
A1P2MIS-12312-20-L	Carbon disulfide	ug/kg	12	ug/kg	U
A1P2MIS-12312-20-L	Carbon Tetrachloride	ug/kg	12	ug/kg	U
A1P2MIS-12312-20-L	Chlorobenzene	ug/kg	12	ug/kg	U
A1P2MIS-12312-20-L	Chloroethane	ug/kg	12	ug/kg	U
A1P2MIS-12312-20-L	Chloroform	ug/kg	12	ug/kg	U
A1P2MIS-12312-20-L	Chloromethane	ug/kg	12	ug/kg	U
A1P2MIS-12312-20-L	cis-1,3-Dichloroprop	ug/kg	12	ug/kg	U
A1P2MIS-12312-20-L	Dibromochlorometha	ug/kg	12	ug/kg	U
A1P2MIS-12312-20-L	Ethylbenzene	ug/kg	12	ug/kg	U
A1P2MIS-12312-20-L	Methylene chloride	ug/kg	12	ug/kg	U
A1P2MIS-12312-20-L	Styrene	ug/kg	12	ug/kg	U
A1P2MIS-12312-20-L	Tetrachloroethene	ug/kg	12	ug/kg	U
A1P2MIS-12312-20-L	Toluene	ug/kg	12	ug/kg	U
A1P2MIS-12312-20-L	trans-1,3-Dichloropr	ug/kg	12	ug/kg	U
A1P2MIS-12312-20-L	Trichloroethene	ug/kg	12	ug/kg	U
A1P2MIS-12312-20-L	Vinyl chloride	ug/kg	12	ug/kg	U
A1P2MIS-12312-20-L	Xylenes, Total	ug/kg	12	ug/kg	U
A1P2MIS-12312-20-M	Antimony	mg/kg	16	mg/kg	U
A1P2MIS-12312-20-M	Arsenic	mg/kg	3.26	mg/kg	
A1P2MIS-12312-20-M	Beryllium	mg/kg	1	mg/kg	
A1P2MIS-12312-20-M	Cadmium	mg/kg	1	mg/kg	U
A1P2MIS-12312-20-M	Chromium	mg/kg	12.3	mg/kg	
A1P2MIS-12312-20-M	Copper	mg/kg	14.8	mg/kg	
A1P2MIS-12312-20-M	Lead	mg/kg	15.6	mg/kg	
A1P2MIS-12312-20-M	Manganese	mg/kg	420	mg/kg	
A1P2MIS-12312-20-M	Mercury	mg/kg	0.03	mg/kg	

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SAMPLE ID	PARAMETER	UNITS	RESULT	UNITS	QUALIFIER
A1P2MIS-12312-20-M	Nickel	mg/kg	18	mg/kg	
A1P2MIS-12312-20-M	Zinc	mg/kg	39.5	mg/kg	
A1P2MIS-12312-20-R	Moisture Content	PERCENT	13.5	PERCENT	
A1P2MIS-12312-20-R	Radium-226	pCi/g dry	1.1	pCi/g dry	
A1P2MIS-12312-20-R	Radium-228	pCi/g dry	0.8	pCi/g dry	
A1P2MIS-12312-20-R	Thorium-228	pCi/g	0.6	pCi/g	
A1P2MIS-12312-20-R	Thorium-230	pCi/g	0.49	pCi/g	
A1P2MIS-12312-20-R	Thorium-232	pCi/g	0.53	pCi/g	
A1P2MIS-12312-20-R	Uranium, Total	ppm dry	4	ppm dry	
A1P2MIS-12312-23-AB	Gross Alpha	pCi/g	8.5	pCi/g	U
A1P2MIS-12312-23-AB	Gross Beta	pCi/g	10	pCi/g	U
A1P2MIS-12312-23-L	1,1,1-Trichloroethan	ug/kg	11	ug/kg	U
A1P2MIS-12312-23-L	1,1,2,2-Tetrachloroet	ug/kg	11	ug/kg	U
A1P2MIS-12312-23-L	1,1,2-Trichloroethan	ug/kg	11	ug/kg	U
A1P2MIS-12312-23-L	1,1-Dichloroethane	ug/kg	11	ug/kg	U
A1P2MIS-12312-23-L	1,1-Dichloroethene	ug/kg	11	ug/kg	U
A1P2MIS-12312-23-L	1,2-Dichloroethane	ug/kg	11	ug/kg	U
A1P2MIS-12312-23-L	1,2-Dichloroethene (T	ug/kg	11	ug/kg	U
A1P2MIS-12312-23-L	1,2-Dichloropropane	ug/kg	11	ug/kg	U
A1P2MIS-12312-23-L	2-Butanone	ug/kg	11	ug/kg	U
A1P2MIS-12312-23-L	2-Hexanone	ug/kg	11	ug/kg	U
A1P2MIS-12312-23-L	4-Methyl-2-pentanon	ug/kg	11	ug/kg	U
A1P2MIS-12312-23-L	Acetone	ug/kg	11	ug/kg	U
A1P2MIS-12312-23-L	Benzene	ug/kg	11	ug/kg	U
A1P2MIS-12312-23-L	Bromodichlorometha	ug/kg	11	ug/kg	U
A1P2MIS-12312-23-L	Bromoform	ug/kg	11	ug/kg	U
A1P2MIS-12312-23-L	Bromomethane	ug/kg	11	ug/kg	U
A1P2MIS-12312-23-L	Carbon disulfide	ug/kg	11	ug/kg	U
A1P2MIS-12312-23-L	Carbon Tetrachloride	ug/kg	11	ug/kg	U
A1P2MIS-12312-23-L	Chlorobenzene	ug/kg	11	ug/kg	U
A1P2MIS-12312-23-L	Chloroethane	ug/kg	11	ug/kg	U
A1P2MIS-12312-23-L	Chloroform	ug/kg	11	ug/kg	U
A1P2MIS-12312-23-L	Chloromethane	ug/kg	11	ug/kg	U
A1P2MIS-12312-23-L	cis-1,3-Dichloroprop	ug/kg	11	ug/kg	U
A1P2MIS-12312-23-L	Dibromochlorometha	ug/kg	11	ug/kg	U
A1P2MIS-12312-23-L	Ethylbenzene	ug/kg	11	ug/kg	U
A1P2MIS-12312-23-L	Methylene chloride	ug/kg	11	ug/kg	U
A1P2MIS-12312-23-L	Styrene	ug/kg	11	ug/kg	U
A1P2MIS-12312-23-L	Tetrachloroethene	ug/kg	11	ug/kg	U
A1P2MIS-12312-23-L	Toluene	ug/kg	11	ug/kg	U
A1P2MIS-12312-23-L	trans-1,3-Dichloropr	ug/kg	11	ug/kg	U
A1P2MIS-12312-23-L	Trichloroethene	ug/kg	11	ug/kg	U

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APPENDIX B-6
MISCELLANEOUS AREAS INVESTIGATIONS

SAMPLE ID	PARAMETER	UNITS	RESULT	UNITS	QUALIFIER
A1P2MIS-12312-23-L	Vinyl chloride	ug/kg	11	ug/kg	U
A1P2MIS-12312-23-L	Xylenes, Total	ug/kg	11	ug/kg	U
A1P2MIS-12312-23-M	Antimony	mg/kg	16	mg/kg	U
A1P2MIS-12312-23-M	Arsenic	mg/kg	3.45	mg/kg	
A1P2MIS-12312-23-M	Beryllium	mg/kg	1	mg/kg	U
A1P2MIS-12312-23-M	Cadmium	mg/kg	1	mg/kg	U
A1P2MIS-12312-23-M	Chromium	mg/kg	11.4	mg/kg	
A1P2MIS-12312-23-M	Copper	mg/kg	14.8	mg/kg	
A1P2MIS-12312-23-M	Lead	mg/kg	12.5	mg/kg	
A1P2MIS-12312-23-M	Manganese	mg/kg	405	mg/kg	
A1P2MIS-12312-23-M	Mercury	mg/kg	0.02	mg/kg	
A1P2MIS-12312-23-M	Nickel	mg/kg	18	mg/kg	
A1P2MIS-12312-23-M	Zinc	mg/kg	36.4	mg/kg	
A1P2MIS-12312-23-R	Moisture Content	PERCENT	13	PERCENT	
A1P2MIS-12312-23-R	Radium-226	pCi/g dry	0.95	pCi/g dry	
A1P2MIS-12312-23-R	Radium-228	pCi/g dry	0.84	pCi/g dry	
A1P2MIS-12312-23-R	Thorium-228	pCi/g	0.53	pCi/g	
A1P2MIS-12312-23-R	Thorium-230	pCi/g	0.48	pCi/g	
A1P2MIS-12312-23-R	Thorium-232	pCi/g	0.49	pCi/g	
A1P2MIS-12312-23-R	Uranium, Total	ppm dry	2.6	ppm dry	U
A1P2MIS-12312-26-R	Moisture Content	PERCENT	12.3	PERCENT	
A1P2MIS-12312-26-R	Uranium, Total	ppm dry	1.38	ppm dry	
A1P2MIS-12312-29-R	Moisture Content	PERCENT	12.7	PERCENT	
A1P2MIS-12312-29-R	Uranium, Total	ppm dry	1.44	ppm dry	
A1P2MIS-123-1-2K	Moisture Content	PERCENT	24	PERCENT	
A1P2MIS-123-1-2K	Uranium, Total	ppm dry	25.2	ppm dry	
A1P2MIS-12313-16-R	Moisture Content	PERCENT	18.7	PERCENT	
A1P2MIS-12313-16-R	Uranium, Total	ppm dry	1.77	ppm dry	
A1P2MIS-12313-19-R	Moisture Content	PERCENT	15.7	PERCENT	
A1P2MIS-12313-19-R	Uranium, Total	ppm dry	1.34	ppm dry	
A1P2MIS-12313-22-AB	Gross Alpha	pCi/g	27	pCi/g	
A1P2MIS-12313-22-AB	Gross Beta	pCi/g	32	pCi/g	
A1P2MIS-12313-22-M	Antimony	mg/kg	16	mg/kg	U
A1P2MIS-12313-22-M	Arsenic	mg/kg	2.48	mg/kg	
A1P2MIS-12313-22-M	Beryllium	mg/kg	1	mg/kg	U
A1P2MIS-12313-22-M	Cadmium	mg/kg	1	mg/kg	U
A1P2MIS-12313-22-M	Chromium	mg/kg	12	mg/kg	
A1P2MIS-12313-22-M	Copper	mg/kg	14.3	mg/kg	
A1P2MIS-12313-22-M	Lead	mg/kg	10.8	mg/kg	
A1P2MIS-12313-22-M	Manganese	mg/kg	419	mg/kg	
A1P2MIS-12313-22-M	Mercury	mg/kg	0.02	mg/kg	
A1P2MIS-12313-22-M	Nickel	mg/kg	16.6	mg/kg	

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MISCELLANEOUS AREAS INVESTIGATIONS

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SAMPLE ID	PARAMETER	UNITS	RESULT	UNITS	QUALIFIER
A1P2MIS-12313-22-M	Zinc	mg/kg	36.4	mg/kg	
A1P2MIS-12313-22-R	Moisture Content	PERCENT	13.5	PERCENT	
A1P2MIS-12313-22-R	Radium-226	pCi/g dry	0.97	pCi/g dry	
A1P2MIS-12313-22-R	Radium-228	pCi/g dry	0.83	pCi/g dry	
A1P2MIS-12313-22-R	Thorium-228	pCi/g	0.54	pCi/g	
A1P2MIS-12313-22-R	Thorium-230	pCi/g	0.49	pCi/g	
A1P2MIS-12313-22-R	Thorium-232	pCi/g	0.47	pCi/g	
A1P2MIS-12313-22-R	Uranium, Total	ppm dry	2.8	ppm dry	
A1P2MIS-12313-25-AB	Gross Alpha	pCi/g	14	pCi/g	
A1P2MIS-12313-25-AB	Gross Beta	pCi/g	39	pCi/g	
A1P2MIS-12313-25-L	1,1,1-Trichloroethan	ug/kg	11	ug/kg	U
A1P2MIS-12313-25-L	1,1,2,2-Tetrachloroe	ug/kg	11	ug/kg	U
A1P2MIS-12313-25-L	1,1,2-Trichloroethan	ug/kg	11	ug/kg	U
A1P2MIS-12313-25-L	1,1-Dichloroethane	ug/kg	11	ug/kg	U
A1P2MIS-12313-25-L	1,1-Dichloroethene	ug/kg	11	ug/kg	U
A1P2MIS-12313-25-L	1,2-Dichloroethane	ug/kg	11	ug/kg	U
A1P2MIS-12313-25-L	1,2-Dichloroethene (T	ug/kg	11	ug/kg	U
A1P2MIS-12313-25-L	1,2-Dichloropropane	ug/kg	11	ug/kg	U
A1P2MIS-12313-25-L	2-Butanone	ug/kg	11	ug/kg	U
A1P2MIS-12313-25-L	2-Hexanone	ug/kg	11	ug/kg	U
A1P2MIS-12313-25-L	4-Methyl-2-pentanon	ug/kg	11	ug/kg	U
A1P2MIS-12313-25-L	Acetone	ug/kg	10	ug/kg	J
A1P2MIS-12313-25-L	Benzene	ug/kg	11	ug/kg	U
A1P2MIS-12313-25-L	Bromodichlorometha	ug/kg	11	ug/kg	U
A1P2MIS-12313-25-L	Bromoform	ug/kg	11	ug/kg	U
A1P2MIS-12313-25-L	Bromomethane	ug/kg	11	ug/kg	U
A1P2MIS-12313-25-L	Carbon disulfide	ug/kg	11	ug/kg	U
A1P2MIS-12313-25-L	Carbon Tetrachloride	ug/kg	11	ug/kg	U
A1P2MIS-12313-25-L	Chlorobenzene	ug/kg	11	ug/kg	U
A1P2MIS-12313-25-L	Chloroethane	ug/kg	11	ug/kg	U
A1P2MIS-12313-25-L	Chloroform	ug/kg	11	ug/kg	U
A1P2MIS-12313-25-L	Chloromethane	ug/kg	11	ug/kg	U
A1P2MIS-12313-25-L	cis-1,3-Dichloroprop	ug/kg	11	ug/kg	U
A1P2MIS-12313-25-L	Dibromochlorometha	ug/kg	11	ug/kg	U
A1P2MIS-12313-25-L	Ethylbenzene	ug/kg	11	ug/kg	U
A1P2MIS-12313-25-L	Methylene chloride	ug/kg	11	ug/kg	U
A1P2MIS-12313-25-L	Styrene	ug/kg	11	ug/kg	U
A1P2MIS-12313-25-L	Tetrachloroethene	ug/kg	11	ug/kg	U
A1P2MIS-12313-25-L	Toluene	ug/kg	11	ug/kg	U
A1P2MIS-12313-25-L	trans-1,3-Dichloropr	ug/kg	11	ug/kg	U
A1P2MIS-12313-25-L	Trichloroethene	ug/kg	11	ug/kg	U
A1P2MIS-12313-25-L	Vinyl chloride	ug/kg	11	ug/kg	U

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APPENDIX B-6
MISCELLANEOUS AREAS INVESTIGATIONS

SAMPLE ID	PARAMETER	UNITS	RESULT	UNITS	QUALIFIER
A1P2MIS-12313-25-L	Xylenes, Total	ug/kg	11	ug/kg	U
A1P2MIS-12313-25-M	Antimony	mg/kg	16	mg/kg	U
A1P2MIS-12313-25-M	Arsenic	mg/kg	4.49	mg/kg	
A1P2MIS-12313-25-M	Beryllium	mg/kg	1	mg/kg	U
A1P2MIS-12313-25-M	Cadmium	mg/kg	1	mg/kg	U
A1P2MIS-12313-25-M	Chromium	mg/kg	11.9	mg/kg	
A1P2MIS-12313-25-M	Copper	mg/kg	14.7	mg/kg	
A1P2MIS-12313-25-M	Lead	mg/kg	10.2	mg/kg	
A1P2MIS-12313-25-M	Manganese	mg/kg	486	mg/kg	
A1P2MIS-12313-25-M	Mercury	mg/kg	0.02	mg/kg	
A1P2MIS-12313-25-M	Nickel	mg/kg	19.7	mg/kg	
A1P2MIS-12313-25-M	Zinc	mg/kg	37.4	mg/kg	
A1P2MIS-12313-25-R	Moisture Content	PERCENT	12.5	PERCENT	
A1P2MIS-12313-25-R	Radium-226	pCi/g dry	0.81	pCi/g dry	
A1P2MIS-12313-25-R	Radium-228	pCi/g dry	1.1	pCi/g dry	
A1P2MIS-12313-25-R	Thorium-228	pCi/g	0.55	pCi/g	
A1P2MIS-12313-25-R	Thorium-230	pCi/g	0.46	pCi/g	
A1P2MIS-12313-25-R	Thorium-232	pCi/g	0.49	pCi/g	
A1P2MIS-12313-2-L	1,1,1-Trichloroethan	ug/kg	12	ug/kg	U
A1P2MIS-12313-2-L	1,1,2,2-Tetrachloroe	ug/kg	12	ug/kg	U
A1P2MIS-12313-2-L	1,1,2-Trichloroethan	ug/kg	12	ug/kg	U
A1P2MIS-12313-2-L	1,1-Dichloroethane	ug/kg	12	ug/kg	U
A1P2MIS-12313-2-L	1,1-Dichloroethene	ug/kg	12	ug/kg	U
A1P2MIS-12313-2-L	1,2-Dichloroethane	ug/kg	12	ug/kg	U
A1P2MIS-12313-2-L	1,2-Dichloroethene (T	ug/kg	12	ug/kg	U
A1P2MIS-12313-2-L	1,2-Dichloropropane	ug/kg	12	ug/kg	U
A1P2MIS-12313-2-L	2-Butanone	ug/kg	12	ug/kg	U
A1P2MIS-12313-2-L	2-Hexanone	ug/kg	12	ug/kg	U
A1P2MIS-12313-2-L	4-Methyl-2-pentanon	ug/kg	12	ug/kg	U
A1P2MIS-12313-2-L	Acetone	ug/kg	11	ug/kg	J
A1P2MIS-12313-2-L	Benzene	ug/kg	12	ug/kg	U
A1P2MIS-12313-2-L	Bromodichlorometha	ug/kg	12	ug/kg	U
A1P2MIS-12313-2-L	Bromoform	ug/kg	12	ug/kg	U
A1P2MIS-12313-2-L	Bromomethane	ug/kg	12	ug/kg	U
A1P2MIS-12313-2-L	Carbon disulfide	ug/kg	12	ug/kg	U
A1P2MIS-12313-2-L	Carbon Tetrachloride	ug/kg	12	ug/kg	U
A1P2MIS-12313-2-L	Chlorobenzene	ug/kg	12	ug/kg	U
A1P2MIS-12313-2-L	Chloroethane	ug/kg	12	ug/kg	U
A1P2MIS-12313-2-L	Chloroform	ug/kg	12	ug/kg	U
A1P2MIS-12313-2-L	Chloromethane	ug/kg	12	ug/kg	U
A1P2MIS-12313-2-L	cis-1,3-Dichloroprop	ug/kg	12	ug/kg	U
A1P2MIS-12313-2-L	Dibromochlorometha	ug/kg	12	ug/kg	U

SAMPLE ID	PARAMETER	UNITS	RESULT	UNITS	QUALIFIER
A1P2MIS-12313-2-L	Ethylbenzene	ug/kg	12	ug/kg	U
A1P2MIS-12313-2-L	Methylene chloride	ug/kg	12	ug/kg	U
A1P2MIS-12313-2-L	Styrene	ug/kg	12	ug/kg	U
A1P2MIS-12313-2-L	Tetrachloroethene	ug/kg	12	ug/kg	U
A1P2MIS-12313-2-L	Toluene	ug/kg	12	ug/kg	U
A1P2MIS-12313-2-L	trans-1,3-Dichloropro	ug/kg	12	ug/kg	U
A1P2MIS-12313-2-L	Trichloroethene	ug/kg	12	ug/kg	U
A1P2MIS-12313-2-L	Vinyl chloride	ug/kg	12	ug/kg	U
A1P2MIS-12313-2-L	Xylenes, Total	ug/kg	12	ug/kg	U
A1P2MIS-12313-8-R	Moisture Content	PERCENT	11.8	PERCENT	
A1P2MIS-12313-8-R	Uranium, Total	ppm dry	1.3	ppm dry	
A1P2MIS-12314-11-R	Moisture Content	PERCENT	13.4	PERCENT	
A1P2MIS-12314-11-R	Uranium, Total	ppm dry	1.48	ppm dry	
A1P2MIS-12314-14-L	1,1,1-Trichloroethan	ug/kg	11	ug/kg	U
A1P2MIS-12314-14-L	1,1,2,2-Tetrachloroe	ug/kg	11	ug/kg	U
A1P2MIS-12314-14-L	1,1,2-Trichloroethan	ug/kg	11	ug/kg	U
A1P2MIS-12314-14-L	1,1-Dichloroethane	ug/kg	11	ug/kg	U
A1P2MIS-12314-14-L	1,1-Dichloroethene	ug/kg	11	ug/kg	U
A1P2MIS-12314-14-L	1,2-Dichloroethane	ug/kg	11	ug/kg	U
A1P2MIS-12314-14-L	1,2-Dichloroethene (T	ug/kg	11	ug/kg	U
A1P2MIS-12314-14-L	1,2-Dichloropropane	ug/kg	11	ug/kg	U
A1P2MIS-12314-14-L	2-Butanone	ug/kg	11	ug/kg	U
A1P2MIS-12314-14-L	2-Hexanone	ug/kg	11	ug/kg	U
A1P2MIS-12314-14-L	4-Methyl-2-pentanon	ug/kg	11	ug/kg	U
A1P2MIS-12314-14-L	Acetone	ug/kg	11	ug/kg	U
A1P2MIS-12314-14-L	Benzene	ug/kg	11	ug/kg	U
A1P2MIS-12314-14-L	Bromodichlorometha	ug/kg	11	ug/kg	U
A1P2MIS-12314-14-L	Bromoform	ug/kg	11	ug/kg	U
A1P2MIS-12314-14-L	Bromomethane	ug/kg	11	ug/kg	U
A1P2MIS-12314-14-L	Carbon disulfide	ug/kg	11	ug/kg	U
A1P2MIS-12314-14-L	Carbon Tetrachloride	ug/kg	11	ug/kg	U
A1P2MIS-12314-14-L	Chlorobenzene	ug/kg	11	ug/kg	U
A1P2MIS-12314-14-L	Chloroethane	ug/kg	11	ug/kg	U
A1P2MIS-12314-14-L	Chloroform	ug/kg	11	ug/kg	U
A1P2MIS-12314-14-L	Chloromethane	ug/kg	11	ug/kg	U
A1P2MIS-12314-14-L	cis-1,3-Dichloroprop	ug/kg	11	ug/kg	U
A1P2MIS-12314-14-L	Dibromochlorometha	ug/kg	11	ug/kg	U
A1P2MIS-12314-14-L	Ethylbenzene	ug/kg	11	ug/kg	U
A1P2MIS-12314-14-L	Gross Alpha	pCi/g	27	pCi/g	
A1P2MIS-12314-14-L	Gross Beta	pCi/g	39	pCi/g	
A1P2MIS-12314-14-L	Methylene chloride	ug/kg	11	ug/kg	U
A1P2MIS-12314-14-L	Styrene	ug/kg	11	ug/kg	U

APPENDIX B-6
MISCELLANEOUS AREAS INVESTIGATIONS

SAMPLE ID	PARAMETER	UNITS	RESULT	UNITS	QUALIFIER
A1P2MIS-12314-14-L	Tetrachloroethene	ug/kg	11	ug/kg	U
A1P2MIS-12314-14-L	Toluene	ug/kg	1	ug/kg	J
A1P2MIS-12314-14-L	trans-1,3-Dichloropr	ug/kg	11	ug/kg	U
A1P2MIS-12314-14-L	Trichloroethene	ug/kg	11	ug/kg	U
A1P2MIS-12314-14-L	Vinyl chloride	ug/kg	11	ug/kg	U
A1P2MIS-12314-14-L	Xylenes, Total	ug/kg	11	ug/kg	U
A1P2MIS-12314-14-M	Antimony	mg/kg	16	mg/kg	U
A1P2MIS-12314-14-M	Arsenic	mg/kg	4.31	mg/kg	
A1P2MIS-12314-14-M	Beryllium	mg/kg	1	mg/kg	U
A1P2MIS-12314-14-M	Cadmium	mg/kg	1	mg/kg	U
A1P2MIS-12314-14-M	Chromium	mg/kg	10	mg/kg	
A1P2MIS-12314-14-M	Copper	mg/kg	14	mg/kg	
A1P2MIS-12314-14-M	Lead	mg/kg	9.3	mg/kg	
A1P2MIS-12314-14-M	Manganese	mg/kg	298	mg/kg	
A1P2MIS-12314-14-M	Nickel	mg/kg	14.4	mg/kg	
A1P2MIS-12314-14-M	Zinc	mg/kg	32.4	mg/kg	
A1P2MIS-12314-14-R	Moisture Content	PERCENT	11.3	PERCENT	
A1P2MIS-12314-14-R	Radium-226	pCi/g dry	0.94	pCi/g dry	
A1P2MIS-12314-14-R	Radium-228	pCi/g dry	0.75	pCi/g dry	
A1P2MIS-12314-14-R	Thorium-228	pCi/g	0.49	pCi/g	
A1P2MIS-12314-14-R	Thorium-230	pCi/g	0.46	pCi/g	
A1P2MIS-12314-14-R	Thorium-232	pCi/g	0.43	pCi/g	
A1P2MIS-12314-17-L	1,1,1-Trichloroethan	ug/kg	11	ug/kg	U
A1P2MIS-12314-17-L	1,1,2,2-Tetrachloroe	ug/kg	11	ug/kg	U
A1P2MIS-12314-17-L	1,1,2-Trichloroethan	ug/kg	11	ug/kg	U
A1P2MIS-12314-17-L	1,1-Dichloroethane	ug/kg	11	ug/kg	U
A1P2MIS-12314-17-L	1,1-Dichloroethene	ug/kg	11	ug/kg	U
A1P2MIS-12314-17-L	1,2-Dichloroethane	ug/kg	11	ug/kg	U
A1P2MIS-12314-17-L	1,2-Dichloroethene (	ug/kg	11	ug/kg	U
A1P2MIS-12314-17-L	1,2-Dichloropropane	ug/kg	11	ug/kg	U
A1P2MIS-12314-17-L	2-Butanone	ug/kg	11	ug/kg	U
A1P2MIS-12314-17-L	2-Hexanone	ug/kg	11	ug/kg	U
A1P2MIS-12314-17-L	4-Methyl-2-pentanon	ug/kg	11	ug/kg	U
A1P2MIS-12314-17-L	Acetone	ug/kg	11	ug/kg	U
A1P2MIS-12314-17-L	Benzene	ug/kg	11	ug/kg	U
A1P2MIS-12314-17-L	Bromodichlorometha	ug/kg	11	ug/kg	U
A1P2MIS-12314-17-L	Bromoform	ug/kg	11	ug/kg	U
A1P2MIS-12314-17-L	Bromomethane	ug/kg	11	ug/kg	U
A1P2MIS-12314-17-L	Carbon disulfide	ug/kg	11	ug/kg	U
A1P2MIS-12314-17-L	Carbon Tetrachloride	ug/kg	11	ug/kg	U
A1P2MIS-12314-17-L	Chlorobenzene	ug/kg	11	ug/kg	U
A1P2MIS-12314-17-L	Chloroethane	ug/kg	11	ug/kg	U

SAMPLE ID	PARAMETER	UNITS	RESULT	UNITS	QUALIFIER
A1P2MIS-12314-17-L	Chloroform	ug/kg	11	ug/kg	U
A1P2MIS-12314-17-L	Chloromethane	ug/kg	11	ug/kg	U
A1P2MIS-12314-17-L	cis-1,3-Dichloroprop	ug/kg	11	ug/kg	U
A1P2MIS-12314-17-L	Dibromochlorometha	ug/kg	11	ug/kg	U
A1P2MIS-12314-17-L	Ethylbenzene	ug/kg	11	ug/kg	U
A1P2MIS-12314-17-L	Gross Alpha	pCi/g	21	pCi/g	
A1P2MIS-12314-17-L	Gross Beta	pCi/g	41	pCi/g	
A1P2MIS-12314-17-L	Methylene chloride	ug/kg	11	ug/kg	U
A1P2MIS-12314-17-L	Styrene	ug/kg	11	ug/kg	U
A1P2MIS-12314-17-L	Tetrachloroethene	ug/kg	11	ug/kg	U
A1P2MIS-12314-17-L	Toluene	ug/kg	11	ug/kg	U
A1P2MIS-12314-17-L	trans-1,3-Dichloropr	ug/kg	11	ug/kg	U
A1P2MIS-12314-17-L	Trichloroethene	ug/kg	11	ug/kg	U
A1P2MIS-12314-17-L	Vinyl chloride	ug/kg	11	ug/kg	U
A1P2MIS-12314-17-L	Xylenes, Total	ug/kg	11	ug/kg	U
A1P2MIS-12314-17-M	Antimony	mg/kg	16	mg/kg	U
A1P2MIS-12314-17-M	Arsenic	mg/kg	3.64	mg/kg	
A1P2MIS-12314-17-M	Beryllium	mg/kg	1	mg/kg	U
A1P2MIS-12314-17-M	Cadmium	mg/kg	1	mg/kg	U
A1P2MIS-12314-17-M	Chromium	mg/kg	11.2	mg/kg	
A1P2MIS-12314-17-M	Copper	mg/kg	14.7	mg/kg	
A1P2MIS-12314-17-M	Lead	mg/kg	12.6	mg/kg	
A1P2MIS-12314-17-M	Manganese	mg/kg	341	mg/kg	
A1P2MIS-12314-17-M	Mercury	mg/kg	0.02	mg/kg	
A1P2MIS-12314-17-M	Nickel	mg/kg	17.1	mg/kg	
A1P2MIS-12314-17-M	Zinc	mg/kg	35.2	mg/kg	
A1P2MIS-12314-17-R	Moisture Content	PERCENT	11.7	PERCENT	
A1P2MIS-12314-17-R	Radium-226	pCi/g dry	0.74	pCi/g dry	
A1P2MIS-12314-17-R	Radium-228	pCi/g dry	0.84	pCi/g dry	
A1P2MIS-12314-17-R	Thorium-228	pCi/g	0.51	pCi/g	
A1P2MIS-12314-17-R	Thorium-230	pCi/g	0.46	pCi/g	
A1P2MIS-12314-17-R	Thorium-232	pCi/g	0.51	pCi/g	
A1P2MIS-12314-20-R	Moisture Content	PERCENT	11.7	PERCENT	
A1P2MIS-12314-20-R	Uranium, Total	ppm dry	1.49	ppm dry	
A1P2MIS-12314-23-R	Moisture Content	PERCENT	10.8	PERCENT	
A1P2MIS-12314-23-R	Uranium, Total	ppm dry	1.77	ppm dry	
A1P2MIS-12315-10-L	Gross Alpha	pCi/mL	12	pCi/mL	U
A1P2MIS-12315-10-L	Gross Beta	pCi/mL	8	pCi/mL	U
A1P2MIS-12315-10-M	Antimony	mg/kg	18	mg/kg	U
A1P2MIS-12315-10-M	Arsenic	mg/kg	2.9	mg/kg	
A1P2MIS-12315-10-M	Beryllium	mg/kg	1	mg/kg	
A1P2MIS-12315-10-M	Cadmium	mg/kg	0.5	mg/kg	

APPENDIX B-6
MISCELLANEOUS AREAS INVESTIGATIONS

SAMPLE ID	PARAMETER	UNITS	RESULT	UNITS	QUALIFIER
A1P2MIS-12315-10-M	Chromium	mg/kg	13.9	mg/kg	
A1P2MIS-12315-10-M	Copper	mg/kg	19.6	mg/kg	
A1P2MIS-12315-10-M	Lead	mg/kg	10.7	mg/kg	
A1P2MIS-12315-10-M	Manganese	mg/kg	487	mg/kg	
A1P2MIS-12315-10-M	Mercury	mg/kg	0.03	mg/kg	
A1P2MIS-12315-10-M	Nickel	mg/kg	18.5	mg/kg	
A1P2MIS-12315-10-M	Zinc	mg/kg	38.6	mg/kg	
A1P2MIS-12315-10-R	Moisture Content	PERCENT	11.6	PERCENT	
A1P2MIS-12315-10-R	Radium-226	pCi/g dry	0.72	pCi/g dry	
A1P2MIS-12315-10-R	Radium-228	pCi/g dry	0.64	pCi/g dry	
A1P2MIS-12315-10-R	Thorium-228	pCi/g	0.47	pCi/g	
A1P2MIS-12315-10-R	Thorium-230	pCi/g	0.45	pCi/g	
A1P2MIS-12315-10-R	Thorium-232	pCi/g	0.43	pCi/g	
A1P2MIS-12315-10-R	Uranium, Total	ppm dry	2.8	ppm dry	
A1P2MIS-12315-13-L	Gross Alpha	pCi/g	8.9	pCi/g	U
A1P2MIS-12315-13-L	Gross Beta	pCi/g	15	pCi/g	U
A1P2MIS-12315-13-M	Antimony	mg/kg	18	mg/kg	U
A1P2MIS-12315-13-M	Arsenic	mg/kg	3.5	mg/kg	
A1P2MIS-12315-13-M	Beryllium	mg/kg	1	mg/kg	
A1P2MIS-12315-13-M	Cadmium	mg/kg	0.4	mg/kg	
A1P2MIS-12315-13-M	Chromium	mg/kg	14.4	mg/kg	
A1P2MIS-12315-13-M	Copper	mg/kg	20.8	mg/kg	
A1P2MIS-12315-13-M	Lead	mg/kg	11.3	mg/kg	
A1P2MIS-12315-13-M	Manganese	mg/kg	430	mg/kg	
A1P2MIS-12315-13-M	Mercury	mg/kg	0.02	mg/kg	
A1P2MIS-12315-13-M	Nickel	mg/kg	17.3	mg/kg	
A1P2MIS-12315-13-M	Zinc	mg/kg	39.2	mg/kg	
A1P2MIS-12315-13-R	Moisture Content	PERCENT	7.6	PERCENT	
A1P2MIS-12315-13-R	Radium-226	pCi/g dry	0.82	pCi/g dry	
A1P2MIS-12315-13-R	Radium-228	pCi/g dry	0.68	pCi/g dry	
A1P2MIS-12315-13-R	Thorium-228	pCi/g	0.35	pCi/g	
A1P2MIS-12315-13-R	Thorium-230	pCi/g	0.33	pCi/g	
A1P2MIS-12315-13-R	Thorium-232	pCi/g	0.34	pCi/g	
A1P2MIS-12315-13-R	Uranium, Total	ppm dry	2.6	ppm dry	
A1P2MIS-12315-16-R	Moisture Content	PERCENT	11.5	PERCENT	
A1P2MIS-12315-16-R	Uranium, Total	ppm dry	1.2	ppm dry	
A1P2MIS-12315-19-R	Moisture Content	PERCENT	10.2	PERCENT	
A1P2MIS-12315-19-R	Uranium, Total	ppm dry	1.17	ppm dry	
A1P2MIS-12315-7-R	Moisture Content	PERCENT	13.5	PERCENT	
A1P2MIS-12315-7-R	Uranium, Total	ppm dry	2.1	ppm dry	
A1P2MIS-12316-11-R	Moisture Content	PERCENT	20.5	PERCENT	
A1P2MIS-12316-11-R	Uranium, Total	ppm dry	1.58	ppm dry	

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SAMPLE ID	PARAMETER	UNITS	RESULT	UNITS	QUALIFIER
A1P2MIS-12316-14-R	Moisture Content	PERCENT	18.9	PERCENT	
A1P2MIS-12316-14-R	Uranium, Total	ppm dry	1.48	ppm dry	
A1P2MIS-12316-17-AB	Gross Alpha	pCi/g	25	pCi/g	
A1P2MIS-12316-17-AB	Gross Beta	pCi/g	37	pCi/g	
A1P2MIS-12316-17-M	Antimony	mg/kg	16	mg/kg	U
A1P2MIS-12316-17-M	Arsenic	mg/kg	2.9	mg/kg	
A1P2MIS-12316-17-M	Beryllium	mg/kg	1.1	mg/kg	
A1P2MIS-12316-17-M	Cadmium	mg/kg	0.82	mg/kg	
A1P2MIS-12316-17-M	Chromium	mg/kg	13.22	mg/kg	
A1P2MIS-12316-17-M	Copper	mg/kg	16.45	mg/kg	
A1P2MIS-12316-17-M	Lead	mg/kg	13.51	mg/kg	
A1P2MIS-12316-17-M	Manganese	mg/kg	542	mg/kg	
A1P2MIS-12316-17-M	Mercury	mg/kg	0.02	mg/kg	
A1P2MIS-12316-17-M	Nickel	mg/kg	17.13	mg/kg	
A1P2MIS-12316-17-M	Zinc	mg/kg	45.85	mg/kg	
A1P2MIS-12316-17-R	Moisture Content	PERCENT	13.2	PERCENT	
A1P2MIS-12316-17-R	Radium-226	pCi/g dry	0.75	pCi/g dry	
A1P2MIS-12316-17-R	Radium-228	pCi/g dry	0.79	pCi/g dry	
A1P2MIS-12316-17-R	Thorium-228	pCi/g	0.58	pCi/g	
A1P2MIS-12316-17-R	Thorium-230	pCi/g	0.48	pCi/g	
A1P2MIS-12316-17-R	Thorium-232	pCi/g	0.58	pCi/g	
A1P2MIS-12316-17-R	Uranium, Total	ppm dry	5.4	ppm dry	
A1P2MIS-12316-20-AB	Gross Alpha	pCi/g	13	pCi/g	
A1P2MIS-12316-20-AB	Gross Beta	pCi/g	15	pCi/g	
A1P2MIS-12316-20-M	Antimony	mg/kg	16	mg/kg	U
A1P2MIS-12316-20-M	Arsenic	mg/kg	3.7	mg/kg	
A1P2MIS-12316-20-M	Beryllium	mg/kg	0.93	mg/kg	
A1P2MIS-12316-20-M	Cadmium	mg/kg	0.56	mg/kg	
A1P2MIS-12316-20-M	Chromium	mg/kg	12.5	mg/kg	
A1P2MIS-12316-20-M	Copper	mg/kg	16.7	mg/kg	
A1P2MIS-12316-20-M	Lead	mg/kg	6.24	mg/kg	U
A1P2MIS-12316-20-M	Manganese	mg/kg	387	mg/kg	
A1P2MIS-12316-20-M	Mercury	mg/kg	0.01	mg/kg	
A1P2MIS-12316-20-M	Nickel	mg/kg	14.5	mg/kg	
A1P2MIS-12316-20-M	Zinc	mg/kg	36.4	mg/kg	
A1P2MIS-12316-20-R	Moisture Content	PERCENT	11.8	PERCENT	
A1P2MIS-12316-20-R	Radium-226	pCi/g dry	0.68	pCi/g dry	
A1P2MIS-12316-20-R	Radium-228	pCi/g dry	0.53	pCi/g dry	
A1P2MIS-12316-20-R	Thorium-228	pCi/g	0.51	pCi/g	
A1P2MIS-12316-20-R	Thorium-230	pCi/g	0.48	pCi/g	
A1P2MIS-12316-20-R	Thorium-232	pCi/g	0.47	pCi/g	
A1P2MIS-12316-20-R	Uranium, Total	ppm dry	2.9	ppm dry	U

APPENDIX B-6
MISCELLANEOUS AREAS INVESTIGATIONS

SAMPLE ID	PARAMETER	UNITS	RESULT	UNITS	QUALIFIER
A1P2MIS-12316-23-R	Moisture Content	PERCENT	9.8	PERCENT	
A1P2MIS-12316-23-R	Uranium, Total	ppm dry	1.16	ppm dry	
A1P2MIS-12317-15-R	Moisture Content	PERCENT	17	PERCENT	
A1P2MIS-12317-15-R	Uranium, Total	ppm dry	1.14	ppm dry	
A1P2MIS-12317-18-R	Moisture Content	PERCENT	12.5	PERCENT	
A1P2MIS-12317-18-R	Uranium, Total	ppm dry	1	ppm dry	
A1P2MIS-12317-21-AB	Gross Alpha	pCi/g	17	pCi/g	
A1P2MIS-12317-21-AB	Gross Beta	pCi/g	18	pCi/g	
A1P2MIS-12317-21-M	Antimony	mg/kg	16	mg/kg	U
A1P2MIS-12317-21-M	Arsenic	mg/kg	4.1	mg/kg	
A1P2MIS-12317-21-M	Beryllium	mg/kg	1.16	mg/kg	
A1P2MIS-12317-21-M	Cadmium	mg/kg	0.6	mg/kg	
A1P2MIS-12317-21-M	Chromium	mg/kg	16.2	mg/kg	
A1P2MIS-12317-21-M	Copper	mg/kg	18.7	mg/kg	
A1P2MIS-12317-21-M	Lead	mg/kg	18.5	mg/kg	
A1P2MIS-12317-21-M	Manganese	mg/kg	461	mg/kg	
A1P2MIS-12317-21-M	Mercury	mg/kg	0.02	mg/kg	
A1P2MIS-12317-21-M	Nickel	mg/kg	22.2	mg/kg	
A1P2MIS-12317-21-M	Zinc	mg/kg	49.8	mg/kg	
A1P2MIS-12317-21-R	Moisture Content	PERCENT	14.6	PERCENT	
A1P2MIS-12317-21-R	Radium-226	pCi/g dry	0.86	pCi/g dry	
A1P2MIS-12317-21-R	Radium-228	pCi/g dry	0.66	pCi/g dry	
A1P2MIS-12317-21-R	Thorium-228	pCi/g	0.63	pCi/g	
A1P2MIS-12317-21-R	Thorium-230	pCi/g	0.57	pCi/g	
A1P2MIS-12317-21-R	Thorium-232	pCi/g	0.55	pCi/g	
A1P2MIS-12317-21-R	Uranium, Total	ppm dry	6.6	ppm dry	
A1P2MIS-12317-24-AB	Gross Alpha	pCi/g	9.3	pCi/g	U
A1P2MIS-12317-24-AB	Gross Beta	pCi/g	8	pCi/g	U
A1P2MIS-12317-24-M	Antimony	mg/kg	16	mg/kg	U
A1P2MIS-12317-24-M	Arsenic	mg/kg	2	mg/kg	
A1P2MIS-12317-24-M	Beryllium	mg/kg	0.79	mg/kg	
A1P2MIS-12317-24-M	Cadmium	mg/kg	0.54	mg/kg	
A1P2MIS-12317-24-M	Chromium	mg/kg	11	mg/kg	
A1P2MIS-12317-24-M	Copper	mg/kg	14.8	mg/kg	
A1P2MIS-12317-24-M	Lead	mg/kg	6.24	mg/kg	U
A1P2MIS-12317-24-M	Manganese	mg/kg	427	mg/kg	
A1P2MIS-12317-24-M	Mercury	mg/kg	0.02	mg/kg	
A1P2MIS-12317-24-M	Nickel	mg/kg	9.85	mg/kg	
A1P2MIS-12317-24-M	Zinc	mg/kg	25.6	mg/kg	
A1P2MIS-12317-24-R	Moisture Content	PERCENT	11.4	PERCENT	
A1P2MIS-12317-24-R	Radium-226	pCi/g dry	0.69	pCi/g dry	
A1P2MIS-12317-24-R	Radium-228	pCi/g dry	0.61	pCi/g dry	

SAMPLE ID	PARAMETER	UNITS	RESULT	UNITS	QUALIFIER
A1P2MIS-12317-24-R	Thorium-228	pCi/g	0.47	pCi/g	
A1P2MIS-12317-24-R	Thorium-230	pCi/g	0.45	pCi/g	
A1P2MIS-12317-24-R	Thorium-232	pCi/g	0.43	pCi/g	
A1P2MIS-12317-27-R	Moisture Content	PERCENT	10.7	PERCENT	
A1P2MIS-12317-27-R	Uranium, Total	ppm dry	1.17	ppm dry	
A1P2MIS-12318-11-R	Moisture Content	PERCENT	22.8	PERCENT	
A1P2MIS-12318-11-R	Uranium, Total	ppm dry	1.42	ppm dry	
A1P2MIS-12318-14-R	Moisture Content	PERCENT	19.8	PERCENT	
A1P2MIS-12318-14-R	Uranium, Total	ppm dry	1.33	ppm dry	
A1P2MIS-12318-17-AB	Gross Alpha	pCi/g	18	pCi/g	
A1P2MIS-12318-17-AB	Gross Beta	pCi/g	37	pCi/g	
A1P2MIS-12318-17-M	Antimony	mg/kg	16	mg/kg	U
A1P2MIS-12318-17-M	Arsenic	mg/kg	4.7	mg/kg	
A1P2MIS-12318-17-M	Beryllium	mg/kg	1.69	mg/kg	
A1P2MIS-12318-17-M	Cadmium	mg/kg	0.83	mg/kg	
A1P2MIS-12318-17-M	Chromium	mg/kg	18.5	mg/kg	
A1P2MIS-12318-17-M	Copper	mg/kg	26.2	mg/kg	
A1P2MIS-12318-17-M	Lead	mg/kg	17.4	mg/kg	
A1P2MIS-12318-17-M	Manganese	mg/kg	444	mg/kg	
A1P2MIS-12318-17-M	Mercury	mg/kg	0.03	mg/kg	
A1P2MIS-12318-17-M	Nickel	mg/kg	30.5	mg/kg	
A1P2MIS-12318-17-M	Zinc	mg/kg	73.7	mg/kg	
A1P2MIS-12318-17-R	Moisture Content	PERCENT	21.4	PERCENT	
A1P2MIS-12318-17-R	Radium-226	pCi/g dry	1.2	pCi/g dry	
A1P2MIS-12318-17-R	Radium-228	pCi/g dry	1.1	pCi/g dry	
A1P2MIS-12318-17-R	Thorium-228	pCi/g	0.7	pCi/g	
A1P2MIS-12318-17-R	Thorium-230	pCi/g	0.6	pCi/g	
A1P2MIS-12318-17-R	Thorium-232	pCi/g	0.62	pCi/g	
A1P2MIS-12318-17-R	Uranium, Total	ppm dry	11	ppm dry	
A1P2MIS-12318-20-AB	Gross Alpha	pCi/g	23	pCi/g	
A1P2MIS-12318-20-AB	Gross Beta	pCi/g	42	pCi/g	
A1P2MIS-12318-20-M	Antimony	mg/kg	16	mg/kg	U
A1P2MIS-12318-20-M	Arsenic	mg/kg	3.3	mg/kg	
A1P2MIS-12318-20-M	Beryllium	mg/kg	1.22	mg/kg	
A1P2MIS-12318-20-M	Cadmium	mg/kg	0.43	mg/kg	
A1P2MIS-12318-20-M	Chromium	mg/kg	13.3	mg/kg	
A1P2MIS-12318-20-M	Copper	mg/kg	18	mg/kg	
A1P2MIS-12318-20-M	Lead	mg/kg	15.1	mg/kg	
A1P2MIS-12318-20-M	Manganese	mg/kg	647	mg/kg	
A1P2MIS-12318-20-M	Mercury	mg/kg	0.04	mg/kg	
A1P2MIS-12318-20-M	Nickel	mg/kg	23.9	mg/kg	
A1P2MIS-12318-20-M	Zinc	mg/kg	54	mg/kg	

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MISCELLANEOUS AREAS INVESTIGATIONS

SAMPLE ID	PARAMETER	UNITS	RESULT	UNITS	QUALIFIER
A1P2MIS-12318-20-R	Moisture Content	PERCENT	18.9	PERCENT	
A1P2MIS-12318-20-R	Radium-226	pCi/g dry	1.2	pCi/g dry	
A1P2MIS-12318-20-R	Radium-228	pCi/g dry	1.3	pCi/g dry	
A1P2MIS-12318-20-R	Thorium-228	pCi/g	0.77	pCi/g	
A1P2MIS-12318-20-R	Thorium-230	pCi/g	0.65	pCi/g	
A1P2MIS-12318-20-R	Thorium-232	pCi/g	0.73	pCi/g	
A1P2MIS-12318-20-R	Uranium, Total	ppm dry	13	ppm dry	
A1P2MIS-12318-23-R	Moisture Content	PERCENT	22.7	PERCENT	
A1P2MIS-12318-23-R	Uranium, Total	ppm dry	1.1	ppm dry	
A1P2MIS-12319-10-AB	Gross Alpha	pCi/g	22	pCi/g	
A1P2MIS-12319-10-AB	Gross Beta	pCi/g	40	pCi/g	
A1P2MIS-12319-10-M	Antimony	mg/kg	16	mg/kg	U
A1P2MIS-12319-10-M	Arsenic	mg/kg	4.5	mg/kg	
A1P2MIS-12319-10-M	Beryllium	mg/kg	1.94	mg/kg	
A1P2MIS-12319-10-M	Cadmium	mg/kg	0.92	mg/kg	
A1P2MIS-12319-10-M	Chromium	mg/kg	17.9	mg/kg	
A1P2MIS-12319-10-M	Copper	mg/kg	23.2	mg/kg	
A1P2MIS-12319-10-M	Lead	mg/kg	24.4	mg/kg	
A1P2MIS-12319-10-M	Manganese	mg/kg	665	mg/kg	
A1P2MIS-12319-10-M	Mercury	mg/kg	0.04	mg/kg	
A1P2MIS-12319-10-M	Nickel	mg/kg	32.3	mg/kg	
A1P2MIS-12319-10-M	Zinc	mg/kg	67.1	mg/kg	
A1P2MIS-12319-10-R	Moisture Content	PERCENT	21.1	PERCENT	
A1P2MIS-12319-10-R	Radium-226	pCi/g dry	1.1	pCi/g dry	
A1P2MIS-12319-10-R	Radium-228	pCi/g dry	1.2	pCi/g dry	
A1P2MIS-12319-10-R	Thorium-228	pCi/g	0.76	pCi/g	
A1P2MIS-12319-10-R	Thorium-230	pCi/g	0.7	pCi/g	
A1P2MIS-12319-10-R	Thorium-232	pCi/g	0.69	pCi/g	
A1P2MIS-12319-10-R	Uranium, Total	ppm dry	4.9	ppm dry	
A1P2MIS-12319-13-AB	Gross Alpha	pCi/g	140	pCi/g	
A1P2MIS-12319-13-AB	Gross Beta	pCi/g	230	pCi/g	
A1P2MIS-12319-13-M	Antimony	mg/kg	16	mg/kg	U
A1P2MIS-12319-13-M	Arsenic	mg/kg	8.7	mg/kg	
A1P2MIS-12319-13-M	Beryllium	mg/kg	1.63	mg/kg	
A1P2MIS-12319-13-M	Cadmium	mg/kg	0.8	mg/kg	
A1P2MIS-12319-13-M	Chromium	mg/kg	19.7	mg/kg	
A1P2MIS-12319-13-M	Copper	mg/kg	18.8	mg/kg	
A1P2MIS-12319-13-M	Lead	mg/kg	11.6	mg/kg	
A1P2MIS-12319-13-M	Manganese	mg/kg	595	mg/kg	
A1P2MIS-12319-13-M	Mercury	mg/kg	0.04	mg/kg	
A1P2MIS-12319-13-M	Nickel	mg/kg	23.7	mg/kg	
A1P2MIS-12319-13-M	Zinc	mg/kg	72.9	mg/kg	

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MISCELLANEOUS AREAS INVESTIGATIONS

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SAMPLE ID	PARAMETER	UNITS	RESULT	UNITS	QUALIFIER
A1P2MIS-12319-13-R	Moisture Content	PERCENT	19.7	PERCENT	
A1P2MIS-12319-13-R	Radium-226	pCi/g dry	1.2	pCi/g dry	
A1P2MIS-12319-13-R	Radium-228	pCi/g dry	1.6	pCi/g dry	
A1P2MIS-12319-13-R	Thorium-228	pCi/g	0.82	pCi/g	
A1P2MIS-12319-13-R	Thorium-230	pCi/g	0.71	pCi/g	
A1P2MIS-12319-13-R	Thorium-232	pCi/g	0.78	pCi/g	
A1P2MIS-12319-13-R	Uranium, Total	ppm dry	5.8	ppm dry	
A1P2MIS-12319-16-R	Moisture Content	PERCENT	11.8	PERCENT	
A1P2MIS-12319-16-R	Uranium, Total	ppm dry	1.1	ppm dry	
A1P2MIS-12319-19-R	Moisture Content	PERCENT	11.4	PERCENT	
A1P2MIS-12319-19-R	Uranium, Total	ppm dry	1.22	ppm dry	
A1P2MIS-12319-7-R	Moisture Content	PERCENT	15.2	PERCENT	
A1P2MIS-12319-7-R	Uranium, Total	ppm dry	1.06	ppm dry	
A1P2MIS-12320-10-AB	Gross Alpha	pCi/g	55	pCi/g	
A1P2MIS-12320-10-AB	Gross Beta	pCi/g	110	pCi/g	
A1P2MIS-12320-10-M	Antimony	mg/kg	16	mg/kg	U
A1P2MIS-12320-10-M	Arsenic	mg/kg	3.9	mg/kg	
A1P2MIS-12320-10-M	Beryllium	mg/kg	1.34	mg/kg	
A1P2MIS-12320-10-M	Cadmium	mg/kg	0.51	mg/kg	
A1P2MIS-12320-10-M	Chromium	mg/kg	12.1	mg/kg	
A1P2MIS-12320-10-M	Copper	mg/kg	15.4	mg/kg	
A1P2MIS-12320-10-M	Lead	mg/kg	24.4	mg/kg	
A1P2MIS-12320-10-M	Manganese	mg/kg	465	mg/kg	
A1P2MIS-12320-10-M	Mercury	mg/kg	0.04	mg/kg	
A1P2MIS-12320-10-M	Nickel	mg/kg	13.3	mg/kg	
A1P2MIS-12320-10-M	Zinc	mg/kg	64.2	mg/kg	
A1P2MIS-12320-10-R	Moisture Content	PERCENT	14.8	PERCENT	
A1P2MIS-12320-10-R	Radium-226	pCi/g dry	0.79	pCi/g dry	
A1P2MIS-12320-10-R	Radium-228	pCi/g dry	0.96	pCi/g dry	
A1P2MIS-12320-10-R	Thorium-228	pCi/g	0.54	pCi/g	
A1P2MIS-12320-10-R	Thorium-230	pCi/g	0.54	pCi/g	
A1P2MIS-12320-10-R	Thorium-232	pCi/g	0.47	pCi/g	
A1P2MIS-12320-10-R	Uranium, Total	ppm dry	4.3	ppm dry	
A1P2MIS-12320-13-AB	Gross Alpha	pCi/g	72	pCi/g	
A1P2MIS-12320-13-AB	Gross Beta	pCi/g	110	pCi/g	
A1P2MIS-12320-13-M	Antimony	mg/kg	16	mg/kg	U
A1P2MIS-12320-13-M	Arsenic	mg/kg	4.2	mg/kg	
A1P2MIS-12320-13-M	Beryllium	mg/kg	0.89	mg/kg	
A1P2MIS-12320-13-M	Cadmium	mg/kg	0.32	mg/kg	
A1P2MIS-12320-13-M	Chromium	mg/kg	11.6	mg/kg	
A1P2MIS-12320-13-M	Copper	mg/kg	15.2	mg/kg	
A1P2MIS-12320-13-M	Lead	mg/kg	17.1	mg/kg	

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MISCELLANEOUS AREAS INVESTIGATIONS

SAMPLE ID	PARAMETER	UNITS	RESULT	UNITS	QUALIFIER
A1P2MIS-12320-13-M	Manganese	mg/kg	938	mg/kg	
A1P2MIS-12320-13-M	Mercury	mg/kg	0.04	mg/kg	
A1P2MIS-12320-13-M	Nickel	mg/kg	13.1	mg/kg	
A1P2MIS-12320-13-M	Zinc	mg/kg	48.1	mg/kg	
A1P2MIS-12320-13-R	Moisture Content	PERCENT	18.1	PERCENT	
A1P2MIS-12320-13-R	Radium-226	pCi/g dry	0.9	pCi/g dry	
A1P2MIS-12320-13-R	Radium-228	pCi/g dry	0.78	pCi/g dry	
A1P2MIS-12320-13-R	Thorium-228	pCi/g	0.55	pCi/g	
A1P2MIS-12320-13-R	Thorium-230	pCi/g	0.62	pCi/g	
A1P2MIS-12320-13-R	Thorium-232	pCi/g	0.52	pCi/g	
A1P2MIS-12320-13-R	Uranium, Total	ppm dry	3.2	ppm dry	
A1P2MIS-12320-16-R	Moisture Content	PERCENT	15.5	PERCENT	
A1P2MIS-12320-16-R	Uranium, Total	ppm dry	2.24	ppm dry	
A1P2MIS-12320-19-R	Moisture Content	PERCENT	12.1	PERCENT	
A1P2MIS-12320-19-R	Uranium, Total	ppm dry	1.62	ppm dry	
A1P2MIS-12320-7-R	Moisture Content	PERCENT	18.1	PERCENT	
A1P2MIS-12320-7-R	Uranium, Total	ppm dry	5.86	ppm dry	
A1P2MIS-12321-10-AB	Gross Alpha	pCi/g	120	pCi/g	
A1P2MIS-12321-10-AB	Gross Beta	pCi/g	240	pCi/g	
A1P2MIS-12321-10-M	Antimony	mg/kg	16	mg/kg	U
A1P2MIS-12321-10-M	Arsenic	mg/kg	6.6	mg/kg	
A1P2MIS-12321-10-M	Beryllium	mg/kg	2.04	mg/kg	
A1P2MIS-12321-10-M	Cadmium	mg/kg	1.08	mg/kg	
A1P2MIS-12321-10-M	Chromium	mg/kg	20.1	mg/kg	
A1P2MIS-12321-10-M	Copper	mg/kg	20.6	mg/kg	
A1P2MIS-12321-10-M	Lead	mg/kg	22.7	mg/kg	
A1P2MIS-12321-10-M	Manganese	mg/kg	1400	mg/kg	
A1P2MIS-12321-10-M	Mercury	mg/kg	0.04	mg/kg	
A1P2MIS-12321-10-M	Nickel	mg/kg	28	mg/kg	
A1P2MIS-12321-10-M	Zinc	mg/kg	73.6	mg/kg	
A1P2MIS-12321-10-R	Moisture Content	PERCENT	19.2	PERCENT	
A1P2MIS-12321-10-R	Radium-226	pCi/g dry	1.2	pCi/g dry	
A1P2MIS-12321-10-R	Radium-228	pCi/g dry	1.3	pCi/g dry	
A1P2MIS-12321-10-R	Thorium-228	pCi/g	0.87	pCi/g	
A1P2MIS-12321-10-R	Thorium-230	pCi/g	0.085	pCi/g	
A1P2MIS-12321-10-R	Thorium-232	pCi/g	0.82	pCi/g	
A1P2MIS-12321-10-R	Uranium, Total	ppm dry	5	ppm dry	
A1P2MIS-12321-13-AB	Gross Alpha	pCi/g	30	pCi/g	
A1P2MIS-12321-13-AB	Gross Beta	pCi/g	43	pCi/g	
A1P2MIS-12321-13-M	Antimony	mg/kg	16	mg/kg	U
A1P2MIS-12321-13-M	Arsenic	mg/kg	3.6	mg/kg	
A1P2MIS-12321-13-M	Beryllium	mg/kg	1.19	mg/kg	

SAMPLE ID	PARAMETER	UNITS	RESULT	UNITS	QUALIFIER
A1P2MIS-12321-13-M	Cadmium	mg/kg	0.4	mg/kg	
A1P2MIS-12321-13-M	Chromium	mg/kg	15.3	mg/kg	
A1P2MIS-12321-13-M	Copper	mg/kg	20.4	mg/kg	
A1P2MIS-12321-13-M	Lead	mg/kg	14.7	mg/kg	
A1P2MIS-12321-13-M	Manganese	mg/kg	718	mg/kg	
A1P2MIS-12321-13-M	Mercury	mg/kg	0.02	mg/kg	
A1P2MIS-12321-13-M	Nickel	mg/kg	19.2	mg/kg	
A1P2MIS-12321-13-M	Zinc	mg/kg	48.7	mg/kg	
A1P2MIS-12321-13-R	Moisture Content	PERCENT	15.1	PERCENT	
A1P2MIS-12321-13-R	Radium-226	pCi/g dry	0.89	pCi/g dry	
A1P2MIS-12321-13-R	Radium-228	pCi/g dry	1.3	pCi/g dry	
A1P2MIS-12321-13-R	Thorium-228	pCi/g	0.71	pCi/g	
A1P2MIS-12321-13-R	Thorium-230	pCi/g	0.72	pCi/g	
A1P2MIS-12321-13-R	Thorium-232	pCi/g	0.81	pCi/g	
A1P2MIS-12321-13-R	Uranium, Total	ppm dry	3	ppm dry	
A1P2MIS-12321-16-R	Moisture Content	PERCENT	11.8	PERCENT	
A1P2MIS-12321-16-R	Uranium, Total	ppm dry	1	ppm dry	U
A1P2MIS-12321-19-R	Moisture Content	PERCENT	11.5	PERCENT	
A1P2MIS-12321-19-R	Uranium, Total	ppm dry	1.14	ppm dry	
A1P2MIS-12321-7-R	Moisture Content	PERCENT	16.7	PERCENT	
A1P2MIS-12321-7-R	Uranium, Total	ppm dry	1.47	ppm dry	
A1P2MIS-12322-1-R	Moisture Content	PERCENT	4.3	PERCENT	
A1P2MIS-12322-1-R	Uranium, Total	ppm dry	7.53	ppm dry	
A1P2MIS-12322-5-R	Moisture Content	PERCENT	14.7	PERCENT	
A1P2MIS-12322-5-R	Uranium, Total	ppm dry	1.84	ppm dry	
A1P2MIS-12323-1-R	Moisture Content	PERCENT	8	PERCENT	
A1P2MIS-12323-1-R	Uranium, Total	ppm dry	12.5	ppm dry	
A1P2MIS-12323-3-R	Moisture Content	PERCENT	16.4	PERCENT	
A1P2MIS-12323-3-R	Uranium, Total	ppm dry	1.66	ppm dry	
A1P2MIS-12324-1-R	Moisture Content	PERCENT	3.8	PERCENT	
A1P2MIS-12324-1-R	Uranium, Total	ppm dry	5.22	ppm dry	
A1P2MIS-12324-3-R	Moisture Content	PERCENT	13.3	PERCENT	
A1P2MIS-12324-3-R	Uranium, Total	ppm dry	2.09	ppm dry	
A1P2MIS-12325-1-R	Moisture Content	PERCENT	3.9	PERCENT	
A1P2MIS-12325-1-R	Uranium, Total	ppm dry	2.28	ppm dry	
A1P2MIS-12325-3-R	Moisture Content	PERCENT	17.7	PERCENT	
A1P2MIS-12325-3-R	Uranium, Total	ppm dry	1.44	ppm dry	
A1P2MIS-12325-5-R	Moisture Content	PERCENT	3	PERCENT	
A1P2MIS-12325-5-R	Uranium, Total	ppm dry	1.1	ppm dry	
A1P2MIS-12326-1-R	Moisture Content	PERCENT	8.4	PERCENT	
A1P2MIS-12326-1-R	Uranium, Total	ppm dry	11.7	ppm dry	
A1P2MIS-12326-2-AB	Gross Alpha	pCi/g	14	pCi/g	

APPENDIX B-6
MISCELLANEOUS AREAS INVESTIGATIONS

SAMPLE ID	PARAMETER	UNITS	RESULT	UNITS	QUALIFIER
A1P2MIS-12326-2-AB	Gross Beta	pCi/g	22	pCi/g	
A1P2MIS-12326-2-R	Moisture Content	PERCENT	8	PERCENT	
A1P2MIS-12326-2-R	Uranium, Total	ppm dry	18.2	ppm dry	
A1P2MIS-12326-3-L	1,1,1-Trichloroethan	ug/kg	11	ug/kg	U
A1P2MIS-12326-3-L	1,1,2,2-Tetrachloroe	ug/kg	11	ug/kg	U
A1P2MIS-12326-3-L	1,1,2-Trichloroethan	ug/kg	11	ug/kg	U
A1P2MIS-12326-3-L	1,1-Dichloroethane	ug/kg	11	ug/kg	U
A1P2MIS-12326-3-L	1,1-Dichloroethene	ug/kg	11	ug/kg	U
A1P2MIS-12326-3-L	1,2-Dichloroethane	ug/kg	11	ug/kg	U
A1P2MIS-12326-3-L	1,2-Dichloroethene (T	ug/kg	11	ug/kg	U
A1P2MIS-12326-3-L	1,2-Dichloropropane	ug/kg	11	ug/kg	U
A1P2MIS-12326-3-L	2-Butanone	ug/kg	11	ug/kg	U
A1P2MIS-12326-3-L	2-Hexanone	ug/kg	11	ug/kg	U
A1P2MIS-12326-3-L	4-Methyl-2-pentanon	ug/kg	11	ug/kg	U
A1P2MIS-12326-3-L	Acetone	ug/kg	11	ug/kg	U
A1P2MIS-12326-3-L	Benzene	ug/kg	11	ug/kg	U
A1P2MIS-12326-3-L	Bromodichlorometha	ug/kg	11	ug/kg	U
A1P2MIS-12326-3-L	Bromoform	ug/kg	11	ug/kg	U
A1P2MIS-12326-3-L	Bromomethane	ug/kg	11	ug/kg	U
A1P2MIS-12326-3-L	Carbon disulfide	ug/kg	11	ug/kg	U
A1P2MIS-12326-3-L	Carbon Tetrachloride	ug/kg	11	ug/kg	U
A1P2MIS-12326-3-L	Chlorobenzene	ug/kg	11	ug/kg	U
A1P2MIS-12326-3-L	Chloroethane	ug/kg	11	ug/kg	U
A1P2MIS-12326-3-L	Chloroform	ug/kg	11	ug/kg	U
A1P2MIS-12326-3-L	Chloromethane	ug/kg	11	ug/kg	U
A1P2MIS-12326-3-L	cis-1,3-Dichloroprop	ug/kg	11	ug/kg	U
A1P2MIS-12326-3-L	Dibromochlorometha	ug/kg	11	ug/kg	U
A1P2MIS-12326-3-L	Ethylbenzene	ug/kg	11	ug/kg	U
A1P2MIS-12326-3-L	Methylene chloride	ug/kg	11	ug/kg	U
A1P2MIS-12326-3-L	Styrene	ug/kg	11	ug/kg	U
A1P2MIS-12326-3-L	Tetrachloroethene	ug/kg	11	ug/kg	U
A1P2MIS-12326-3-L	Toluene	ug/kg	11	ug/kg	U
A1P2MIS-12326-3-L	trans-1,3-Dichloropr	ug/kg	11	ug/kg	U
A1P2MIS-12326-3-L	Trichloroethene	ug/kg	11	ug/kg	U
A1P2MIS-12326-3-L	Vinyl chloride	ug/kg	11	ug/kg	U
A1P2MIS-12326-3-L	Xylenes, Total	ug/kg	11	ug/kg	U
A1P2MIS-12326-3-R	Moisture Content	PERCENT	20.2	PERCENT	
A1P2MIS-12326-3-R	Uranium, Total	ppm dry	2.52	ppm dry	
A1P2MIS-12327-12-AB	Gross Alpha	pCi/g	35	pCi/g	
A1P2MIS-12327-12-AB	Gross Beta	pCi/g	48	pCi/g	
A1P2MIS-12327-12-R	Moisture Content	PERCENT	16.6	PERCENT	
A1P2MIS-12327-12-R	Uranium, Total	ppm dry	1.5	ppm dry	

SAMPLE ID	PARAMETER	UNITS	RESULT	UNITS	QUALIFIER
A1P2MIS-12327-15-AB	Gross Alpha	pCi/g	30	pCi/g	
A1P2MIS-12327-15-AB	Gross Beta	pCi/g	47	pCi/g	
A1P2MIS-12327-15-R	Moisture Content	PERCENT	11.9	PERCENT	
A1P2MIS-12327-15-R	Uranium, Total	ppm dry	1	ppm dry	
A1P2MIS-12327-18-AB	Gross Alpha	pCi/g	33	pCi/g	
A1P2MIS-12327-18-AB	Gross Beta	pCi/g	38	pCi/g	
A1P2MIS-12327-18-R	Moisture Content	PERCENT	11.2	PERCENT	
A1P2MIS-12327-18-R	Uranium, Total	ppm dry	1.24	ppm dry	
A1P2MIS-12327-1-R	Moisture Content	PERCENT	2	PERCENT	
A1P2MIS-12327-1-R	Uranium, Total	ppm dry	69.3	ppm dry	
A1P2MIS-12327-21-AB	Gross Alpha	pCi/g	83	pCi/g	
A1P2MIS-12327-21-AB	Gross Beta	pCi/g	147	pCi/g	
A1P2MIS-12327-21-R	Moisture Content	PERCENT	11.9	PERCENT	
A1P2MIS-12327-21-R	Uranium, Total	ppm dry	1.27	ppm dry	
A1P2MIS-12327-4-AB	Gross Alpha	pCi/g	120	pCi/g	
A1P2MIS-12327-4-AB	Gross Beta	pCi/g	190	pCi/g	
A1P2MIS-12327-6-AB	Gross Alpha	pCi/g	23	pCi/g	
A1P2MIS-12327-6-AB	Gross Beta	pCi/g	47	pCi/g	
A1P2MIS-12327-6-R	Moisture Content	PERCENT	21.3	PERCENT	
A1P2MIS-12327-6-R	Uranium, Total	ppm dry	3.46	ppm dry	
A1P2MIS-12327-9-AB	Gross Alpha	pCi/g	35	pCi/g	
A1P2MIS-12327-9-AB	Gross Beta	pCi/g	68	pCi/g	
A1P2MIS-12327-9-R	Moisture Content	PERCENT	18.5	PERCENT	
A1P2MIS-12327-9-R	Uranium, Total	ppm dry	5.67	ppm dry	
A1P2MIS-12328-12-AB	Gross Alpha	pCi/g	67	pCi/g	
A1P2MIS-12328-12-AB	Gross Beta	pCi/g	110	pCi/g	
A1P2MIS-12328-12-R	Moisture Content	PERCENT	17.6	PERCENT	
A1P2MIS-12328-12-R	Uranium, Total	ppm dry	2.08	ppm dry	
A1P2MIS-12328-15-AB	Gross Alpha	pCi/g	92	pCi/g	
A1P2MIS-12328-15-AB	Gross Beta	pCi/g	130	pCi/g	
A1P2MIS-12328-15-R	Moisture Content	PERCENT	16.4	PERCENT	
A1P2MIS-12328-15-R	Uranium, Total	ppm dry	1.35	ppm dry	
A1P2MIS-12328-18-AB	Gross Alpha	pCi/g	50	pCi/g	
A1P2MIS-12328-18-AB	Gross Beta	pCi/g	90	pCi/g	
A1P2MIS-12328-18-R	Moisture Content	PERCENT	17	PERCENT	
A1P2MIS-12328-18-R	Uranium, Total	ppm dry	1.36	ppm dry	
A1P2MIS-12328-1-AB	Gross Alpha	pCi/g	76	pCi/g	
A1P2MIS-12328-1-AB	Gross Beta	pCi/g	140	pCi/g	
A1P2MIS-12328-1-R	Moisture Content	PERCENT	2	PERCENT	
A1P2MIS-12328-1-R	Uranium, Total	ppm dry	32.1	ppm dry	
A1P2MIS-12328-21-AB	Gross Alpha	pCi/g	23	pCi/g	
A1P2MIS-12328-21-AB	Gross Beta	pCi/g	33	pCi/g	

APPENDIX B-6
MISCELLANEOUS AREAS INVESTIGATIONS

SAMPLE ID	PARAMETER	UNITS	RESULT	UNITS	QUALIFIER
A1P2MIS-12328-21-R	Moisture Content	PERCENT	12.9	PERCENT	
A1P2MIS-12328-21-R	Uranium, Total	ppm dry	1.21	ppm dry	
A1P2MIS-12328-6-AB	Gross Alpha	pCi/g	56	pCi/g	
A1P2MIS-12328-6-AB	Gross Beta	pCi/g	110	pCi/g	
A1P2MIS-12328-6-R	Moisture Content	PERCENT	19.9	PERCENT	
A1P2MIS-12328-6-R	Uranium, Total	ppm dry	3.35	ppm dry	
A1P2MIS-12328-9-AB	Gross Alpha	pCi/g	22	pCi/g	
A1P2MIS-12328-9-AB	Gross Beta	pCi/g	51	pCi/g	
A1P2MIS-12328-9-R	Moisture Content	PERCENT	20.1	PERCENT	
A1P2MIS-12328-9-R	Uranium, Total	ppm dry	3.25	ppm dry	
A1P2MIS-12329-1-R	Moisture Content	PERCENT	3	PERCENT	
A1P2MIS-12329-1-R	Uranium, Total	ppm dry	1.07	ppm dry	
A1P2MIS-12329-2-R	Moisture Content	PERCENT	19.6	PERCENT	
A1P2MIS-12329-2-R	Uranium, Total	ppm dry	1.75	ppm dry	
A1P2MIS-12330-1-R	Moisture Content	PERCENT	4.9	PERCENT	
A1P2MIS-12330-1-R	Uranium, Total	ppm dry	1.12	ppm dry	
A1P2MIS-12330-2-R	Moisture Content	PERCENT	15.8	PERCENT	
A1P2MIS-12330-2-R	Uranium, Total	ppm dry	1.71	ppm dry	
A1P2MIS-12331-1-R	Moisture Content	PERCENT	3.6	PERCENT	
A1P2MIS-12331-1-R	Uranium, Total	ppm dry	1.06	ppm dry	
A1P2MIS-12331-2-R	Moisture Content	PERCENT	15.1	PERCENT	
A1P2MIS-12331-2-R	Uranium, Total	ppm dry	1.57	ppm dry	
A1P2MIS-12332-1-R	Moisture Content	PERCENT	14.6	PERCENT	
A1P2MIS-12332-1-R	Uranium, Total	ppm dry	1.56	ppm dry	
A1P2MIS-12332-2-R	Moisture Content	PERCENT	3.7	PERCENT	
A1P2MIS-12332-2-R	Uranium, Total	ppm dry	0.955	ppm dry	
A1P2MIS-12333-1-R	Moisture Content	PERCENT	18.8	PERCENT	
A1P2MIS-12333-1-R	Uranium, Total	ppm dry	2.05	ppm dry	
A1P2MIS-12333-2-R	Moisture Content	PERCENT	3	PERCENT	
A1P2MIS-12333-2-R	Uranium, Total	ppm dry	1.48	ppm dry	
A1P2MIS-12334-1-R	Moisture Content	PERCENT	4.8	PERCENT	
A1P2MIS-12334-1-R	Uranium, Total	ppm dry	2.06	ppm dry	
A1P2MIS-12334-2-R	Moisture Content	PERCENT	15.9	PERCENT	
A1P2MIS-12334-2-R	Uranium, Total	ppm dry	1.73	ppm dry	
A1P2MIS-12335-6-M	Antimony	mg/kg	44.2	mg/kg	U
A1P2MIS-12335-6-M	Arsenic	mg/kg	5.8	mg/kg	
A1P2MIS-12335-6-M	Beryllium	mg/kg	0.91	mg/kg	
A1P2MIS-12335-6-M	Cadmium	mg/kg	1.1	mg/kg	
A1P2MIS-12335-6-M	Chromium	mg/kg	19.27	mg/kg	
A1P2MIS-12335-6-M	Copper	mg/kg	21.65	mg/kg	
A1P2MIS-12335-6-M	Lead	mg/kg	24.4	mg/kg	
A1P2MIS-12335-6-M	Manganese	mg/kg	580	mg/kg	

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SAMPLE ID	PARAMETER	UNITS	RESULT	UNITS	QUALIFIER
A1P2MIS-12335-6-M	Mercury	mg/kg	0.022	mg/kg	
A1P2MIS-12335-6-M	Nickel	mg/kg	24.4	mg/kg	
A1P2MIS-12335-6-M	Zinc	mg/kg	65.71	mg/kg	
A1P2MIS-12335-6-R	Moisture Content	PERCENT	19	PERCENT	
A1P2MIS-12335-6-R	Uranium, Total	ppm dry	3.95	ppm dry	
A1P2MIS-12336-1-M	Antimony	mg/kg	44.2	mg/kg	U
A1P2MIS-12336-1-M	Arsenic	mg/kg	4.4	mg/kg	
A1P2MIS-12336-1-M	Beryllium	mg/kg	0.69	mg/kg	
A1P2MIS-12336-1-M	Cadmium	mg/kg	0.74	mg/kg	
A1P2MIS-12336-1-M	Chromium	mg/kg	8.71	mg/kg	
A1P2MIS-12336-1-M	Copper	mg/kg	8.55	mg/kg	
A1P2MIS-12336-1-M	Lead	mg/kg	20.12	mg/kg	
A1P2MIS-12336-1-M	Manganese	mg/kg	459.75	mg/kg	
A1P2MIS-12336-1-M	Mercury	mg/kg	0.014	mg/kg	
A1P2MIS-12336-1-M	Nickel	mg/kg	7.97	mg/kg	
A1P2MIS-12336-1-M	Zinc	mg/kg	33.5	mg/kg	
A1P2MIS-12336-1-R	Moisture Content	PERCENT	20.1	PERCENT	
A1P2MIS-12336-1-R	Uranium, Total	ppm dry	17.8	ppm dry	
A1P2MIS-12337-1-M	Antimony	mg/kg	39.8	mg/kg	U
A1P2MIS-12337-1-M	Arsenic	mg/kg	4.4	mg/kg	
A1P2MIS-12337-1-M	Beryllium	mg/kg	0.23	mg/kg	
A1P2MIS-12337-1-M	Cadmium	mg/kg	0.31	mg/kg	
A1P2MIS-12337-1-M	Chromium	mg/kg	7.53	mg/kg	
A1P2MIS-12337-1-M	Copper	mg/kg	11.7	mg/kg	
A1P2MIS-12337-1-M	Lead	mg/kg	15.16	mg/kg	
A1P2MIS-12337-1-M	Manganese	mg/kg	317.94	mg/kg	
A1P2MIS-12337-1-M	Mercury	mg/kg	0.02	mg/kg	
A1P2MIS-12337-1-M	Nickel	mg/kg	8.83	mg/kg	
A1P2MIS-12337-1-M	Zinc	mg/kg	26.27	mg/kg	
A1P2MIS-12337-1-R	Moisture Content	PERCENT	13.4	PERCENT	
A1P2MIS-12337-1-R	Uranium, Total	ppm dry	1.39	ppm dry	
A1P2MIS-126-1-1K	Moisture Content	PERCENT	23.7	PERCENT	
A1P2MIS-126-1-1K	Uranium, Total	ppm dry	33.1	ppm dry	
A1P2MIS-126-1-1K-D	Moisture Content	PERCENT	10	PERCENT	
A1P2MIS-126-1-1K-D	Uranium, Total	ppm dry	32.6	ppm dry	
A1P2MIS-126-1-2K	Moisture Content	PERCENT	22.3	PERCENT	
A1P2MIS-126-1-2K	Uranium, Total	ppm dry	63	ppm dry	
A1P2MIS-126-1-3K	Moisture Content	PERCENT	22	PERCENT	
A1P2MIS-126-1-3K	Uranium, Total	ppm dry	33.1	ppm dry	
A1P2MIS-126-1-4K	Moisture Content	PERCENT	17.7	PERCENT	
A1P2MIS-126-1-4K	Uranium, Total	ppm dry	60.1	ppm dry	
A1P2MIS-143-1-1K	Moisture Content	PERCENT	18.3	PERCENT	

APPENDIX B-6
MISCELLANEOUS AREAS INVESTIGATIONS

SAMPLE ID	PARAMETER	UNITS	RESULT	UNITS	QUALIFIER
A1P2MIS-143-1-1K	Uranium, Total	ppm dry	5.39	ppm dry	
A1P2MIS-143-1-2K	Moisture Content	PERCENT	17.1	PERCENT	
A1P2MIS-143-1-2K	Uranium, Total	ppm dry	3.63	ppm dry	
A1P2MIS-143-1-3K	Moisture Content	PERCENT	19.6	PERCENT	
A1P2MIS-143-1-3K	Uranium, Total	ppm dry	23.1	ppm dry	
A1P2MIS-146-1-1K	Moisture Content	PERCENT	20.4	PERCENT	
A1P2MIS-146-1-1K	Uranium, Total	ppm dry	4.15	ppm dry	
A1P2MIS-146-1-2K	Moisture Content	PERCENT	9.9	PERCENT	
A1P2MIS-146-1-2K	Uranium, Total	ppm dry	10.6	ppm dry	
A1P2MIS-146-1-3K	Moisture Content	PERCENT	10.9	PERCENT	
A1P2MIS-146-1-3K	Uranium, Total	ppm dry	48.2	ppm dry	
A1P2MIS-146-1-4K	Moisture Content	PERCENT	16.8	PERCENT	
A1P2MIS-146-1-4K	Uranium, Total	ppm dry	10.8	ppm dry	
A1P2MIS-146-1-5K	Moisture Content	PERCENT	11.4	PERCENT	
A1P2MIS-146-1-5K	Uranium, Total	ppm dry	53	ppm dry	
A1P2MIS-146-1-6K	Moisture Content	PERCENT	9.2	PERCENT	
A1P2MIS-146-1-6K	Uranium, Total	ppm dry	12.7	ppm dry	
A1P2MIS-150-1-1K	Moisture Content	PERCENT	12.6	PERCENT	
A1P2MIS-150-1-1K	Uranium, Total	ppm dry	16.5	ppm dry	
A1P2MIS-151-1-1K	Moisture Content	PERCENT	12.6	PERCENT	
A1P2MIS-151-1-1K	Uranium, Total	ppm dry	6.29	ppm dry	
A1P2MIS-151-1-2K	Moisture Content	PERCENT	10	PERCENT	
A1P2MIS-151-1-2K	Uranium, Total	ppm dry	39.9	ppm dry	
A1P2MIS-151-1-3K	Moisture Content	PERCENT	11.1	PERCENT	
A1P2MIS-151-1-3K	Uranium, Total	ppm dry	16.4	ppm dry	
A1P2MIS-152-1-1K	Moisture Content	PERCENT	7.3	PERCENT	
A1P2MIS-152-1-1K	Uranium, Total	ppm dry	7.53	ppm dry	
A1P2MIS-152-1-2K	Moisture Content	PERCENT	8.5	PERCENT	
A1P2MIS-152-1-2K	Uranium, Total	ppm dry	25.9	ppm dry	
A1P2MIS-152-1-3K	Moisture Content	PERCENT	14.4	PERCENT	
A1P2MIS-152-1-3K	Uranium, Total	ppm dry	5.45	ppm dry	
A1P2MIS-152-1-4K	Moisture Content	PERCENT	12.3	PERCENT	
A1P2MIS-152-1-4K	Uranium, Total	ppm dry	5.48	ppm dry	
A1P2MIS-152-1-5K	Moisture Content	PERCENT	9	PERCENT	
A1P2MIS-152-1-5K	Uranium, Total	ppm dry	47	ppm dry	
A1P2MIS-152-1-6K	Moisture Content	PERCENT	14.4	PERCENT	
A1P2MIS-152-1-6K	Uranium, Total	ppm dry	27.2	ppm dry	
A1P2MIS-156-1-1K	Moisture Content	PERCENT	9.2	PERCENT	
A1P2MIS-156-1-1K	Uranium, Total	ppm dry	4.41	ppm dry	
A1P2MIS-156-1-1K-D	Moisture Content	PERCENT	8.3	PERCENT	
A1P2MIS-156-1-1K-D	Uranium, Total	ppm dry	4.37	ppm dry	
A1P2MIS-156-1-2K	Moisture Content	PERCENT	7.1	PERCENT	

SAMPLE ID	PARAMETER	UNITS	RESULT	UNITS	QUALIFIER
A1P2MIS-156-1-2K	Uranium, Total	ppm dry	7.31	ppm dry	
A1P2MIS-156-1-3K	Moisture Content	PERCENT	10.6	PERCENT	
A1P2MIS-156-1-3K	Uranium, Total	ppm dry	12.2	ppm dry	
A1P2MIS-156-1-4K	Moisture Content	PERCENT	12.9	PERCENT	
A1P2MIS-156-1-4K	Uranium, Total	ppm dry	21.6	ppm dry	
A1P2MIS-156-1-5K	Moisture Content	PERCENT	6	PERCENT	
A1P2MIS-156-1-5K	Uranium, Total	ppm dry	3.24	ppm dry	
A1P2MIS-1-L-F	1,1,1-Trichloroethan	ug/L	10	ug/L	U
A1P2MIS-1-L-F	1,1,2,2-Tetrachloroe	ug/L	10	ug/L	U
A1P2MIS-1-L-F	1,1,2-Trichloroethan	ug/L	10	ug/L	U
A1P2MIS-1-L-F	1,1-Dichloroethane	ug/L	10	ug/L	U
A1P2MIS-1-L-F	1,1-Dichloroethene	ug/L	10	ug/L	U
A1P2MIS-1-L-F	1,2-Dichloroethane	ug/L	10	ug/L	U
A1P2MIS-1-L-F	1,2-Dichloroethene (T	ug/L	10	ug/L	U
A1P2MIS-1-L-F	1,2-Dichloropropane	ug/L	10	ug/L	U
A1P2MIS-1-L-F	2-Butanone	ug/L	10	ug/L	U
A1P2MIS-1-L-F	2-Hexanone	ug/L	10	ug/L	U
A1P2MIS-1-L-F	4-Methyl-2-pentanon	ug/L	10	ug/L	U
A1P2MIS-1-L-F	Acetone	ug/L	10	ug/L	U
A1P2MIS-1-L-F	Benzene	ug/L	10	ug/L	U
A1P2MIS-1-L-F	Bromodichlorometha	ug/L	10	ug/L	U
A1P2MIS-1-L-F	Bromoform	ug/L	10	ug/L	U
A1P2MIS-1-L-F	Bromomethane	ug/L	10	ug/L	U
A1P2MIS-1-L-F	Carbon disulfide	ug/L	10	ug/L	U
A1P2MIS-1-L-F	Carbon Tetrachloride	ug/L	10	ug/L	U
A1P2MIS-1-L-F	Chlorobenzene	ug/L	10	ug/L	U
A1P2MIS-1-L-F	Chloroethane	ug/L	10	ug/L	U
A1P2MIS-1-L-F	Chloroform	ug/L	5	ug/L	J
A1P2MIS-1-L-F	Chloromethane	ug/L	10	ug/L	U
A1P2MIS-1-L-F	cis-1,3-Dichloroprop	ug/L	10	ug/L	U
A1P2MIS-1-L-F	Dibromochlorometha	ug/L	10	ug/L	U
A1P2MIS-1-L-F	Ethylbenzene	ug/L	10	ug/L	U
A1P2MIS-1-L-F	Methylene chloride	ug/L	10	ug/L	U
A1P2MIS-1-L-F	Styrene	ug/L	10	ug/L	U
A1P2MIS-1-L-F	Tetrachloroethene	ug/L	10	ug/L	U
A1P2MIS-1-L-F	Toluene	ug/L	10	ug/L	U
A1P2MIS-1-L-F	trans-1,3-Dichloropr	ug/L	10	ug/L	U
A1P2MIS-1-L-F	Trichloroethene	ug/L	10	ug/L	U
A1P2MIS-1-L-F	Vinyl chloride	ug/L	10	ug/L	U
A1P2MIS-1-L-F	Xylenes, Total	ug/L	10	ug/L	U
A1P2MIS-1-L-T	1,1,1-Trichloroethan	ug/L	10	ug/L	U
A1P2MIS-1-L-T	1,1,2,2-Tetrachloroe	ug/L	10	ug/L	U

APPENDIX B-6
MISCELLANEOUS AREAS INVESTIGATIONS

SAMPLE ID	PARAMETER	UNITS	RESULT	UNITS	QUALIFIER
A1P2MIS-1-L-T	1,1,2-Trichloroethan	ug/L	10	ug/L	U
A1P2MIS-1-L-T	1,1-Dichloroethane	ug/L	10	ug/L	U
A1P2MIS-1-L-T	1,1-Dichloroethene	ug/L	10	ug/L	U
A1P2MIS-1-L-T	1,2-Dichloroethane	ug/L	10	ug/L	U
A1P2MIS-1-L-T	1,2-Dichloroethene (	ug/L	10	ug/L	U
A1P2MIS-1-L-T	1,2-Dichloropropane	ug/L	10	ug/L	U
A1P2MIS-1-L-T	2-Butanone	ug/L	10	ug/L	U
A1P2MIS-1-L-T	2-Hexanone	ug/L	10	ug/L	U
A1P2MIS-1-L-T	4-Methyl-2-pentanon	ug/L	10	ug/L	U
A1P2MIS-1-L-T	Acetone	ug/L	10	ug/L	U
A1P2MIS-1-L-T	Benzene	ug/L	10	ug/L	U
A1P2MIS-1-L-T	Bromodichlorometha	ug/L	10	ug/L	U
A1P2MIS-1-L-T	Bromoform	ug/L	10	ug/L	U
A1P2MIS-1-L-T	Bromomethane	ug/L	10	ug/L	U
A1P2MIS-1-L-T	Carbon disulfide	ug/L	10	ug/L	U
A1P2MIS-1-L-T	Carbon Tetrachloride	ug/L	10	ug/L	U
A1P2MIS-1-L-T	Chlorobenzene	ug/L	10	ug/L	U
A1P2MIS-1-L-T	Chloroethane	ug/L	10	ug/L	U
A1P2MIS-1-L-T	Chloroform	ug/L	10	ug/L	U
A1P2MIS-1-L-T	Chloromethane	ug/L	10	ug/L	U
A1P2MIS-1-L-T	cis-1,3-Dichloroprop	ug/L	10	ug/L	U
A1P2MIS-1-L-T	Dibromochlorometha	ug/L	10	ug/L	U
A1P2MIS-1-L-T	Ethylbenzene	ug/L	10	ug/L	U
A1P2MIS-1-L-T	Methylene chloride	ug/L	10	ug/L	U
A1P2MIS-1-L-T	Styrene	ug/L	10	ug/L	U
A1P2MIS-1-L-T	Tetrachloroethene	ug/L	10	ug/L	U
A1P2MIS-1-L-T	Toluene	ug/L	10	ug/L	U
A1P2MIS-1-L-T	trans-1,3-Dichloropr	ug/L	10	ug/L	U
A1P2MIS-1-L-T	Trichloroethene	ug/L	10	ug/L	U
A1P2MIS-1-L-T	Vinyl chloride	ug/L	10	ug/L	U
A1P2MIS-1-L-T	Xylenes, Total	ug/L	10	ug/L	U
A1P2MIS-1-M-X	Antimony	ug/L	82	ug/L	U
A1P2MIS-1-M-X	Arsenic	ug/L	10	ug/L	U
A1P2MIS-1-M-X	Beryllium	ug/L	5	ug/L	U
A1P2MIS-1-M-X	Cadmium	ug/L	5	ug/L	U
A1P2MIS-1-M-X	Chromium	ug/L	10	ug/L	U
A1P2MIS-1-M-X	Copper	ug/L	25	ug/L	U
A1P2MIS-1-M-X	Lead	ug/L	31.2	ug/L	U
A1P2MIS-1-M-X	Manganese	ug/L	15	ug/L	U
A1P2MIS-1-M-X	Mercury	ug/L	0.03	ug/L	
A1P2MIS-1-M-X	Nickel	ug/L	40	ug/L	U
A1P2MIS-1-M-X	Zinc	ug/L	20	ug/L	U

SAMPLE ID	PARAMETER	UNITS	RESULT	UNITS	QUALIFIER
A1P2MIS-1-R-X	Thorium-228	pCi/L	-0.00083	pCi/L	U
A1P2MIS-1-R-X	Thorium-230	pCi/L	-0.038	pCi/L	U
A1P2MIS-1-R-X	Thorium-232	pCi/L	0.051	pCi/L	U
A1P2MIS-2-L-F	1,1,1-Trichloroethan	ug/L	10	ug/L	U
A1P2MIS-2-L-F	1,1,2,2-Tetrachloroe	ug/L	10	ug/L	U
A1P2MIS-2-L-F	1,1,2-Trichloroethan	ug/L	10	ug/L	U
A1P2MIS-2-L-F	1,1-Dichloroethane	ug/L	10	ug/L	U
A1P2MIS-2-L-F	1,1-Dichloroethene	ug/L	10	ug/L	U
A1P2MIS-2-L-F	1,2-Dichloroethane	ug/L	10	ug/L	U
A1P2MIS-2-L-F	1,2-Dichloroethene (T	ug/L	10	ug/L	U
A1P2MIS-2-L-F	1,2-Dichloropropane	ug/L	10	ug/L	U
A1P2MIS-2-L-F	2-Butanone	ug/L	10	ug/L	U
A1P2MIS-2-L-F	2-Hexanone	ug/L	10	ug/L	U
A1P2MIS-2-L-F	4-Methyl-2-pentanon	ug/L	10	ug/L	U
A1P2MIS-2-L-F	Acetone	ug/L	10	ug/L	U
A1P2MIS-2-L-F	Benzene	ug/L	10	ug/L	U
A1P2MIS-2-L-F	Bromodichlorometha	ug/L	10	ug/L	U
A1P2MIS-2-L-F	Bromoform	ug/L	10	ug/L	U
A1P2MIS-2-L-F	Bromomethane	ug/L	10	ug/L	U
A1P2MIS-2-L-F	Carbon disulfide	ug/L	10	ug/L	U
A1P2MIS-2-L-F	Carbon Tetrachloride	ug/L	10	ug/L	U
A1P2MIS-2-L-F	Chlorobenzene	ug/L	10	ug/L	U
A1P2MIS-2-L-F	Chloroethane	ug/L	10	ug/L	U
A1P2MIS-2-L-F	Chloroform	ug/L	5	ug/L	J
A1P2MIS-2-L-F	Chloromethane	ug/L	10	ug/L	U
A1P2MIS-2-L-F	cis-1,3-Dichloroprop	ug/L	10	ug/L	U
A1P2MIS-2-L-F	Dibromochlorometha	ug/L	10	ug/L	U
A1P2MIS-2-L-F	Ethylbenzene	ug/L	10	ug/L	U
A1P2MIS-2-L-F	Methylene chloride	ug/L	10	ug/L	U
A1P2MIS-2-L-F	Styrene	ug/L	10	ug/L	U
A1P2MIS-2-L-F	Tetrachloroethene	ug/L	10	ug/L	U
A1P2MIS-2-L-F	Toluene	ug/L	10	ug/L	U
A1P2MIS-2-L-F	trans-1,3-Dichloropro	ug/L	10	ug/L	U
A1P2MIS-2-L-F	Trichloroethene	ug/L	10	ug/L	U
A1P2MIS-2-L-F	Vinyl chloride	ug/L	10	ug/L	U
A1P2MIS-2-L-F	Xylenes, Total	ug/L	10	ug/L	U
A1P2MIS-2-L-T	1,1,1-Trichloroethan	ug/L	10	ug/L	U
A1P2MIS-2-L-T	1,1,2,2-Tetrachloroe	ug/L	10	ug/L	U
A1P2MIS-2-L-T	1,1,2-Trichloroethan	ug/L	10	ug/L	U
A1P2MIS-2-L-T	1,1-Dichloroethane	ug/L	10	ug/L	U
A1P2MIS-2-L-T	1,1-Dichloroethene	ug/L	10	ug/L	U
A1P2MIS-2-L-T	1,2-Dichloroethane	ug/L	10	ug/L	U

APPENDIX B-6
MISCELLANEOUS AREAS INVESTIGATIONS

SAMPLE ID	PARAMETER	UNITS	RESULT	UNITS	QUALIFIER
A1P2MIS-2-L-T	1,2-Dichloroethene (	ug/L	10	ug/L	U
A1P2MIS-2-L-T	1,2-Dichloropropane	ug/L	10	ug/L	U
A1P2MIS-2-L-T	2-Butanone	ug/L	10	ug/L	U
A1P2MIS-2-L-T	2-Hexanone	ug/L	10	ug/L	U
A1P2MIS-2-L-T	4-Methyl-2-pentanon	ug/L	10	ug/L	U
A1P2MIS-2-L-T	Acetone	ug/L	10	ug/L	U
A1P2MIS-2-L-T	Benzene	ug/L	10	ug/L	U
A1P2MIS-2-L-T	Bromodichlorometha	ug/L	10	ug/L	U
A1P2MIS-2-L-T	Bromoform	ug/L	10	ug/L	U
A1P2MIS-2-L-T	Bromomethane	ug/L	10	ug/L	U
A1P2MIS-2-L-T	Carbon disulfide	ug/L	10	ug/L	U
A1P2MIS-2-L-T	Carbon Tetrachloride	ug/L	10	ug/L	U
A1P2MIS-2-L-T	Chlorobenzene	ug/L	10	ug/L	U
A1P2MIS-2-L-T	Chloroethane	ug/L	10	ug/L	U
A1P2MIS-2-L-T	Chloroform	ug/L	10	ug/L	U
A1P2MIS-2-L-T	Chloromethane	ug/L	10	ug/L	U
A1P2MIS-2-L-T	cis-1,3-Dichloroprop	ug/L	10	ug/L	U
A1P2MIS-2-L-T	Dibromochlorometha	ug/L	10	ug/L	U
A1P2MIS-2-L-T	Ethylbenzene	ug/L	10	ug/L	U
A1P2MIS-2-L-T	Methylene chloride	ug/L	10	ug/L	U
A1P2MIS-2-L-T	Styrene	ug/L	10	ug/L	U
A1P2MIS-2-L-T	Tetrachloroethene	ug/L	10	ug/L	U
A1P2MIS-2-L-T	Toluene	ug/L	10	ug/L	U
A1P2MIS-2-L-T	trans-1,3-Dichloropr	ug/L	10	ug/L	U
A1P2MIS-2-L-T	Trichloroethene	ug/L	10	ug/L	U
A1P2MIS-2-L-T	Vinyl chloride	ug/L	10	ug/L	U
A1P2MIS-2-L-T	Xylenes, Total	ug/L	10	ug/L	U
A1P2MIS-2-M-X	Antimony	ug/L	82	ug/L	U
A1P2MIS-2-M-X	Arsenic	ug/L	10	ug/L	U
A1P2MIS-2-M-X	Beryllium	ug/L	5	ug/L	U
A1P2MIS-2-M-X	Cadmium	ug/L	5	ug/L	U
A1P2MIS-2-M-X	Chromium	ug/L	10	ug/L	U
A1P2MIS-2-M-X	Copper	ug/L	25	ug/L	U
A1P2MIS-2-M-X	Lead	ug/L	31.2	ug/L	U
A1P2MIS-2-M-X	Manganese	ug/L	20	ug/L	
A1P2MIS-2-M-X	Mercury	ug/L	0.03	ug/L	
A1P2MIS-2-M-X	Nickel	ug/L	40	ug/L	U
A1P2MIS-2-M-X	Zinc	ug/L	20	ug/L	U
A1P2MIS-2-R-X	Thorium-228	pCi/L	0.015	pCi/L	U
A1P2MIS-2-R-X	Thorium-230	pCi/L	-0.018	pCi/L	U
A1P2MIS-2-R-X	Thorium-232	pCi/L	0.017	pCi/L	U
A1P2MIS-2-R-X	Uranium, Total	ppb	1	ppb	U

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SAMPLE ID	PARAMETER	UNITS	RESULT	UNITS	QUALIFIER
A1P2MIS-3-M-X	Antimony	ug/L	81.7	ug/L	U
A1P2MIS-3-M-X	Arsenic	ug/L	10	ug/L	U
A1P2MIS-3-M-X	Beryllium	ug/L	5	ug/L	U
A1P2MIS-3-M-X	Cadmium	ug/L	5	ug/L	U
A1P2MIS-3-M-X	Chromium	ug/L	10	ug/L	U
A1P2MIS-3-M-X	Copper	ug/L	25	ug/L	U
A1P2MIS-3-M-X	Lead	ug/L	31.2	ug/L	U
A1P2MIS-3-M-X	Manganese	ug/L	15	ug/L	U
A1P2MIS-3-M-X	Mercury	ug/L	0.02	ug/L	U
A1P2MIS-3-M-X	Nickel	ug/L	40	ug/L	U
A1P2MIS-3-M-X	Zinc	ug/L	20	ug/L	U
A1P2MIS-3-R-X	Radium-226	pCi/mL	0.16	pCi/mL	U
A1P2MIS-3-R-X	Thorium-228	pCi/L	0.028	pCi/L	U
A1P2MIS-3-R-X	Thorium-230	pCi/L	0.018	pCi/L	U
A1P2MIS-3-R-X	Thorium-232	pCi/L	0.0062	pCi/L	U
A1P2MIS-3-R-X	Uranium, Total	ug/L	0	ug/L	U
A1P2MIS-4-M-X	Antimony	ug/L	81.7	ug/L	U
A1P2MIS-4-M-X	Arsenic	ug/L	10	ug/L	U
A1P2MIS-4-M-X	Beryllium	ug/L	5	ug/L	U
A1P2MIS-4-M-X	Cadmium	ug/L	5	ug/L	U
A1P2MIS-4-M-X	Chromium	ug/L	10	ug/L	U
A1P2MIS-4-M-X	Copper	ug/L	25	ug/L	U
A1P2MIS-4-M-X	Lead	ug/L	31.2	ug/L	U
A1P2MIS-4-M-X	Manganese	ug/L	15	ug/L	U
A1P2MIS-4-M-X	Mercury	ug/L	0.02	ug/L	
A1P2MIS-4-M-X	Nickel	ug/L	40	ug/L	U
A1P2MIS-4-M-X	Zinc	ug/L	508.7	ug/L	
A1P2MIS-4-R-X	Thorium-228	pCi/L	-0.0035	pCi/L	U
A1P2MIS-4-R-X	Thorium-230	pCi/L	0.077	pCi/L	
A1P2MIS-4-R-X	Thorium-232	pCi/L	0.0061	pCi/L	U
A1P2MIS-4-R-X	Uranium, Total	ppm	3	ppm	U
A1P2MIS-5-L-F	1,1,1-Trichloroethan	ug/L	10	ug/L	U
A1P2MIS-5-L-F	1,1,2,2-Tetrachloroe	ug/L	10	ug/L	U
A1P2MIS-5-L-F	1,1,2-Trichloroethan	ug/L	10	ug/L	U
A1P2MIS-5-L-F	1,1-Dichloroethane	ug/L	10	ug/L	U
A1P2MIS-5-L-F	1,1-Dichloroethene	ug/L	10	ug/L	U
A1P2MIS-5-L-F	1,2-Dichloroethane	ug/L	10	ug/L	U
A1P2MIS-5-L-F	1,2-Dichloroethene (	ug/L	10	ug/L	U
A1P2MIS-5-L-F	1,2-Dichloropropane	ug/L	10	ug/L	U
A1P2MIS-5-L-F	2-Butanone	ug/L	10	ug/L	U
A1P2MIS-5-L-F	2-Hexanone	ug/L	10	ug/L	U
A1P2MIS-5-L-F	4-Methyl-2-pentanon	ug/L	10	ug/L	U

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APPENDIX B-6
MISCELLANEOUS AREAS INVESTIGATIONS

SAMPLE ID	PARAMETER	UNITS	RESULT	UNITS	QUALIFIER
A1P2MIS-5-L-F	Acetone	ug/L	10	ug/L	U
A1P2MIS-5-L-F	Benzene	ug/L	10	ug/L	U
A1P2MIS-5-L-F	Bromodichlorometha	ug/L	10	ug/L	U
A1P2MIS-5-L-F	Bromoform	ug/L	10	ug/L	U
A1P2MIS-5-L-F	Bromomethane	ug/L	10	ug/L	U
A1P2MIS-5-L-F	Carbon disulfide	ug/L	10	ug/L	U
A1P2MIS-5-L-F	Carbon Tetrachloride	ug/L	10	ug/L	U
A1P2MIS-5-L-F	Chlorobenzene	ug/L	10	ug/L	U
A1P2MIS-5-L-F	Chloroethane	ug/L	10	ug/L	U
A1P2MIS-5-L-F	Chloroform	ug/L	4	ug/L	J
A1P2MIS-5-L-F	Chloromethane	ug/L	10	ug/L	U
A1P2MIS-5-L-F	cis-1,3-Dichloroprop	ug/L	10	ug/L	U
A1P2MIS-5-L-F	Dibromochlorometha	ug/L	10	ug/L	U
A1P2MIS-5-L-F	Ethylbenzene	ug/L	10	ug/L	U
A1P2MIS-5-L-F	Methylene chloride	ug/L	10	ug/L	U
A1P2MIS-5-L-F	Styrene	ug/L	10	ug/L	U
A1P2MIS-5-L-F	Tetrachloroethene	ug/L	10	ug/L	U
A1P2MIS-5-L-F	Toluene	ug/L	10	ug/L	U
A1P2MIS-5-L-F	trans-1,3-Dichloropr	ug/L	10	ug/L	U
A1P2MIS-5-L-F	Trichloroethene	ug/L	10	ug/L	U
A1P2MIS-5-L-F	Vinyl chloride	ug/L	10	ug/L	U
A1P2MIS-5-L-F	Xylenes, Total	ug/L	10	ug/L	U
A1P2MIS-5-L-T	1,1,1-Trichloroethan	ug/L	10	ug/L	U
A1P2MIS-5-L-T	1,1,2,2-Tetrachloroe	ug/L	10	ug/L	U
A1P2MIS-5-L-T	1,1,2-Trichloroethan	ug/L	10	ug/L	U
A1P2MIS-5-L-T	1,1-Dichloroethane	ug/L	10	ug/L	U
A1P2MIS-5-L-T	1,1-Dichloroethene	ug/L	10	ug/L	U
A1P2MIS-5-L-T	1,2-Dichloroethane	ug/L	10	ug/L	U
A1P2MIS-5-L-T	1,2-Dichloroethene (	ug/L	10	ug/L	U
A1P2MIS-5-L-T	1,2-Dichloropropane	ug/L	10	ug/L	U
A1P2MIS-5-L-T	2-Butanone	ug/L	10	ug/L	U
A1P2MIS-5-L-T	2-Hexanone	ug/L	10	ug/L	U
A1P2MIS-5-L-T	4-Methyl-2-pentanon	ug/L	10	ug/L	U
A1P2MIS-5-L-T	Acetone	ug/L	10	ug/L	U
A1P2MIS-5-L-T	Benzene	ug/L	10	ug/L	U
A1P2MIS-5-L-T	Bromodichlorometha	ug/L	10	ug/L	U
A1P2MIS-5-L-T	Bromoform	ug/L	10	ug/L	U
A1P2MIS-5-L-T	Bromomethane	ug/L	10	ug/L	U
A1P2MIS-5-L-T	Carbon disulfide	ug/L	10	ug/L	U
A1P2MIS-5-L-T	Carbon Tetrachloride	ug/L	10	ug/L	U
A1P2MIS-5-L-T	Chlorobenzene	ug/L	10	ug/L	U
A1P2MIS-5-L-T	Chloroethane	ug/L	10	ug/L	U

SAMPLE ID	PARAMETER	UNITS	RESULT	UNITS	QUALIFIER
A1P2MIS-5-L-T	Chloroform	ug/L	10	ug/L	U
A1P2MIS-5-L-T	Chloromethane	ug/L	10	ug/L	U
A1P2MIS-5-L-T	cis-1,3-Dichloroprop	ug/L	10	ug/L	U
A1P2MIS-5-L-T	Dibromochlorometha	ug/L	10	ug/L	U
A1P2MIS-5-L-T	Ethylbenzene	ug/L	10	ug/L	U
A1P2MIS-5-L-T	Methylene chloride	ug/L	10	ug/L	U
A1P2MIS-5-L-T	Styrene	ug/L	10	ug/L	U
A1P2MIS-5-L-T	Tetrachloroethene	ug/L	10	ug/L	U
A1P2MIS-5-L-T	Toluene	ug/L	10	ug/L	U
A1P2MIS-5-L-T	trans-1,3-Dichloropr	ug/L	10	ug/L	U
A1P2MIS-5-L-T	Trichloroethene	ug/L	10	ug/L	U
A1P2MIS-5-L-T	Vinyl chloride	ug/L	10	ug/L	U
A1P2MIS-5-L-T	Xylenes, Total	ug/L	10	ug/L	U
A1P2MIS-5-M-X	Antimony	ug/L	73.5	ug/L	U
A1P2MIS-5-M-X	Arsenic	ug/L	1.3	ug/L	U
A1P2MIS-5-M-X	Beryllium	ug/L	0.5	ug/L	U
A1P2MIS-5-M-X	Cadmium	ug/L	2	ug/L	U
A1P2MIS-5-M-X	Chromium	ug/L	2.9	ug/L	U
A1P2MIS-5-M-X	Copper	ug/L	5.7	ug/L	U
A1P2MIS-5-M-X	Lead	ug/L	36.2	ug/L	U
A1P2MIS-5-M-X	Manganese	ug/L	0.9	ug/L	U
A1P2MIS-5-M-X	Mercury	ug/L	0.02	ug/L	U
A1P2MIS-5-M-X	Nickel	ug/L	5.5	ug/L	U
A1P2MIS-5-M-X	Zinc	ug/L	25.8	ug/L	

Appendix C

APPENDIX C

SURFACE WATER MANAGEMENT PLAN

1728

Surface Water Management Plan for Remediation Area 1, Phase II

FDF Project No. 20710
Document No. 20710 PL-0001

August 1998
Revision 1A

Environmental Remedial Action Project
Fernald Environmental Management Project
Fernald, Ohio
FDF Subcontract No. 2-21487
Project Order 175 / Task Order P-012/P-013

PARSONS

4055 Executive Park Drive
Cincinnati, Ohio 4524

000408

Surface Water Management Plan for Remediation Area 1, Phase II

1728

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LIST OF ACRONYMS AND ABBREVIATIONS

A1PI	Area 1, Phase I
A1PII	Area 1, Phase II
AWWT	Advanced Wastewater Treatment Facility
BSL	Biodenitrification Surge Lagoon
cfs	cubic feet per second
DOE	United States Department of Energy
FEMP	Fernald Environmental Management Project
FDF	Fluor Daniel Fernald, Inc.
fps	feet per second
FRL	Final Remediation Level
gpm	gallons per minute
LCS	Leachate Conveyance System
LGTL	Leachate Gravity Transmission Line
NPDES	National Pollutant Discharge Elimination System
ODNR	Ohio Department of Natural Resources
OSDF	On-Site Disposal Facility
PLS	Permanent Lift Station
STP	Sewage Treatment Plant
SWMP	Surface Water Management Plan
SWPPP	Stormwater Pollution Prevention Plan

SECTION 1

INTRODUCTION AND AREA 1, PHASE II DESCRIPTION

1.1 Introduction

The Fernald Environmental Management Project (FEMP) is a 1,050-acre facility located in southwestern Ohio approximately 18 miles northwest of downtown Cincinnati. The mission of the facility was to provide high-purity uranium metal products to support United States defense programs. Production operations were discontinued in 1989. Subsequently, the United States Department of Energy (DOE) decided to decontaminate and dismantle the facility and began environmental remediation of the site.

To facilitate management of the environmental remediation activities, the site was divided into seven sitewide remediation areas. Several of these areas will be remediated in phases. Area 1 is subdivided into two major phases (Phase I and Phase II). Remediation of A1PI was completed in March 1997.

The A1PII project area encompasses approximately 153 acres and is located in the southeastern part of the FEMP. It is bordered on the east and south by the FEMP boundary; on the west by the South Access Road, an unnamed stream and former production area; and on the north by A1PI, and the OSDF. The terrain in the project area is rolling pasture. The STP is completely within and Phase I of the North Entrance Road is partially located in this area. A former trap shooting range is also located in the area. The remediation activities within the A1PII project will include: demolition of below grade structures, removal of subsurface utility lines, and excavation at the STP; demolition of concrete pads, and excavation of lead contaminated soils at the former Trap Range Area; surface stripping around the STP excavation area (see Figure 1-1, and Construction Drawings for locations).; and removal of sediments from existing sediment basins used during the A1PI remedial activities.

To facilitate remediation of A1PII, the project work is included in three packages including an initial Site Preparation Package, STP Excavation Package, and ~~Trap Range Remediation~~ Lead Contaminated Soil Excavation Package. The initial package primarily covers stormwater and erosion control facilities and the second package primarily covers excavation of impacted materials. Lead stabilization surface water controls will focus on small sumps and erosion control. (Note that lead ~~area~~ contaminated soil remediation will be by separate contractor, but the preliminary stormwater controls will be done by the Site Preparation contractor.) There will also be separate smaller packages for development of a borrow area for backfill of the STP excavation area and a package for final reclamation of two sediment traps in A1PI. ~~The Trap Range Remediation Package and the~~ The separate smaller packages previously mentioned are outside the scope of this SWMP.

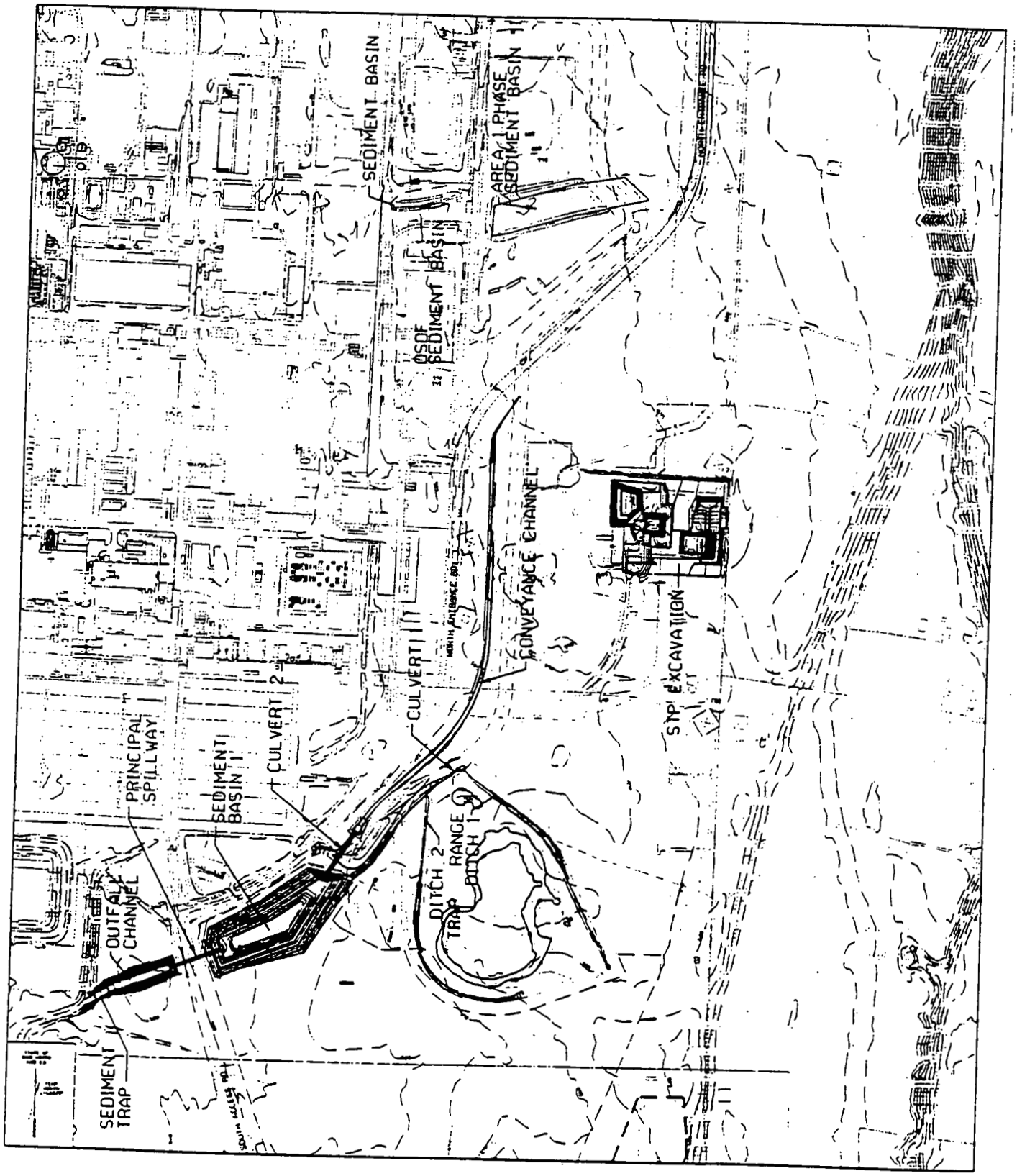

Figure 1-1 - General Site Features

This SWMP covers and applies to all project work including both the Site Preparation and STP Excavation Packages. It supplements the stormwater and erosion control facilities, measures, and related information presented in the Construction Drawings and Specifications.

1.2 Purpose

The FEMP is operating under a National Pollutant Discharge Elimination System (NPDES) Permit which requires the preparation and implementation of a Stormwater Pollution Prevention Plan (SWPPP). This SWPPP became effective May 1, 1996. Section 6 of the SWPPP addresses discharges related to construction activities. The measures outlined in this SWMP and details shown on the Construction Drawings and Specifications will be implemented to effectively manage stormwater and limit the amount of erosion and the release of sediment that will occur during the remediation of A1PII.

Stormwater and erosion and sediment control measures are also required to minimize release of radiological contaminants. This SWMP has been prepared as a guide to minimize construction-related impacts on water quality from erosion and sedimentation, and minimize the spread of contamination during remediation. During remediation, Fluor Daniel Fernald, Inc. (FDF) will perform required NPDES monitoring at the permitted stormwater outfalls and comply with all applicable Federal, State, DOE, and FEMP requirements.

1.3 Scope

This SWMP provides the following information:

- Background discussion of the scope of the A1PII project,
- Description of the A1PII proposed surface water management system.
- Description of proposed general and area-specific erosion and sediment control measures,
- Description of the type and frequency of maintenance activities required to support the control measures.

The SWMP addresses stormwater management, erosion prevention, sediment control, hydrologic and hydraulic evaluation, stormwater runon and runoff, physical site characteristics that impact the selection and implementation of control measures, and references to established design criteria. Supporting engineering data and calculations are attached as Appendix A.

SECTION 2

SURFACE WATER MANAGEMENT SYSTEM

2.1 Overall Approach

The principal objectives of surface water management in the A1PII project area are to prevent or minimize stormwater runon to the work areas and to control water and runoff which has come into contact with contamination and/or impacted material. The project area covers approximately 153 acres. The topography is gentle to rolling pasture land. Existing drainage consists mainly of sheet flow that is uncontrolled before reaching existing conveyance channels. Drainage flows through the A1PII area in a south and westerly direction and eventually drains to Paddys Run via a storm sewer outfall ditch.

As a basic or fundamental approach to surface water management, runon from upgradient areas will be prevented, where possible, from flowing into the remediation area. This will minimize the possibility of erosion and limit the amount of potentially contaminated water.

Existing drainage patterns and facilities will be used for stormwater management, wherever possible, by implementing improvements to convey design flows. Incorporating erosion control measures and revegetation will limit erosion along drainage paths. Where necessary, new ditches or diversion berms will be constructed to redirect existing drainage paths away from the construction area. Within the STP Excavation area, excavation sumps ~~Sediment basins~~ will be used to provide detention time for sediments to settle out. Where possible, existing and proposed vegetative buffer zones will be used to reduce sediment load in the stormwater runoff. Where runoff cannot be directed to a sediment basin, silt fence will be used to filter-out sediments.

Water collected in the STP excavation area may be contaminated. All water collected within the STP excavation will be pumped to Advanced Wastewater Treatment Facility (AWWT) Phase II for treatment. Water from the Site Preparation activities will be routed through either a sediment trap, sediment basin, or silt fence prior to discharge to natural conveyance.

2.2 Surface Water

Precipitation not collected in the STP Excavation Area ~~excavation areas~~ will be classified as surface water. Surface water which flows through the A1PII area will be collected and conveyed to sediment basins where practicable. Diversions (berms, ditches) will be used to divert surface water around the STP Excavation Area ~~excavation~~ where possible.

Surface water runoff from the STP and Trap Range excavation areas will be conveyed to a new sediment basin designated as Sediment Basin 1 (see Figure 1.1). Runoff from activities in the northern portion of the A1PII project area will utilize two existing sediment basins (designated as OSDF Sediment Basin and the Sediment Basin) to control sediment. OSDF Sediment Basin is approximately 2 acres in size, and is currently being used as the sediment basin for OSDF construction activities. The Sediment Basin is located due north of the OSDF Sediment Basin and is approximately one-half acre in size. This basin was used previously during the A1PI remediation activities. There is an isolated area south of the OSDF Sediment Basin which will require soil stripping. Due to the relatively small size (approximately 1.5 acres) and flat topography, runoff from this area will be directed to perimeter silt fencing.

2.3 Specific System Components

Specific components of the surface water management system are described below. See the Construction Drawings and Specifications for detailed design information concerning stormwater controls. See Appendix A for design calculations. A drainage area map for A1PII is presented in Appendix B.

2.3.1 Diversion Ditches and Related Devices

Runon from upgradient areas will be collected and diverted, where possible, around the remediation areas using field located ditches and berms. A diversion ditch and series of berms have been specified around the STP excavation area to minimize the amount of surface water from entering the STP Excavation Area, and to prevent water within the excavation area from leaving the excavation boundary. See the STP Excavation Package Construction Drawings for locations of the ditch and berms.

2.3.2 Primary Collection and Excavation Sumps

The STP excavation area will be graded to drain to field located primary collection ~~points~~ sumps within the excavation area to the extent practical. These sumps will be excavated ~~at these collection points~~ to temporarily hold the stormwater and provide settling time for reduction of suspended solids. Water collected in the primary collection sumps will be pumped via portable pumps to field located excavation sumps. The excavation sumps will serve as a temporary holding reservoirs until the water can be pumped into the LCS. The excavation sumps will also provide additional settling capability. One semi-permanent excavation sump pump will be used to transfer water to the OSDF leachate conveyance (transmission) system (LCS) for conveyance to the AWWT Phase II facility. Multiple sumps/pumps may be used for dewatering of the excavation area. The sump pumps will be ~~provided and~~ moved as necessary by the contractor as excavation progresses or as necessary to collect water from specific areas, based on the construction requirements. Water from the temporary sumps will be transferred by the contractor to the semi-permanent excavation sump pump. The excavation sump pump controls will be tied into the controls at the LCS Permanent Lift Station (PLS) such

that during high flow conditions into the LCS PLS, the excavation sump pump will be turned off. This will give the flow from the OSDF cells priority.

2.3.3 Transfer Line

The effluent from the excavation sump pump will be routed mostly above ground in a transfer line to ~~the~~ a clean-out located on the LCS ~~PLS~~. This transfer line will run under the OSDF Haul Road, conveyance channel, and old North Entrance Road. Where the transfer line crosses the old North Entrance Road, a pavement cut will be used to install the transfer line. ~~needs to cross paved roads, it will be run through existing culverts to avoid pavement cuts and disturbance to FEMP operation.~~ The transfer line will discharge into the ~~top of the~~ LCS ~~PLS at the access door~~ clean-out. This clean-out will have a check valve installed to prevent backflow of leachate into the transfer line. From the clean-out tie-in point, the water pumped from the STP will travel via the leachate gravity transfer line until reaching the LCS Permanent Lift Station (PLS). ~~This will avoid any disturbance to the tank and its secondary containment system.~~ The effluent from the LCS PLS is pumped to the Biodentrification Surge Lagoon (BSL) where it is then transferred to the AWWT Phase II facility.

To ensure that discharge from the STP Transfer Line does not impede the performance of the LCS, the design of the LCS was evaluated in conjunction with expected quantities of water at the STP excavation area. Specifically, the Leachate Gravity Transmission Line (LGTL), which AIPII will be pumping into at the clean-out, is a 10"/6" High-Density Polyethylene, dual containment pipe. The OSDF Final Design Calculation Package recommends that the peak flow into the LGTL be regulated by valves at each cell outlet to produce a peak flow not to exceed 200 gallons per minute (gpm). Thus, during a 25-yr., 24-hr. storm event, the design flowrate generated by the OSDF leachate system is 200 gpm for a duration of 6 days (*"Final Design Calculation Package, On-Site Disposal Facility"*, Revision 0, Volume II of IV, May 1997, GeoSyntec Consultants).

Second, the design and operation of the PLS was evaluated. The PLS is located south of future cell number 9 and is designed to receive leachate via gravity flow from the OSDF cells. The PLS was designed as a duplex system (i.e., two pumps) with each pump rated at 200 gpm. However, testing after installation has revealed that the maximum pumping rate for the pumps when operating together is only 240 gpm. The PLS is also equipped with a high-level, sensor-actuated control valve upstream in the LGTL which shuts leachate inflow off when a high liquid level is detected in the PLS.

Third, the expected quantity of water from the STP deep excavation area was calculated (Refer to Appendix C for calculation of water quantities within the STP deep excavation area). For a 25-yr., 24-hr. storm event, approximately 420,000 gallons of water would accumulate within the STP excavation area. Theoretically, If the design maximum flow rate coming out of the OSDF is regulated to 200 gpm, and the observed pumping rate at the PLS remains at 240 gpm, the AIPII project should be able to pump approximately 40 gpm to the

LCS. Given the 6 day peak flow duration of the OSDF, and the expected volume of water within the STP, the AIPII project would be able to pump a maximum of 57,600 gallons per day.

Because of the uncertain and complex nature of estimating leachate and storm flows, the AIPII project is proposing additional engineering controls to ensure that the operation of the LCS for leachate generated by the OSDF will be given priority. The engineering controls are outlined as follows:

A. The STP excavation sump pump controls will be tied into the controls at the PLS. Thus, should the high-level sensor in the PLS close the control valve, the sump pump would automatically shut-off. A delay of one (1) hour will be programmed (further adjustment can also be made as necessary) into the controls of the sump pump so that the pump will wait one (1) hour after the PLS has pumped down and opened the control valve before trying to restart.

B. Recognizing that any significant rainfall within the STP excavation will take days to pump out (due to the likely use of the LCS by the OSDF), the Contractor will be instructed to have alternate work sites identified which can be worked during pumping delays. Further, the Contractor can use multiple sumps within the STP excavation area to move accumulated water into and out of different excavation areas as the need arises.

The above engineering controls should prevent the AIPII project from adversely affecting the operation and performance of the LCS and will assure the OSDF has priority for use of the LCS.

~~2.3.4 Equipment Wash Facility~~

~~An Equipment Wash Facility will be constructed north of the STP excavation area. It will be used to remove mud and debris from the wheels and undercarriage of haul vehicles. Water from the collection sump at this facility will be pumped to the STP excavation and treated as STP excavation sump water. See Section 2.3.2~~

2.3.54 A1PII Sediment Basin 1

The proposed (during excavation conditions) watershed from A1PII is approximately 73 acres in size. Runoff will be collected and conveyed to the new sediment basin (see Construction Drawings and calculations) via Conveyance Channel 1. The sediment basin will be located adjacent to the South Access Road, and will cover approximately 2.0 acres of surface area.

The sediment basin will be designed in accordance with the Ohio Department of Natural Resources' (ODNR) *"Rainwater and Land Development"* as a minimum. The required storage capacity for the sediment basin and sediment trap are given as follows:

Sediment Basin

Watershed Area = 73.2 Acres
Total Storage Required = 3.0 Acre-Feet
Sediment Storage Required = 1.2 Acre-Feet

The OSDF originally planned a sediment basin in the same location to accommodate the development of the OSDF Borrow Area. A preliminary borrow area grading plan and sediment basin design have been submitted as part of the OSDF Drawings to the U.S. Environmental Protection Agency and the Ohio Environmental Protection Agency. Since the A1PII project is scheduled to be completed prior to beginning development of the OSDF Borrow Area, the goal is to prevent duplication in the construction of two sediment basins. The A1PII project will provide a sediment basin which will accommodate the A1PII remediation activities, while providing OSDF with a sediment basin that with limits can be modified to accommodate future activities.

Since the OSDF borrow area grading plan and geometry of the sediment basin are interrelated, the OSDF sediment basin geometry will be used as much as possible. The OSDF Borrow Area Sediment Basin was designed according to OAC 3745-27-08(C)(6)(d). This basin is an excavated basin with twin pipe principal spillway structure.

Sediment basin requirements specified in the ODNR "*Rainwater and Land Development*" will be used for A1PII remediation activities. With the basin geometry defined, an outlet control structure will be designed for the A1PII remediation work which will meet total volume and sediment storage requirements. In anticipation of modifications that may be needed for future OSDF use, a second riser/pipe outlet structure will be installed during basin construction. An additional modification to OSDF Sediment Basin Plan was to raise the outlet control structure and pipe elevations to provide for an embankment height of less than 10 feet as defined by the Ohio Safe Dam Regulations. When A1PII activities are completed, the outlet control structures can be modified as needed by the OSDF project. The sediment storage volume will be in a sump below the elevation of the outlet control structure and is considered "dead storage" for any pond routing. The principal outlet control spillway discharges into an outlet channel, then to an unnamed existing channel.

2.3.65 Conveyance Channel

A conveyance channel will be constructed west of the STP excavation area to intercept and convey runoff from the A1PII project area south of the North Entrance Road to Sediment Basin 1 (see the Drainage Area Map, Appendix B). The conveyance channel will be grassed-lined using an erosion control blanket and will be designed to accommodate a 10-year, 24 hour precipitation event from A1PII catchment with a maximum velocity in the channel of 3 feet per second. If the velocity is between 3 to 4 feet per second, stone check dams are required. When required, stone check dams will be designed according to ODNR "Rainwater and Land Development" criteria. Velocity greater than 4 feet per second requires stone channel protection. The

conveyance channel will remain after A1PII remediation has been completed in anticipation of future modification and use by the OSDF. Diversion Ditch 1 will be constructed upgradient of the ~~Trap Range~~ Lead Contaminated Soil Excavation Area to minimize surface water run-on ~~to the Trap Range~~ and will discharge runoff to Sediment Basin 1. Diversion Ditch 2 will be constructed downgradient around the ~~Trap Range~~ Lead Contaminated Soil Excavation area to collect and convey runoff to Sediment Basin 1.

2.3.~~7~~6 Culverts

Culvert 1 is at the access point of the ~~Trap Range~~ (Lead Contaminated Soil Excavation Area). It discharges into the side ditch along the rerouted portion of the STP Access Road. This side ditch then discharges into Sediment Basin 1.

At the STP Access Road, Culvert 2 will consist of a series of pipes installed to carry flow from the conveyance channel to Sediment Basin 1. The culverts will pass over top an existing 24-inch diameter groundwater line (GW-24"). Culvert 2 is designed to include the peak discharge from A1PII catchment plus 16.1 acres from OSDF cell construction for the 25-year, 24-hour storm event. There are several locations where temporary access is required, such as the access point to the Lead Contaminated Soil Excavation Area ~~Trap Range~~, outfall area access, and the Radiological Monitoring Trailer which ~~will~~ may need small culverts to maintain positive drainage. In these cases, they are for short-term construction activities and would cause no significant problems if the capacity of the culvert is exceeded. The Contractor will be responsible for providing positive drainage through the use of temporary culverts or other measures.

2.3.~~8~~7 Sediment Trap

A Sediment Trap will be constructed prior to the start of the construction of the outfall channel for the Sediment Basin 1 Principal Spillway. The trap will be designed according to ODNR requirements. Once the outfall channel is constructed and stabilized, it is to be removed.

SECTION 3

STORMWATER MANAGEMENT

The goal of FEMP stormwater management on a sitewide basis is to prevent an increase in the peak runoff during remediation and restoration activities and after restoration. Stormwater management, as described in this SWMP, addresses the peak runoff that discharges from the A1PII project site during construction/ remediation activities.

The A1PII project site is currently vegetated and consists of sheet flow and shallow concentrated flow in the upper watershed areas, leading to concentrated flows in the existing stormwater conveyance ditch, located east of the production area. All runoff from the A1PII project area presently flows into Paddys Run. Prior to the start of remediation, a surface water management system will be implemented to prevent runon to the A1PII project site, where possible, and collect and convey runoff from the A1PII project site for storm events up to the 10-year, 24-hour storm. The majority of runoff from the A1PII Project site will be diverted to sediment basins or traps during construction activities.

Water collected within the STP Excavation Area will be pumped to the BSL then on to the AWWT prior to discharge into the Great Miami River. The proposed wastewater stream from the STP excavation was previously identified in the Operations and Maintenance Master Plan for the Aquifer Restoration and Wastewater Treatment Project. Thus, it is anticipated that this wastewater stream can be adequately managed through the BSL. FDF will monitor the performance of the BSL in the future, and continue to evaluate issues such as increasing treatment efficiencies, pump-out capacities, etc., to ensure that the BSL maintains the necessary hydraulic capacity.

~~As part of the remediation,~~ The STP excavation area will not be restored to the approximate original topography as part of this project. Instead, the area will be stabilized until certification sampling determines that levels of contamination, if present, are below FRL. The restoration of the STP Area will occur during a future project. Figure 3-1 illustrates a conceptual grading plan which was developed to show how the area should look after backfilling. Areas where surficial stripping occurs will not be backfilled. Instead, surface stripped areas will be graded to provide positive drainage, as necessary. Initial land use after remediation will be undeveloped with a vegetated cover. Based on an undeveloped land use scenario, the total amount of runoff from the A1PII project site after remediation can be expected to be similar to the current conditions. Stormwater management for future land use of the A1PII project area is beyond the scope of this plan.

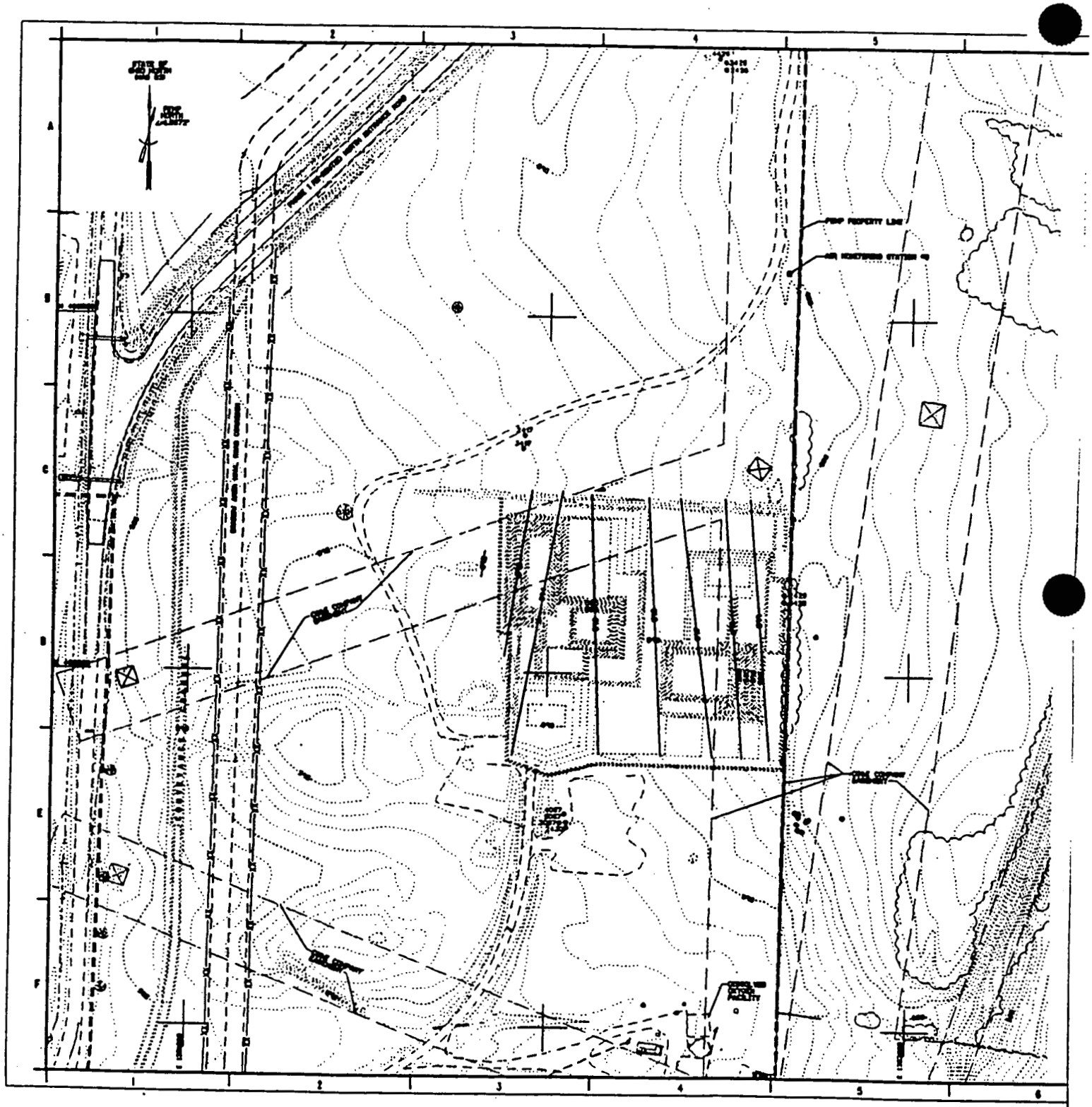

Figure 3-1, Conceptual Reclamation Grading Plan

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SECTION 4

EROSION AND SEDIMENT CONTROL MEASURES

4.1 Overall Concept

Soil conservation practices, combining vegetative and structural measures, have been incorporated in construction documents to mitigate soil erosion damage, off-site sediment migration, and water pollution from erosion. Many of these measures will be long-term in nature and will become part of the completed construction project (i.e., grading and seeding). Other measures will be temporary and will be removed by the Contractor at the completion of excavation and restoration. The selection of erosion and sediment control measures was based on several general principles including the following:

- minimization of water volumes requiring erosion and sediment control through diversion of runon water where possible
- minimization of erosion through project design,
- incorporation of temporary and permanent erosion control measures, and
- removal of sediment prior to discharge.

Erosion and sediment control measures incorporated into the A1PII project design use applicable State, Federal, DOE, and FEMP requirements. The FEMP standards for erosion and sediment control follow the ODNR and United States Soil Conservation Service standards for construction and materials. Vegetative stabilization, silt fencing, and ditch protection will be implemented in accordance with ODNR *"Rainwater and Land Development"*, Ohio Department of Transportation "*Construction and Material Specifications*", and the "*Location and Design Manual, Volume Two, Drainage*". A generalized description of proposed erosion and sediment control measures is presented in this section. Construction details for erosion and sediment control measures are included in the Construction Drawings and Specifications.

Runoff from the STP and Lead Contaminated Soil ~~Trap Range~~ excavation areas will be directed to a new sediment basin (Sediment Basin 1) located adjacent to the South Access Road. See the Drainage Area Map in Appendix B. Runoff from activities in the northeast portion of the project area will be directed to the existing OSDF Sediment Basin and ditch system. Runoff from activities in the northwest portion of the project area will be directed to the existing Sediment Basin and ditch system. Sediment control for isolated stripping activities south of the OSDF Sediment Basin and for the sediment removal activities for the A1PI basins will consist of perimeter silt fence and vegetative buffer zones.

4.2 Specific Components

There are two types of erosion and sediment control components: temporary and long-term measures. Temporary measures include silt fencing, crusting agents, stabilization measures (vegetation, matting, dumped rock), and sediment storage capacity within the sediment basin. Long-term measures include design features such as grading, vegetation, and dumped rock. Both temporary and long-term measures are discussed below.

4.2.1 Silt Fencing

Silt fencing will be used to intercept sheet flow, retain sediments, and disperse flow prior to runoff reaching the collection ditches. Prior to clearing, grading, and excavation activities, silt fencing will be installed along downgradient perimeters along the contour to prevent migration of sediment eroded from exposed areas. Silt fencing will consist of a woven filter fabric attached to wooden posts. Silt fencing will be constructed so that the toe of the filter fabric is securely buried to prevent water from undercutting the fence. Silt fencing will be installed in accordance with details presented on the drawings and in accordance with manufacturer's recommendations. The locations presented on the Construction Drawings for the project areas are considered the minimum necessary during construction. Intermediate silt fencing may be used by the Contractor to control and slow down flows in active excavation areas. The Contractor will install breaks and overlaps in the silt fencing to allow vehicle access to the construction areas.

Inspection and maintenance of silt fence shall occur at regular intervals as outlined in Section 6.

4.2.2 Temporary Stabilization

As a result of phased construction, portions of the project areas may be left in intermediate/incomplete conditions. Intermediate areas may include rough graded areas awaiting final grading. Intermediate areas where activities will not resume for a period of 45 consecutive days or greater will be stabilized by applying a crusting agent within 7 days of last excavation. Temporary measures will help to stabilize exposed soil and limit erosion. As construction progresses, areas containing the crusting agent will be left in place, inspected and repaired regularly according to Section 6 until final seeding or until construction resumes.

The STP excavation area will be stabilized using a crusting agent after excavation is completed. The crusting agent will be maintained in good condition until certification sampling confirms that contamination levels are below FRL. At that time, the area will be backfilled and permanently stabilized with vegetation. Backfilling and establishing vegetation at the STP excavation site is beyond the scope of this project.

4.2.3 Grading and Design Features

Grading design features incorporated into the Construction Drawings to control erosion include runon controls, limiting steep slopes, routing runoff to surface water collection ditches, limiting discharge and flow velocities in the collection ditches to the extent practical, and lining collection ditches with erosion control blankets or dumped rock as required to maintain non-erosive velocities.

4.2.4 Vegetation

Subsequent to final remediation of the project areas, a revegetation program will be implemented to establish a variety of vegetation. The vegetation layer will reduce erosion, enhance evapotranspiration of water, and improve the quality of water leaving the area. The project area, outside of the STP excavation area, will be seeded in stages as remediation is completed. In addition to seeding with a variety of grass seed, mulch and erosion control blankets will be placed to prevent erosion during establishment of vegetation. Mulch will be placed on graded slopes and erosion control blankets will also be used in all grass ditches. As an aid to establishment of vegetation, seeded areas will be fertilized with a starter fertilizer as described in the Technical Specifications.

4.2.5 Dumped Rock

The outlet channel from the Sediment Basin 1 will be lined with dumped rock to protect against erosion from excessive velocities. The slopes around the inlet and outlet of the culverts at the STP Access Road and the groundwater line will be lined with dumped rock. Additionally, a dumped rock apron will be installed at the inlet and outlet of these culverts to prevent scouring.

4.3 Design Criteria and Standards

The criteria used to design the various components of the SWMP are described below.

4.3.1 Sediment Basin 1

- Minimum total volume - determines invert elevation of principal riser and is based on 67 cubic yards per watershed acre in accordance with ODNR *"Rainwater and Land Development"*.

- Maximum sediment cleanout elevation - determines maximum cleanout elevation and is based on 27 cubic yards per watershed acre in accordance with ODNR *"Rainwater and Land Development"*.

- For a basin (such as Sediment Basin 1) designed to store less than 50 acre-feet at elevation where water would overflow embankment, the embankment height is to be less than 10 feet as defined by the Ohio Dam Safety regulations.

- Principal spillway structures - 2 riser/pipe structures each consisting of a 48-inch riser with a 48-inch pipe. The 10-year, 24-hour storm event is routed through outlet structures to evaluate performance under worst case conditions for A1PII. The spillway's controlling discharge was evaluated by determining the minimum flow for weir and orifice conditions on the riser and flow through the barrel, under various headwater elevations up to the elevation where water starts to overflow the basin and flow over the low point in the North Entrance Road. The tailwater condition was assumed to be at the elevation equal to the invert of the pipe plus half its diameter. This is also approximately the same elevation as the depth of flow in the outlet channel using a 16-foot bottom width, 3H:1V side slopes, 0.8 percent channel slope, and a uniform flow depth of 1.9 feet (200 cfs).

  (Note that the second principal spillway structure was added to provide additional capacity if OSDF elects to add to the drainage area beyond that for the A1PII watershed area (73 acres). No analysis was performed for any additional areas and will be the responsibility of others).

- A defined emergency spillway will not be constructed for Sediment Basin 1 due to the close proximity of the existing South Access Road and the North Entrance Road. Instead, emergency overflow (should an overflow situation ever arise), will flow in a northwest direction over the North Entrance Road, then the South Access Road.

4.3.2 Culverts

Culvert 1 is a pipe which conveys drainage from the Trap Range diversion ditch/berm underneath the gravel road leading from the STP Access Road.

Culvert 2 is a series of three pipes used to convey flow from Conveyance Channel 1 into Sediment Basin 1. In anticipation of future use by the OSDF, Culvert 2 is designed to carry 110 cfs which is the peak flow from the A1PII catchment plus 16.1 acres from the OSDF cell construction area, for the 25-year, 24-hour storm event. Culvert 2 is designed to have minimum clearance over the 24-inch diameter groundwater line. Culvert 2 will have 2.5 feet of gravel cover in the area of the STP Access Road crossing. In other locations, it will have a minimum of 1-foot of cover.

4.3.3 Conveyance Channel

The channel is designed to convey 10-year, 24 hour peak runoff from A1PII. Erosion control blanket without check dams will be used when the velocity is less than 3 fps. Between 3 and 4 fps, check dams will be added. Dumped rock channel protection will be used for velocities exceeding 4 fps.

4.3.4 Silt Fence

Silt fence criteria is as specified in ODNR "*Rainwater and Land Development*".

4.3.5 Sediment Trap

The Sediment trap criteria is as specified in ODNR "*Rainwater and Land Development*" and is sized based on 67 cubic yards per acre of total contributing drainage area.

SECTION 5

IMPLEMENTATION

Because of the large expanse of area that will be impacted by remediation, erosion control measures will be required to minimize erosion and maximize the capture of sediment. In conjunction with stormwater management measures, silt fencing will be installed along perimeter downslope areas and drainage ditches, where necessary, prior to the beginning of excavation activities. Erosion and sediment control will be a part of all construction packages for A1PII.

Once excavation of impacted material and contaminated soil begins, erosion and sediment control measures will be integrated with stormwater management measures. The Contractor will be required to periodically remove sediments from silt fences, drainage ditches, and sediment basins to maintain desired performance. Sediment removed from silt fences, drainage ditches, and sediment basins/traps will be managed as impacted material and disposed of in the OSDF.

Any area left exposed for more than 45 consecutive days without any immediate plans for future work will be stabilized within 7 calendar days of last excavation using a crusting agent or seeding according to the Technical Specifications (also see Construction Drawings for proposed stormwater and sediment controls). All disturbed areas will be stabilized to the extent practical prior to winter shutdown.

5.1 General Construction Practices

In general, it is advantageous to disturb only as little an area as necessary to accommodate construction needs. Limiting the extent of grading and excavation will minimize disturbed areas subject to erosion at any given time. However, disturbed areas may be expanded to separate work areas and provide more room to work for safety reasons. The construction phasing ultimately incorporated into the work plan is dependent on several factors including the following:

- Contractor's management strategies,
- Construction conditions,
- Seasonal and weather conditions.

The following construction practices will be followed as a general rule.

- All erosion and sediment control measures are to be installed prior to or as the first step in excavation.

- Disturbed/exposed areas will be excavated as quickly as practical. Disturbed areas which will remain unworked for 45 consecutive days or greater will be stabilized with a crusting agent and/or temporary seeding within 7 days of last excavation.

- All erosion and sediment control measures shall be maintained and/or modified or supplemented as approved by FDF in accordance with the ODNR *"Rainwater and Land Development"* during construction to comply with this SWMP.

- Potential cross-contamination from vehicle traffic will be prevented by stabilization of entry/exit routes, management and control of road crossing, construction of clean roads out of fill material from STP Borrow Area, wheel washing, and monitoring vehicles exiting the work zone.

5.2 Construction Sequencing

The following sections discuss the general erosion control sequencing for the A1PII Construction Packages.

5.2.1 General Erosion Control Sequencing (Prior to Impacted Material Excavation)

Step 1. Establish site boundaries and access controls.

Step 2. Install sediment trap, silt fence, and diversion ditches in locations indicated on the Construction Drawings.

Step 3. Strip the top 6 inches of soil (if not certified below Final Remediation Levels (FRLs) by FDF) from areas designated for Sediment Basin 1 construction as noted on the construction drawings.

Step 4. Complete excavation of sediment basin to lines and grades shown on the plans. Stockpile soil in stockpiles as shown on the Construction Drawings.

Step 5. Install risers and pipes as shown on the Construction Drawings.

Step 6. Divert flow into Sediment Basin 1 by constructing the conveyance channel and diversion ditches.

Step 7. Construct equipment wash facility and associated devices as appropriate for package.

5.2.2 Impacted Material Excavation Sequencing

Step 1. Establish site boundaries and access controls.

Step 2. Confirm that surface water controls are in locations indicated on the Construction Drawings and as shown in the details. Confirm that all erosion and sediment controls are in place and all runoff from disturbed areas and to be disturbed areas flows to the sediment basins or through silt fence.

Step 3. Clear remaining trees and vegetation as indicated on the Construction Drawings. Stumps will be ground in place and excavated with surface soil removal.

Step 4. Excavate impacted material to the limits indicated on the Construction Drawings.

Step 5. When excavation is completed in a discrete area, certification samples will be collected (by FDF).

Step 6. Upon FDF certification that soils remaining in the remediation area meet FRLs, perform restoration grading where required, apply seed and mulch to all disturbed areas~~, and install stabilization blankets~~ as indicated in the Technical Specifications and the Construction Drawings.

Step 7. Upon FDF verification that the excavation meets FRLs, install temporary erosion and sedimentation controls for removal of sediments from sediment basins. (Not in scope of this project)

Step 8. Upon FDF verification that the excavation meets FRLs and has an established stand of vegetation, remove accumulated sediments from the sediment basins and silt fences. (Not in scope of this project)

Step 9. Upon FDF certifying that the upgradient areas and sediment basin meets FRLs, remove the riser and backfill, seed, and mulch when sediment control is no longer necessary.

Step 10. Remove temporary erosion and sedimentation controls following completion of final grading activities and after the excavation areas have an established stand of vegetation. Seed and mulch any areas disturbed by this activity.

5.2.3 ~~Trap Range~~ Lead Contaminated Soil Excavation Area

In general, the ~~Trap Range~~ perimeter controls for the Lead Contaminated Soil Excavation Area will be established with the Site Preparation Package. Additional sediment control measures, such as silt fence and a vegetative buffer upgradient of the silt fence shall be used prior to the start of remediation activities ~~in the Trap Range~~.

SECTION 6

EROSION AND SEDIMENT CONTROLS/ INSPECTION AND MAINTENANCE

6.1 Inspection

The erosion and sediment controls identified in this SWMP will be monitored by a qualified representative of the Contractor and FDF weekly or within 24 hours of a precipitation event of 0.5 inches or greater during the construction phase of the project. Inspections will include areas under excavation, stockpiles, stabilized and unstabilized exposed areas, erosion control measures, and locations where vehicles enter/exit the project area. Where portions of the project area have been completed and permanent erosion control measures have been implemented, inspection will be conducted at least once every month until the entire project area is completely stabilized. All inspections will be conducted and documented in accordance with the SWPPP.

Disturbed areas and areas used for storage of materials that are exposed to the elements will be inspected for evidence of, or for the potential of, pollutants entering local drainage systems. Locations where vehicles exit the project area will be inspected for evidence of off-site tracking of contaminated soil or impacted material.

If the inspections indicate that control measures are not adequate or effective, modifications to the control measure will be implemented immediately by the Contractor. A report summarizing the scope of the inspection, name of the inspector, inspection date, observations relating to the implementation of the SWMP, and corrective action measures (if any) will be made and retained in the FDF project files to demonstrate compliance. The reports will either identify any areas of noncompliance with the SWMP, or contain a certification that control measures are effective and in compliance with this plan.

6.2 Maintenance

Maintenance is according to the requirements of the Technical Specification and part of the warranty.

6.2.1 Silt Fence

The Contractor will remove the sediment that collects along the silt fences to maintain the desired removal performance and prevent structural failure of the fence in accordance with the Technical Specifications. Sediment removed during the STP Excavation Phase will be managed as impacted material and placed in the OSDF. The perimeter silt fencing will remain in place until excavation activities in the area are completed

and vegetative cover or other erosion control measures are adequately established. Damaged fence will be repaired or replaced as appropriate.

6.2.2 Conveyance Channel

~~The Contractor~~ FDF will be required to periodically remove sediment from the Conveyance Channel and other ditches to maintain flow. Unless sampling indicates sediment is below FRL, sediment removed during the STP Excavation Phase will be managed as impacted material and placed in the OSDF.

6.2.3 Sediment Basins

~~A Contractor~~ FDF will ~~be required to~~ periodically remove sediment from the sediment basins to maintain desired sediment storage capacity. Cleanout elevations are indicated on the Construction Drawings and are specified in the Technical Specifications. Unless sampling indicates sediment is below FRL, sediment removed during the STP Excavation phase will be managed as impacted material and placed in the OSDF.

6.2.4 Sediment Trap

The Site Preparation Contractor will be required to periodically remove sediment from the trap such that at least half of its design depth is maintained. The sediment removed shall be handled as indicated in the Site Preparation Technical Specifications and the Construction Drawings.

~~6.2.5 Equipment Wash Facility~~

~~The Contractor will remove the sediments from the collection sump as required. The sediments removed from the Equipment Wash Facility will be managed as impacted material and placed in the OSDF.~~

APPENDIX A

CALCULATIONS

PARSONS

ENGINEERING CALCULATIONS TITLE AND SUMMARY SHEET

1728

Date 2/25/98

Sheet 1 of 9

Proj. Order No. PO175 Calculation No. 15-01

Project Title Area I, Phase II Remediation

Calculation Subject Stormwater Controls Date Verified/Checked 3-10-98

STATUS: PRELIMINARY ____ FINAL X SUPERSEDED ____ VOID ____

STATEMENT OF PROBLEM

Design drainage structures (i.e., sediment basin, conveyance channel, and associated drainage culverts) to accommodate Area I, Phase II (AIPII) remediation activities.

SUMMARY OF CONCLUSIONS	Originator's Signature and Date
Drainage structures are of adequate size to accommodate AIPII remediation activities.	Kenneth F. Gerard 3/6/98, 5/4/98
CHECKING METHOD	**Checker's Signature and Date**
1. Review ✓	May 5, 1998
2. Alternate Calculation ____	Stuart M. Haw March 10, 1998
	Lead Discipline Engineer's Signature and Date
	Kenneth F. Gerard 3-19-98

Rev. No.	Sheet No.	Description	Reviser's Signature/Date	Checker's Signature/Date	Approved by Signature/Date

PARSONS

ENGINEERING CALCULATIONS
BASIS SHEET

Revision No. 0

Proj. Order No. PO175 Calculation No. 15-01

Project Title Area I, Phase II

Calculation Subject Stormwater Controls Date Verified/Checked 3-10-98

Prepared By: K. Gerard K G 5/4/98 Checked/Verified By: L. M. Hamr 3-19-98 5/5/98

Date 2/25/98

SUMMARY OF DATA SOURCES - CODES - ASSUMPTIONS

Data Sources:

1. Brater, E.F., & King, H.W., *"Handbook of Hydraulics"*, 6th ed,.1976, McGraw-Hill
2. FHWA, *Hydraulic Design of Highway Culverts*, HEC No. 5, 1985
3. Haestad Methods, 1989. Quick TR-55™ *Urban Hydrology for Small Watersheds*
4. Haestad Methods, 1989, Pond-2™ *Detention Pond Analysis*
5. Haestad Methods, 1995, Flow Master™ v 5.13
6. ODOT, *Location and Design Manual, Vol 2, Drainage Design*
7. PARSONS DWGs. (used to create drainage area maps)
8. Soil Conservation Service, August 1982. *Soil Survey of Hamilton County, Ohio*
9. Soil Conservation Service, July 1984. *Engineering Field Manual for Conservation Practices*
10. Soil Conservation Service, State of Ohio, June 1986. *Engineering Standard, Pond (No.) - 378*

CODES:

1. Applicable sections of the Ohio Department of Natural Resources *Rainwater and Land Development Manual* , 1996

GENERAL ASSUMPTIONS:

1. Runoff values will be calculated using SCS TR-55 (QTR-55 by Haestad Methods, Inc.)

   A. Hydrologic Soil Groups, HSG, for all soils are assumed to be "C ". This is the "worse case" based on the soil types found in the project area, per the SCS soils maps which are as follows:

FdA	Fincastle	C
XfA	Xenia	B
XfB2	Xenia	B

   B. CN Values used in the TR-55 calculations for discharge are based on the following assumptions for land use:

   Off-Site area is assumed to be in row crops with Contoured and Crop residue cover (C + CR) practices in good condition.

   "Construction"is equal to a bare soil condition, due to excavation, stockpiles, or traffic beating down and destruction of the vegetation. This includes the OSDF Cell construction when included within a design area.

   Open Space is used for existing grassed area that is assumed will be undisturbed during the construction time frame. Since the existing vegetation is well established, it is considered to be in good condition, >75% cover.

   "Revegetated Area" is considered to be an area disturbed and is in the process of establishing grass cover. Therefore it is considered to be the same as Open Space in fair condition, 50-75% cover.

   Riprap (OSDF Cell Construction Area) is in the 2,000-year ditch and is assumed to be the same as gravel.

2. Culvert analysis will use ODOT/BPR(FHWA) design charts unless otherwise noted. Only the final culvert calculation will be included in the calculation set.

3. HDPE pipe is corrugated exterior, smooth interior. Assume Mannings n = 0.012. Bituminous Coated Corrugated Metal Pipe, BCCMP, has a Mannings n = 0.024 based on ODOT and vendor literature. (Assumes annular corrugations. While helical has a lower Mannings n factor than annual, the assumption will provide for some conservatism if helical corrugated pipe is provided and will allow either type to be used.)

4. FlowMaster, by Haestad Methods, Inc., will be used for open channel flow and simplified pressure pipe calculations. Assume unifiorm channel flow.

5. Other assumptions are as noted within the calculations.

1728

PARSONS

COMPUTER CALCULATION SUMMARY SHEET

OU: 2 PO: 175 Job Number: 7663-0175-11115-150

Computer Code: QTR-55 Version: 5.46

Code Verification Status: REV 0, Nov 1992

Description of Program: Developes runoff hydrographs per SCS TR-55. Determines peak flows per Modified Rational Method

Source of Data: Refer to Data Sources, Sheet 2

Purpose/Description of Calculation: To develop runoff hydrographs for 10-yr, 24-hr. storm event. Sediment Basin 1, Ditch 1, Conveyance Channels 1A & 1B, and Culverts 1 & 2 will be sized for this storm. Ditch 2 will be designed for the 10-year frequency storm using the Modified Rational Method.

Run Performed By: K. Gerard

Date/Time of Run: 2/98

Computer Time of Run: n/a

Input Filename: See attached list

Output Filename: See attached list

Files Saved to Diskname: p:\engdata\c&sdata\po175\calc\swcalc2\ Disk Location: network directory, backup with discipline files

Results: Refer to calculation

Performed By: K. Gerard KG Date: 3/6/98

Checked By: S. Haw S. M. Haw Date: 3/19/98

Approved By: Date:

000439

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PARSONS

COMPUTER CALCULATION SUMMARY SHEET

OU: 2 PO: 175 Job Number: 7663-0175-11115-150

Computer Code: Flow Master Version: 5.13

Code Verification Status: Rev 0, Feb. 1997

Description of Program: Computes solutions to uniform flow open channel hydraulic problems

Source of Data: Refer to Data Sources, Sheet 2

Purpose/Description of Calculation: Used to evaluate and select conveyance channel and diversion ditch geometry and acceptable lining material.

Run Performed By: K. Gerard

Date/Time of Run: 2/98 – 5/98

Computer Time of Run: n/a

Input Filename: See attached list

Output Filename: See attached list

Files Saved to Diskname\path: p:engdata\c&sdata\po175\calc\swcalc2\
Disk Location: network directory, backup with discipline files

Results: Refer to calculation

Performed By: K. Gerard KG Date: 3/6/98 5/4/98

Checked By: S. Haw S. M. Haw Date: 3/19/98 5/5/98

Approved By: Date:

000440

12/92

ENG095

PARSONS

1728

COMPUTER CALCULATION SUMMARY SHEET

OU: 2 PO: 175 Job Number: 7663-0175-11115-151

Computer Code: POND -2 Version: 5.17

Code Verification Status: REV 0, NOV 1992

Description of Program: Computes solution for routing inflow hydrograph generated by QTR-55 and generates an outflow hydrograph using level-pool routing techniques

Source of Data: Refer to Data Sources, Sheet 2

Purpose/Description of Calculation: Used to confirm principal spillway and A1PII sediment basin configuration for passing the 10-year, 24-hour storm.

Run Performed By: K. Gerard

Date/Time of Run: 3/6/98

Computer Time of Run: n/a

Input Filename: OSDFSED1.RCN, *.TCT.SB1.VOL

Output Filename: OSDFSED1.MOP, BA1-10.HYD, BA1.HYD, BA1.HYD

Files Saved to Diskname: p:\engdata\c&sdata\po175\swcalc21 Disk Location: network directory, backup with discipline files

Results: Refer to calculation

Performed By: K Gerard KG Date: 3/6/98

Checked By: S. Haw S. M. Haw Date: 3/19/98

Approved By: Date:

8

Print File List
5/4/98 8:51AM
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2

Total Files: 94
Total Bytes: 1,026,375

1501175.clc
a1p2-10.hyd
a1p2sed.mop
a1p2sed.rcn
a1p2sed.tcm
a1p2sed.tct
ba1-10.hyd
ba1-25.hyd
ba1.hyd
ba1.pnd
ba1.vol
c2-10.hyd
c2-25.hyd
ch1a-10.hyd
ch1b-10.hyd
chan1.mop
chan1.rcn
chan1.tct
chan1a.mop
chan1a.rcn
chan1a.tct
chan1b.mop
chan1b.rcn
chan1b.tct
chan2.bak
chan2.fm2
chan2.rcn
chan2.tct
convey.bak
convey.fm2
cul1-10.hyd
cul1.mop
cul1.rcn
cul1.tct
cul2.mop
cul2.rcn
cul2.tct
culv1-.tct
culv1.mop
culv1.rcn
culv2.mop
culv2.rcn
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ditch1.hyd
ditch1.mop
ditch1.rcn

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ditch2.mop
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eng025
eng080
eng095
eng095.1
eng095.2
eng095.3
eng098
estimate.est
osdfsed1.mop
osdfsed1.rcn
osdfsed1.tcm
osdfsed1.tct
outlet.xls
outlet1.xls
project1.bak
project1.fm2
sb1-10.hyd
sb1-100.hyd
sb1-25.hyd
sb1.mop
sb1.msr
sb1.pnd
sb1.rcn
sb1.tcm
sb1.tct
sb1.vol
sb1a-10.hyd
sb1o-10.hyd
sb1o-100.hyd
sb1o-25.hyd
sdclcfly.0b
sdclcfly.wpd
sedbasin.xls
sedbout.bak
sedbout.fm2
trap.bak
trap.fm2

Attachment A - CONVEYANCE CHANNEL

DRAINAGE AREA:

- A1PII Catchment (Subareas 1 and 1A)

CRITERIA:

- 10-Year, 24-hour Storm
- Channel slope to be minimized, 0.40% (per FDF)
- 1-ft minimum freeboard
- Provide for a 6-inch layer above the normal flowline that can be removed if the channel becomes contaminated. Make this adjustment in the riprap area above Culvert 2.

SUMMARY:

DA 1A, 18.55 ac., is at the northern end of the channel

Q_{10} = 36 cfs
V_{10} = 2.5 fps
Width = 5-ft
Depth = 1.7-ft
z = 2:1

DA 1, 40.7 ac., is at the entire drainage area including 1A.

Q_{10} = 56 cfs
V_{10} = 2.8 fps
Width = 8-ft
Depth = 1.8-ft
z = 2:1

A2

Quick TR-55 Ver.5.46 S/N:
Executed: 10:11:28 02-06-1998

CONVEYANCE CHANNEL 1A

RUNOFF CURVE NUMBER SUMMARY

Subarea Description	Area (acres)	CN (weighted)
SUBAREA 1A	18.55	83

A3

Quick TR-55 Ver.5.46 S/N:
Executed: 10:11:28 02-06-1998

1728

CONVEYANCE CHANNEL 1A

RUNOFF CURVE NUMBER DATA

::

Composite Area: SUBAREA 1A

SURFACE DESCRIPTION	AREA (acres)	CN	
C/ROW CROPS C+CR /GOOD	3.60	81	
C/GRAVEL	0.50	89	
PAVEMENT	0.40	98	
C/CONSTRUCTION (bare dirt)	7.58	91	
C/OPEN SPACE/GOOD	6.47	74	
COMPOSITE AREA --->	18.55	83.2	(83)

::

Quick TR-55 Ver.5.46 S/N:
Executed: 10:25:26 02-06-1998
p:\engdata\c&sdata\po175\calc\swcalc2\CHAN1A.TCT

SUMMARY SHEET FOR Tc or Tt COMPUTATIONS
(Solved for Time using TR-55 Methods)

CONVEYANCE CHANNEL 1A

Subarea descr.	Tc or Tt	Time (hrs)
SUBAREA 1A	Tc	0.53

Quick TR-55 Ver.5.46 S/N:
Executed: 10:25:26 02-06-1998
gdata\c&sdata\po175\calc\swcalc2\CHAN1A.TCT

CONVEYANCE CHANNEL 1A

Tc COMPUTATIONS FOR: SUBAREA 1A

SHEET FLOW (Applicable to Tc only)

Segment ID		1	
Surface description		RANGE	
Manning's roughness coeff., n		0.1300	
Flow length, L (total < or = 300)	ft	300.0	
Two-yr 24-hr rainfall, P2	in	3.000	
Land slope, s	ft/ft	0.0233	
$T = \frac{.007 * (n*L)^{0.8}}{P2^{0.5} * s^{0.4}}$	hrs	0.34	= 0.34

SHALLOW CONCENTRATED FLOW

Segment ID		2	
Surface (paved or unpaved)?		Unpaved	
Flow length, L	ft	1214.0	
Watercourse slope, s	ft/ft	0.0186	
Avg.V = $Csf * (s)^{0.5}$	ft/s	2.2005	
where: Unpaved Csf = 16.1345			
Paved Csf = 20.3282			
T = L / (3600*V)	hrs	0.15	= 0.15

CHANNEL FLOW

Segment ID		3	
Cross Sectional Flow Area, a	sq.ft	15.27	
Wetted perimeter, Pw	ft	12.97	
Hydraulic radius, r = a/Pw	ft	1.177	
Channel slope, s	ft/ft	0.0040	
Manning's roughness coeff., n		0.0400	
$V = \frac{1.49 * r^{2/3} * s^{1/2}}{n}$	ft/s	2.6268	
Flow length, L	ft	375	
T = L / (3600*V)	hrs	0.04	= 0.04

:::

TOTAL TIME (hrs) 0.53

Tc Calc for SubArea 1A
Worksheet for Trapezoidal Channel

Project Description	
Project File	p:\engdata\c&sdata\po175\calc\swcalc2\convey.fm2
Worksheet	SubArea 1A - Tc Calc
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.040	
Channel Slope	0.004000	ft/ft
Left Side Slope	2.000000	H : V
Right Side Slope	2.000000	H : V
Bottom Width	5.00	ft
Discharge	40.00	cfs

Results		
Depth	1.78	ft
Flow Area	15.27	ft^2
Wetted Perimeter	12.97	ft
Top Width	12.13	ft
Critical Depth	1.08	ft
Critical Slope	0.026633	ft/ft
Velocity	2.62	ft/s
Velocity Head	0.11	ft
Specific Energy	1.89	ft
Froude Number	0.41	
Flow is subcritical.		

Notes:

For Tc calc, assumed 40 cfs

000369

Quick TR-55 Version: 5.46 S/N:

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

1728

Executed: 02-06-1998 10:25:58
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CHAN1A .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CH1A-10.HYD

CONVEYANCE CHANNEL 1A

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used	
SUBAREA 1A	18.55	83.0	0.50	0.00	4.10	2.37	I.1	.10

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 18.55 acres or 0.02898 sq.mi
Peak discharge = 36 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
SUBAREA 1A	0.53	0.00	0.50	0.00	No	Computed Ia/p < .1

* Travel time from subarea outfall to composite watershed outfall point.

Quick TR-55 Version: 5.46 S/N:

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 02-06-1998 10:25:58
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CHAN1A .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CH1A-10.HYD

CONVEYANCE CHANNEL 1A

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
SUBAREA 1A	36	12.4
Composite Watershed	36	12.4

Quick TR-55 Version: 5.46 S/N:

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

1728

Executed: 02-06-1998 10:25:58
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CHAN1A .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CH1A-10.HYD

CONVEYANCE CHANNEL 1A

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
SUBAREA 1A	1	2	2	4	6	12	21	32	36
Total (cfs)	1	2	2	4	6	12	21	32	36

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
SUBAREA 1A	35	28	20	16	10	7	5	4	4
Total (cfs)	35	28	20	16	10	7	5	4	4

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
SUBAREA 1A	3	3	2	2	2	2	2	1	1
Total (cfs)	3	3	2	2	2	2	2	1	1

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
SUBAREA 1A	1	1	1	1	0
Total (cfs)	1	1	1	1	0

Quick TR-55 Version: 5.46 S/N:

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 02-06-1998 10:25:58
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CHAN1A .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CH1A-10.HYD

CONVEYANCE CHANNEL 1A

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	1	14.8	2
11.1	1	14.9	2
11.2	2	15.0	2
11.3	2	15.1	2
11.4	2	15.2	2
11.5	2	15.3	2
11.6	2	15.4	2
11.7	3	15.5	2
11.8	3	15.6	2
11.9	4	15.7	2
12.0	6	15.8	2
12.1	12	15.9	2
12.2	21	16.0	2
12.3	32	16.1	2
12.4	36	16.2	2
12.5	35	16.3	2
12.6	28	16.4	2
12.7	20	16.5	2
12.8	16	16.6	2
12.9	13	16.7	2
13.0	10	16.8	1
13.1	8	16.9	1
13.2	7	17.0	1
13.3	6	17.1	1
13.4	5	17.2	1
13.5	5	17.3	1
13.6	4	17.4	1
13.7	4	17.5	1
13.8	4	17.6	1
13.9	3	17.7	1
14.0	3	17.8	1
14.1	3	17.9	1
14.2	3	18.0	1
14.3	3	18.1	1

14.4	3	18.2	1
14.5	2	18.3	1
14.6	2	18.4	1
14.7	2	18.5	1

1728

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 02-06-1998 10:25:58
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CHAN1A .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CH1A-10.HYD

CONVEYANCE CHANNEL 1A

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	1	22.4	1
18.7	1	22.5	1
18.8	1	22.6	1
18.9	1	22.7	1
19.0	1	22.8	1
19.1	1	22.9	1
19.2	1	23.0	1
19.3	1	23.1	1
19.4	1	23.2	1
19.5	1	23.3	1
19.6	1	23.4	1
19.7	1	23.5	1
19.8	1	23.6	1
19.9	1	23.7	1
20.0	1	23.8	1
20.1	1	23.9	1
20.2	1	24.0	1
20.3	1	24.1	0
20.4	1	24.2	0
20.5	1	24.3	0
20.6	1	24.4	0
20.7	1	24.5	0
20.8	1	24.6	0
20.9	1	24.7	0
21.0	1	24.8	0
21.1	1	24.9	0
21.2	1	25.0	0
21.3	1	25.1	0
21.4	1	25.2	0
21.5	1	25.3	0
21.6	1	25.4	0
21.7	1	25.5	0
21.8	1	25.6	0
21.9	1	25.7	0
22.0	1	25.8	0
22.1	1	25.9	0

A13

22.2	1
22.3	1

1728

000456

A14

Conveyance Channel - SubArea 1A
Worksheet for Trapezoidal Channel

Project Description	
Project File	p:\engdata\c&sdata\po175\calc\swcalc2\convey.fm2
Worksheet	SubArea 1A - ECB Channel
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.040	
Channel Slope	0.004000	ft/ft
Left Side Slope	2.000000	H : V
Right Side Slope	2.000000	H : V
Bottom Width	5.00	ft
Discharge	36.00	cfs

Results		
Depth	1.69	ft
Flow Area	14.15	ft²
Wetted Perimeter	12.55	ft
Top Width	11.76	ft
Critical Depth	1.02	ft
Critical Slope	0.027034	ft/ft
Velocity	2.54	ft/s
Velocity Head	0.10	ft
Specific Energy	1.79	ft
Froude Number	0.41	
Flow is subcritical.		

Notes:

Assume:
For SubArea 1A Q10
ECB n=0.04

000457

A 15

Quick TR-55 Ver.5.46 S/N:
Executed: 10:21:17 02-06-1998

E-1728

CONVEYANCE CHANNEL 1
(from Area 1A to Culvert 2)

RUNOFF CURVE NUMBER SUMMARY

Subarea Description	Area (acres)	CN (weighted)
SUBAREA 1	40.72	80

Quick TR-55 Ver.5.46 S/N:
Executed: 10:21:17 02-06-1998

CONVEYANCE CHANNEL 1
(from Area 1A to Culvert 2)

RUNOFF CURVE NUMBER DATA

::

Composite Area: SUBAREA 1

SURFACE DESCRIPTION	AREA (acres)	CN	
C/ROW CROPS C+CR /GOOD	12.34	81	
C/GRAVEL	1.18	89	
PAVEMENT	0.49	98	
C/CONSTRUCTION (bare dirt)	7.58	91	
C/OPEN SPACE/GOOD	19.13	74	
COMPOSITE AREA --->	40.72	80.0	(80)

::

A17

E-1728

Quick TR-55 Ver.5.46 S/N:
Executed: 11:13:43 02-06-1998
p gdata\c&sdata\po175\calc\swcalc2\CHAN1.TCT

SUMMARY SHEET FOR Tc or Tt COMPUTATIONS
(Solved for Time using TR-55 Methods)

CONVEYANCE CHANNEL 1
(from Area 1A to Culvert 2)

Subarea descr.	Tc or Tt	Time (hrs)
SUBAREA 1	Tc	0.65

```
Quick TR-55 Ver.5.46   S/N:
Executed: 11:13:43   02-06-1998
p:\engdata\c&sdata\po175\calc\swcalc2\CHAN1.TCT

                              CONVEYANCE CHANNEL 1
                           (from Area 1A to Culvert 2)


                      Tc COMPUTATIONS FOR: SUBAREA 1

 SHEET FLOW (Applicable to Tc only)
     Segment ID                                     1
     Surface description                      RANGE
     Manning's roughness coeff., n                 0.1300
     Flow length, L (total < or = 300)       ft     300.0
     Two-yr 24-hr rainfall, P2               in     3.000
     Land slope, s                         ft/ft    0.0233
                           0.8
          .007 * (n*L)
     T =  --------------                     hrs      0.34                =  0.34
             0.5    0.4
           P2    *  s

 SHALLOW CONCENTRATED FLOW
     Segment ID                                     2
     Surface (paved or unpaved)?                 Unpaved
     Flow length, L                          ft    1214.0
     Watercourse slope, s                  ft/ft    0.0186

                             0.5
     Avg.V =  Csf *  (s)                    ft/s    2.2005
     where:   Unpaved Csf = 16.1345
              Paved   Csf = 20.3282

     T = L / (3600*V)                        hrs      0.15                =  0.15

 CHANNEL FLOW
     Segment ID                                     3          4
     Cross Sectional Flow Area, a          sq.ft     15.27      20.00
     Wetted perimeter, Pw                     ft     12.97      15.79
     Hydraulic radius, r = a/Pw               ft     1.177      1.267
     Channel slope, s                      ft/ft    0.0040     0.0040
     Manning's roughness coeff., n                  0.0400     0.0400

                         2/3    1/2
          1.49  *   r    *   s
     V =  --------------------              ft/s    2.6268     2.7580
                    n

     Flow length, L                           ft       375       1125

     T = L / (3600*V)                        hrs      0.04  +    0.11     =  0.15
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
                                              TOTAL TIME (hrs)            0.65
```

Tc Calc for SubArea 1
Worksheet for Trapezoidal Channel

1728

Project Description	
Project File	p:\engdata\c&sdata\po175\calc\swcalc2\convey.fm2
Worksheet	SubArea 1 - Tc Calc
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.040	
Channel Slope	0.004000	ft/ft
Left Side Slope	2.000000	H : V
Right Side Slope	2.000000	H : V
Bottom Width	8.00	ft
Discharge	55.00	cfs

Results		
Depth	1.74	ft
Flow Area	20.00	ft^2
Wetted Perimeter	15.79	ft
Top Width	14.97	ft
Critical Depth	1.04	ft
Critical Slope	0.025840	ft/ft
Velocity	2.75	ft/s
Velocity Head	0.12	ft
Specific Energy	1.86	ft
Froude Number	0.42	
Flow is subcritical.		

Notes:

For Tc calc, assume 55 cfs

000462

A20

Quick TR-55 Version: 5.46 S/N:

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 02-06-1998 11:14:15
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CHAN1 .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CH1A-10.HYD

CONVEYANCE CHANNEL 1
(from Area 1A to Culvert 2)

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input	Ia/p used
SUBAREA 1	40.72	80.0	0.75	0.00	4.10	2.12	I.12	.12

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 40.72 acres or 0.06363 sq.mi
Peak discharge = 56 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
SUBAREA 1	0.65	0.00	0.75	0.00	Yes	--

* Travel time from subarea outfall to composite watershed outfall point.

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

1728

Executed: 02-06-1998 11:14:15
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CHAN1 .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CH1A-10.HYD

CONVEYANCE CHANNEL 1
(from Area 1A to Culvert 2)

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
SUBAREA 1	56	12.6
Composite Watershed	56	12.6

A22

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 02-06-1998 11:14:15
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CHAN1 .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CH1A-10.HYD

CONVEYANCE CHANNEL 1
(from Area 1A to Culvert 2)

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
SUBAREA 1	2	2	3	4	6	8	14	25	38
Total (cfs)	2	2	3	4	6	8	14	25	38

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
SUBAREA 1	50	56	54	49	34	23	17	13	10
Total (cfs)	50	56	54	49	34	23	17	13	10

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
SUBAREA 1	8	7	6	5	4	4	3	3	3
Total (cfs)	8	7	6	5	4	4	3	3	3

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
SUBAREA 1	3	2	2	2	0
Total (cfs)	3	2	2	2	0

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

1728

Executed: 02-06-1998 11:14:15
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CHAN1 .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CH1A-10.HYD

CONVEYANCE CHANNEL 1
(from Area 1A to Culvert 2)

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	2	14.8	5
11.1	2	14.9	5
11.2	2	15.0	5
11.3	2	15.1	5
11.4	2	15.2	5
11.5	3	15.3	4
11.6	3	15.4	4
11.7	3	15.5	4
11.8	4	15.6	4
11.9	4	15.7	4
12.0	6	15.8	4
12.1	8	15.9	4
12.2	14	16.0	4
12.3	25	16.1	4
12.4	38	16.2	4
12.5	50	16.3	3
12.6	56	16.4	3
12.7	54	16.5	3
12.8	49	16.6	3
12.9	41	16.7	3
13.0	34	16.8	3
13.1	28	16.9	3
13.2	23	17.0	3
13.3	20	17.1	3
13.4	17	17.2	3
13.5	15	17.3	3
13.6	13	17.4	3
13.7	11	17.5	3
13.8	10	17.6	3
13.9	9	17.7	3
14.0	8	17.8	3
14.1	8	17.9	3
14.2	7	18.0	3
14.3	7	18.1	3

14.4	7	18.2	3
14.5	6	18.3	3
14.6	6	18.4	3
14.7	6	18.5	3

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

1728

Executed: 02-06-1998 11:14:15
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CHAN1 .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CH1A-10.HYD

CONVEYANCE CHANNEL 1
(from Area 1A to Culvert 2)

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	2	22.4	2
18.7	2	22.5	2
18.8	2	22.6	2
18.9	2	22.7	2
19.0	2	22.8	2
19.1	2	22.9	2
19.2	2	23.0	2
19.3	2	23.1	1
19.4	2	23.2	1
19.5	2	23.3	1
19.6	2	23.4	1
19.7	2	23.5	1
19.8	2	23.6	1
19.9	2	23.7	1
20.0	2	23.8	1
20.1	2	23.9	1
20.2	2	24.0	1
20.3	2	24.1	1
20.4	2	24.2	1
20.5	2	24.3	1
20.6	2	24.4	1
20.7	2	24.5	1
20.8	2	24.6	1
20.9	2	24.7	1
21.0	2	24.8	1
21.1	2	24.9	1
21.2	2	25.0	1
21.3	2	25.1	0
21.4	2	25.2	0
21.5	2	25.3	0
21.6	2	25.4	0
21.7	2	25.5	0
21.8	2	25.6	0
21.9	2	25.7	0
22.0	2	25.8	0
22.1	2	25.9	0

22.2	2
22.3	2

A27

Conveyance Channel - SubArea 1
Worksheet for Trapezoidal Channel

1728

Project Description	
Project File	p:\engdata\c&sdata\po175\calc\swcalc2\convey.fm2
Worksheet	SubArea 1 - ECB Channel
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.040	
Channel Slope	0.004000	ft/ft
Left Side Slope	2.000000	H : V
Right Side Slope	2.000000	H : V
Bottom Width	8.00	ft
Discharge	56.00	cfs

Results		
Depth	1.76	ft
Flow Area	20.25	ft²
Wetted Perimeter	15.86	ft
Top Width	15.03	ft
Critical Depth	1.05	ft
Critical Slope	0.025768	ft/ft
Velocity	2.76	ft/s
Velocity Head	0.12	ft
Specific Energy	1.88	ft
Froude Number	0.42	
Flow is subcritical.		

Notes:

Assume:
For SubArea 1 Q10
ECB n=0.04

000470

Attachment B - CULVERT 2 (at GW-24" Line)

1728

DRAINAGE AREA:

- Subarea 1 + OSDF Cell

CRITERIA:

- 25-Year, 24-hour Storm
- Culvert to go over GW-24" Line (per FDF). Assume a minimum of 4-inches between top of GW line to invert of culvert.
- Use same slope as Conveyance Channel (s = 0.004ft/ft)
- CN for OSDF area developed from land use data provided by OSDF and is incorporated into Subarea 1 for this calculation.
- Tc based on DA 1 (There is no design basis for getting the OSDF Cell construction runoff to the Conveyance Channel/Culvert 2. Hence, there is no basis for a Tc from the OSDF Cell area.)
- Pipes are assumed to be cut flush with the slope. There is no headwall or end sections. Use riprap to protect the slope.
- Minimum cover is 1 ft. (Top of pipe to bottom of flexible pavement). Use a minimum cover of 2.5 ft. of ODOT 304 at the STP Access Road during construction since there is no pavement. (This is similar to what is recommended for cmp.)

B2

Quick TR-55 Ver.5.46 S/N:
Executed: 08:55:04 02-09-1998

CULVERT 2
(at GW-24" Line)

RUNOFF CURVE NUMBER SUMMARY

Subarea Description	Area (acres)	CN (weighted)
Sub 1 + OSDF	57.02	82

B3

Quick TR-55 Ver.5.46 S/N:
Executed: 08:55:04 02-09-1998

1728

CULVERT 2
(at GW-24" Line)

RUNOFF CURVE NUMBER DATA

Composite Area: Sub 1 + OSDF

	SURFACE DESCRIPTION	AREA (acres)	CN	
SUB 1	C / ROW CROPS C+CR / GOOD	12.34	81	
	C / GRAVEL	1.18	89	
	PAVEMENT	0.49	98	
	C / CONSTRUCTION (bare soil)	7.58	91	
	C / OPEN SPACE / GOOD	19.13	74	
OSDF	C / CELL CONSTRUCTION	6.00	91	
	C / REVEGETATED AREA	6.30	79	
	C / GRAVEL SURFACE	2.00	89	
	C / RIPRAP	2.00	89	
	COMPOSITE AREA --->	57.02	81.7	(82)

B4

```
Quick TR-55 Ver.5.46   S/N:
Executed: 08:58:24   02-09-1998
p:\engdata\c&sdata\po175\calc\swcalc2\CUL2.TCT

                                CULVERT 2
                             (at GW-24" Line)


                      Tc COMPUTATIONS FOR: 1 + OSDF

SHEET FLOW (Applicable to Tc only)
    Segment ID                                      1
    Surface description                         Range
    Manning's roughness coeff., n                  0.1300
    Flow length, L (total < or = 300)     ft       300.0
    Two-yr 24-hr rainfall, P2             in       3.000
    Land slope, s                         ft/ft    0.0233
                          0.8
          .007 * (n*L)
    T =   --------------                  hrs       0.34              =  0.34
             0.5    0.4
           P2    *   s

SHALLOW CONCENTRATED FLOW
    Segment ID                                      2
    Surface (paved or unpaved)?                    Unpaved
    Flow length, L                        ft       1214.0
    Watercourse slope, s                  ft/ft    0.0186

                           0.5
    Avg.V =  Csf *   (s)                  ft/s     2.2005
    where:   Unpaved Csf = 16.1345
             Paved   Csf = 20.3282

    T = L / (3600*V)                      hrs       0.15              =  0.15


CHANNEL FLOW
    Segment ID                                      3        4
    Cross Sectional Flow Area, a          sq.ft    15.27    20.00
    Wetted perimeter, Pw                  ft       12.97    15.79
    Hydraulic radius, r = a/Pw            ft       1.177    1.267
    Channel slope, s                      ft/ft    0.0040   0.0040
    Manning's roughness coeff., n                  0.0400   0.0400

                     2/3    1/2
          1.49  *  r   *  s
    V =   --------------------            ft/s     2.6268   2.7580
                     n

    Flow length, L                        ft        375      1125

    T = L / (3600*V)                      hrs       0.04  +   0.11    =  0.15
:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
                                            TOTAL TIME (hrs)           0.65
```

000474

Quick TR-55 Ver.5.46 S/N:
Executed: 08:58:24 02-09-1998
p:[redacted]data\c&sdata\po175\calc\swcalc2\CUL2.TCT

B5

1728

SUMMARY SHEET FOR Tc or Tt COMPUTATIONS
(Solved for Time using TR-55 Methods)

CULVERT 2
(at GW-24" Line)

Subarea descr.	Tc or Tt	Time (hrs)
1 + OSDF	Tc	0.65

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 02-09-1998 09:00:36
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CUL2 .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\C2-10.HYD

CULVERT 2
(at GW-24" Line)

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
Sub 1 + OSDF	57.02	82.0	0.75	0.00	4.10	2.29	I.11 .11

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 57.02 acres or 0.08909 sq.mi
Peak discharge = 86 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	* Tt (hr)	Rounded Values Tc (hr)	* Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
Sub 1 + OSDF	0.65	0.00	0.75	0.00	Yes	--

* Travel time from subarea outfall to composite watershed outfall point.

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

E-1728

Executed: 02-09-1998 09:00:36
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CUL2 .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\C2-10.HYD

CULVERT 2
(at GW-24" Line)

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
Sub 1 + OSDF	86	12.6
Composite Watershed	86	12.6

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 02-09-1998 09:00:36
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CUL2 .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\C2-10.HYD

CULVERT 2
(at GW-24" Line)

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
Sub 1 + OSDF	3	3	5	7	9	13	23	38	59
Total (cfs)	3	3	5	7	9	13	23	38	59

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
Sub 1 + OSDF	76	86	83	75	51	35	25	19	15
Total (cfs)	76	86	83	75	51	35	25	19	15

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
Sub 1 + OSDF	13	10	9	7	6	6	5	5	4
Total (cfs)	13	10	9	7	6	6	5	5	4

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
Sub 1 + OSDF	4	4	3	3	0
Total (cfs)	4	4	3	3	0

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

1728

Executed: 02-09-1998 09:00:36
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CUL2 .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\C2-10.HYD

CULVERT 2
(at GW-24" Line)

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	3	14.8	8
11.1	3	14.9	7
11.2	3	15.0	7
11.3	3	15.1	7
11.4	4	15.2	7
11.5	4	15.3	6
11.6	5	15.4	6
11.7	6	15.5	6
11.8	6	15.6	6
11.9	7	15.7	6
12.0	9	15.8	6
12.1	13	15.9	6
12.2	23	16.0	6
12.3	38	16.1	6
12.4	59	16.2	6
12.5	76	16.3	5
12.6	86	16.4	5
12.7	83	16.5	5
12.8	75	16.6	5
12.9	63	16.7	5
13.0	51	16.8	5
13.1	43	16.9	5
13.2	35	17.0	5
13.3	30	17.1	5
13.4	25	17.2	5
13.5	22	17.3	4
13.6	19	17.4	4
13.7	17	17.5	4
13.8	15	17.6	4
13.9	14	17.7	4
14.0	13	17.8	4
14.1	12	17.9	4
14.2	11	18.0	4
14.3	10	18.1	4

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14.4	10	18.2	4
14.5	9	18.3	4
14.6	9	18.4	4
14.7	8	18.5	4

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

E-1728

Executed: 02-09-1998 09:00:36
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CUL2 .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\C2-10.HYD

CULVERT 2
(at GW-24" Line)

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	4	22.4	3
18.7	4	22.5	3
18.8	4	22.6	3
18.9	4	22.7	2
19.0	4	22.8	2
19.1	4	22.9	2
19.2	4	23.0	2
19.3	4	23.1	2
19.4	4	23.2	2
19.5	4	23.3	2
19.6	3	23.4	2
19.7	3	23.5	2
19.8	3	23.6	2
19.9	3	23.7	2
20.0	3	23.8	2
20.1	3	23.9	2
20.2	3	24.0	2
20.3	3	24.1	1
20.4	3	24.2	1
20.5	3	24.3	1
20.6	3	24.4	1
20.7	3	24.5	1
20.8	3	24.6	1
20.9	3	24.7	1
21.0	3	24.8	1
21.1	3	24.9	1
21.2	3	25.0	1
21.3	3	25.1	1
21.4	3	25.2	1
21.5	3	25.3	1
21.6	3	25.4	0
21.7	3	25.5	0
21.8	3	25.6	0
21.9	3	25.7	0
22.0	3	25.8	0
22.1	3	25.9	0

22.2	3
22.3	3

B12

Return Frequency: 25 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

F-1728

Executed: 02-09-1998 09:00:36
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CUL2 .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\C2-25.HYD

CULVERT 2
(at GW-24" Line)

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input	Ia/p used
Sub 1 + OSDF	57.02	82.0	0.75	0.00	4.80	2.90	I.09	.10

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 57.02 acres or 0.08909 sq.mi
Peak discharge = 110 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
Sub 1 + OSDF	0.65	0.00	0.75	0.00	No	Computed Ia/p < .1

* Travel time from subarea outfall to composite watershed outfall point.

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 02-09-1998 09:00:36
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CUL2 .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\C2-25.HYD

CULVERT 2
(at GW-24" Line)

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
Sub 1 + OSDF	110	12.6
Composite Watershed	110	12.6

Return Frequency: 25 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

1728

Executed: 02-09-1998 09:00:36
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CUL2 .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\C2-25.HYD

CULVERT 2
(at GW-24" Line)

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
Sub 1 + OSDF	3	5	6	9	12	18	30	50	76
Total (cfs)	3	5	6	9	12	18	30	50	76

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
Sub 1 + OSDF	98	110	106	95	65	44	32	24	19
Total (cfs)	98	110	106	95	65	44	32	24	19

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
Sub 1 + OSDF	16	13	11	9	8	7	6	6	5
Total (cfs)	16	13	11	9	8	7	6	6	5

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
Sub 1 + OSDF	5	4	4	3	0
Total (cfs)	5	4	4	3	0

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 02-09-1998 09:00:36
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CUL2 .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\C2-25.HYD

CULVERT 2
(at GW-24" Line)

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	3	14.8	10
11.1	4	14.9	9
11.2	4	15.0	9
11.3	5	15.1	9
11.4	5	15.2	9
11.5	6	15.3	8
11.6	6	15.4	8
11.7	7	15.5	8
11.8	8	15.6	8
11.9	9	15.7	8
12.0	12	15.8	7
12.1	18	15.9	7
12.2	30	16.0	7
12.3	50	16.1	7
12.4	76	16.2	7
12.5	98	16.3	6
12.6	110	16.4	6
12.7	106	16.5	6
12.8	95	16.6	6
12.9	80	16.7	6
13.0	65	16.8	6
13.1	54	16.9	6
13.2	44	17.0	6
13.3	38	17.1	6
13.4	32	17.2	6
13.5	28	17.3	5
13.6	24	17.4	5
13.7	21	17.5	5
13.8	19	17.6	5
13.9	17	17.7	5
14.0	16	17.8	5
14.1	15	17.9	5
14.2	14	18.0	5
14.3	13	18.1	5

14.4	12	18.2	5
14.5	12	18.3	5
14.6	11	18.4	5
14.7	10	18.5	5

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Return Frequency: 25 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 02-09-1998 09:00:36
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\CUL2 .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\C2-25.HYD

CULVERT 2
(at GW-24" Line)

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	4	22.4	3
18.7	4	22.5	3
18.8	4	22.6	3
18.9	4	22.7	2
19.0	4	22.8	2
19.1	4	22.9	2
19.2	4	23.0	2
19.3	4	23.1	2
19.4	4	23.2	2
19.5	4	23.3	2
19.6	4	23.4	2
19.7	4	23.5	2
19.8	4	23.6	2
19.9	4	23.7	2
20.0	4	23.8	2
20.1	4	23.9	2
20.2	4	24.0	2
20.3	4	24.1	1
20.4	4	24.2	1
20.5	4	24.3	1
20.6	4	24.4	1
20.7	4	24.5	1
20.8	4	24.6	1
20.9	4	24.7	1
21.0	4	24.8	1
21.1	3	24.9	1
21.2	3	25.0	1
21.3	3	25.1	1
21.4	3	25.2	1
21.5	3	25.3	1
21.6	3	25.4	0
21.7	3	25.5	0
21.8	3	25.6	0
21.9	3	25.7	0
22.0	3	25.8	0
22.1	3	25.9	0

22.2	3
22.3	3

B19

1728

050490

SHEET ____ OF ____

CULVERT ANALYSIS.

DATE- 2/9/98

DESIGNED BY- KG

CHECKED BY- A. M. Hauer 5/6/98

CONTRACT- A1 P II SCS

TITLE - CULVERT 2 - 36"ØHDPE OPTION

HYDROLOGIC INFORMATION

SCS METHOD

AREA - ____ AC.= ____ SM.

RCN. = ____

t_c = ____ MIN. = ____ HRS.

RATIONAL METHOD

AREA - ____ AC.

C_w = ____

t_c = ____ MIN.

i_2 = ____ "/HR.

i_{10} = ____ "/HR.

i_{100} = ____ "/HR.

CULVERT DIMENSION(S)- ____ IN. = ____ FT.

CULVERT STATION 2

SUMP STATION ____

SUMP PGL ELEV = ____

SUMP PAVEMENT EDGE ELEV. = 584.25

AHW DEPTH = 3.75 FT.

INVERT ELEV = 580.5

INVERT ELEV = 579.74

S_o = 0.4 %

L = 191 FT.

CULVERT TYPE & ENTRANCE TYPE	Q C.F.S	HEADWATER COMPUTATION														CONTROLLING HW		COMMENTS
		INLET CONTROL		OUTLET CONTROL														
		HW/D	HW	Ke	Dc	(Dc+D)/2	TW	h_o	S_fL	V_f	$V_f^2/2g$	H	LSo	HW		DEPTH	SURF. ELEV.	
TRY 5-36"Ø	17.2	0.64	1.92															Q_{10} = 86 cfs.
TRY 3-36"Ø	28.7	0.88	2.64															
TRY 5-36"Ø	22	0.74	2.22															Q_{25} = 110 cfs
TRY 3-36"Ø	36.7	1.06	3.18	0.7*	1.90	2.45	2.04	2.45	~	~	~	1.2	0.76	2.89	3.18	583.68		

FORMULAE:

OUTLET CONTROL:

$HW = h_o + H - LS_o$

$H = S_fL + (1 + K_e)\left(\frac{V_f^2}{2g}\right)$

REMARKS:

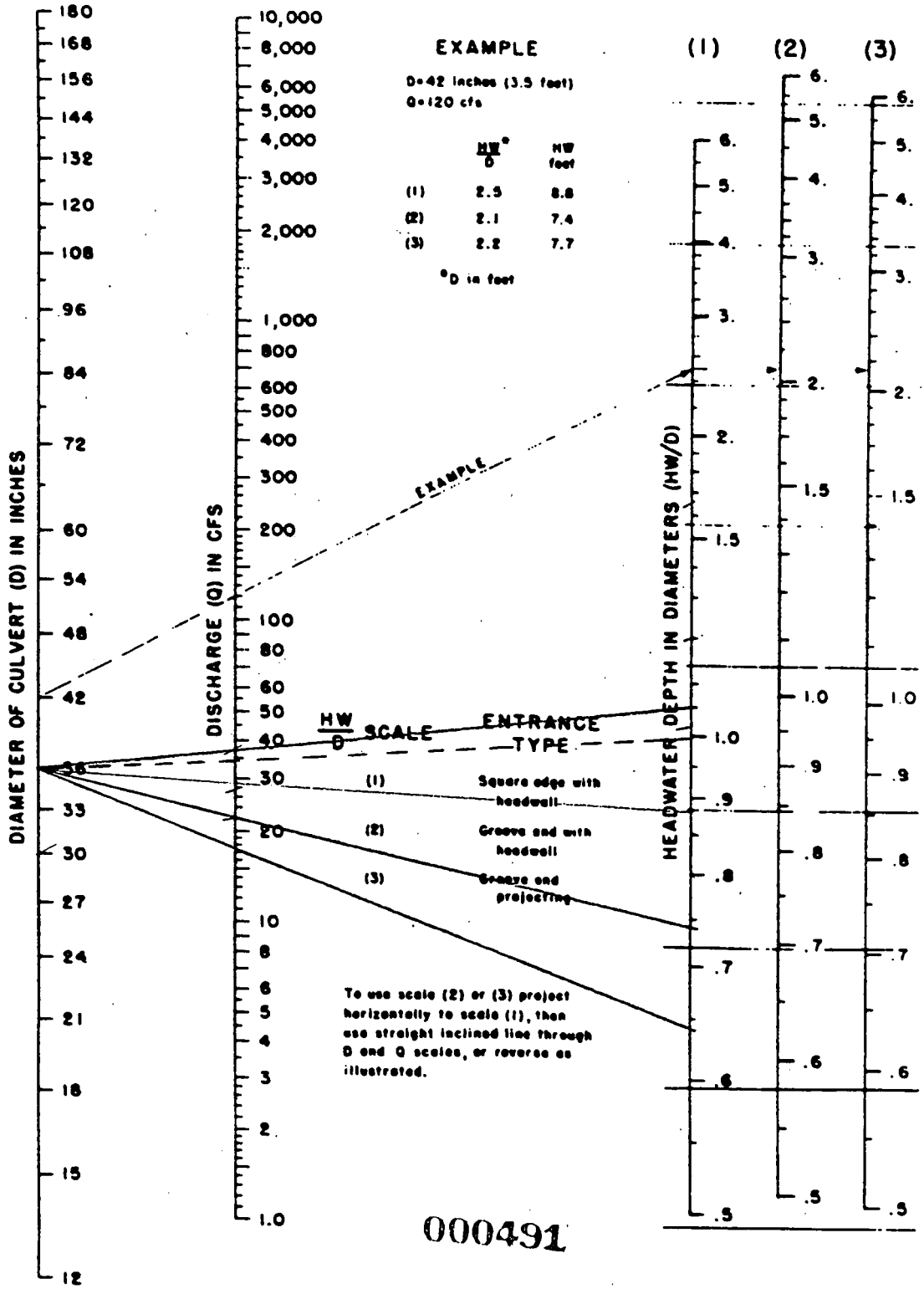
PIPE IS HDPE. USE n = 0.012

*Ke = 0.7 but use 0.5 for calc.

D = PIPE FLOW DEPTH

320

Fig. 1100-246

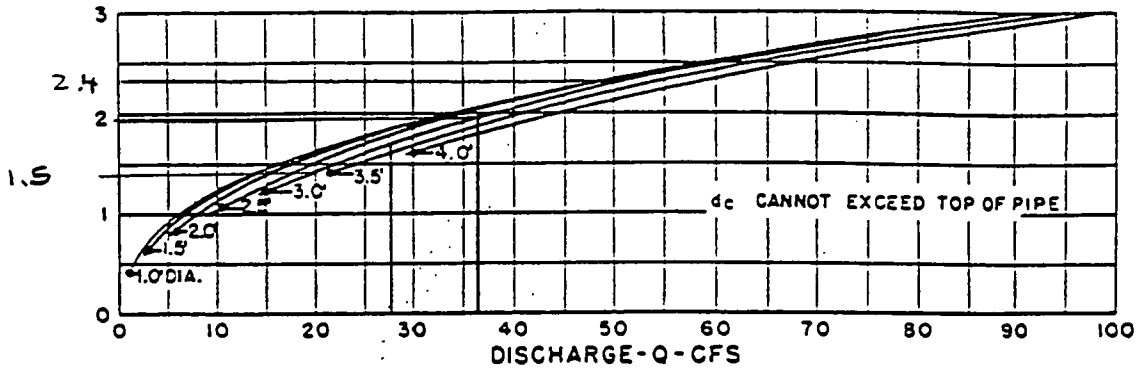


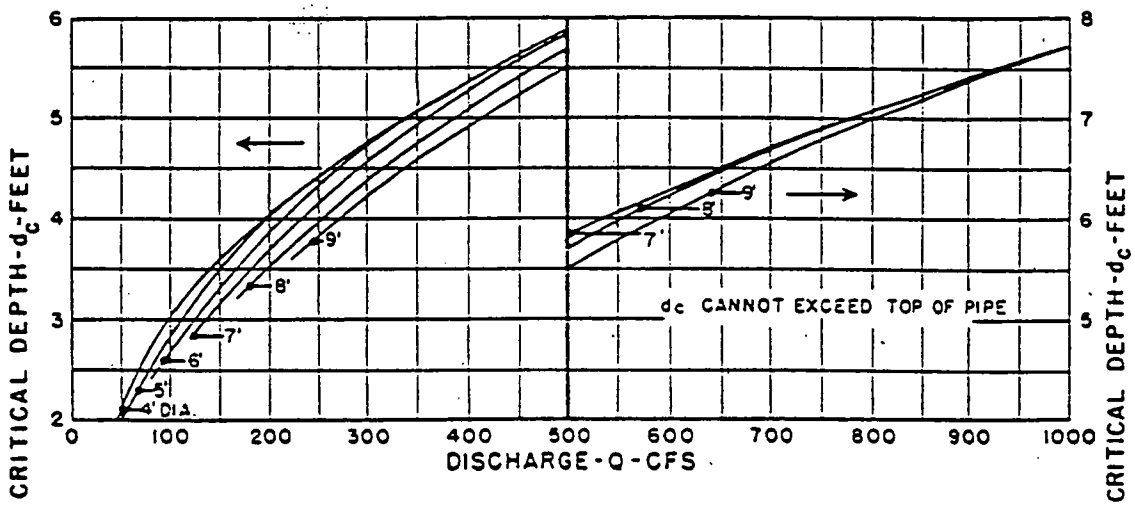
000491

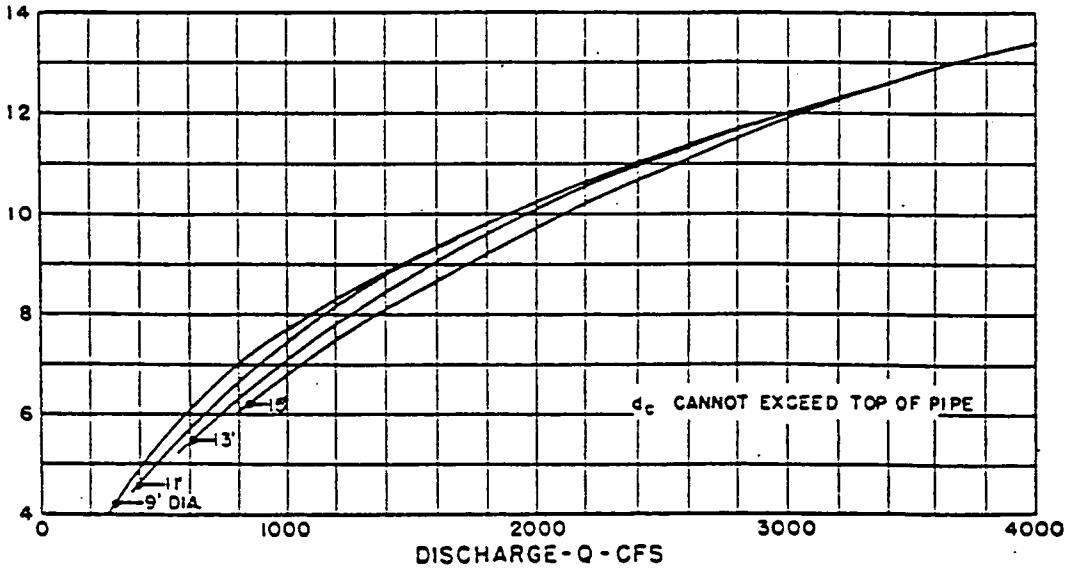
HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

SHT B22

CHART 4







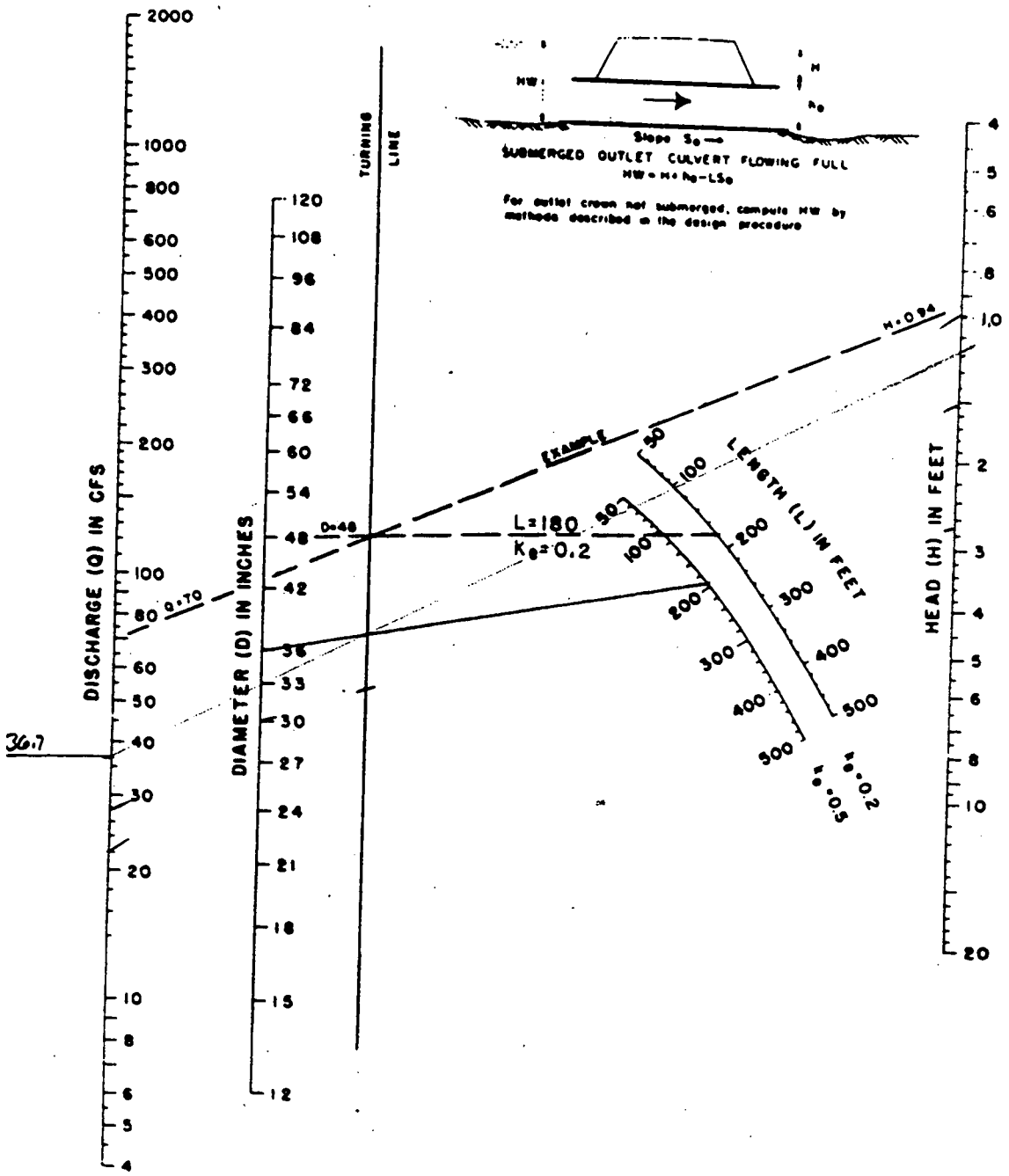
BUREAU OF PUBLIC ROADS

JAN. 1964

CRITICAL DEPTH
CIRCULAR PIPE

000492

Fig. 1100-249



HEAD FOR
CONCRETE PIPE CULVERTS
FLOWING FULL
n = 0.012

B 24

Pipe calc for flow depth, HW calc
Worksheet for Circular Channel

Project Description	
Project File	p:\engdata\c&sdata\po175\calc\swcalc2\convey.fm2
Worksheet	CUVLERT 2
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.012	
Channel Slope	0.004000	ft/ft
Diameter	36.00	in
Discharge	36.70	cfs

Results		
Depth	2.04	ft
Flow Area	5.11	ft^2
Wetted Perimeter	5.81	ft
Top Width	2.80	ft
Critical Depth	1.97	ft
Percent Full	67.85	
Critical Slope	0.004378	ft/ft
Velocity	7.19	ft/s
Velocity Head	0.80	ft
Specific Energy	2.84	ft
Froude Number	0.94	
Maximum Discharge	49.16	cfs
Full Flow Capacity	45.70	cfs
Full Flow Slope	0.002580	ft/ft
Flow is subcritical.		

Notes:

Assume Q25=110cfs total
3 pipes = 36.7cfs each

n=0.012 for HDPE

000494

SM B25

E-1728

TABLE 12 - ENTRANCE LOSS COEFFICIENTS

Outlet Control, Full or Partly Full Entrance head loss

$$H_e = k_e \left(\frac{V^2}{2g} \right)$$

Type of Structure and Design of Entrance	Coefficient k_e
Pipe, Concrete	
Projecting from fill, socket end (groove-end)	0.2
Projecting from fill, sq. cut end	0.5
Headwall or headwall and wingwalls	
Socket end of pipe (groove-end)	0.2
Square-edge	0.5
Rounded (radius = 1/12D)	0.2
Mitered to conform to fill slope	0.7
*End-Section conforming to fill slope	0.5
Beveled edges, 33.7° or 45° bevels	0.2
Side-or slope-tapered inlet	0.2
Pipe, or Pipe-Arch, Corrugated Metal	
Projecting from fill (no headwall)	0.9
Headwall or headwall and wingwalls square-edge	0.5
Mitered to conform to fill slope, paved or unpaved slope	0.7
*End-Section conforming to fill slope	0.5
Beveled edges, 33.7° or 45° bevels	0.2
Side-or slope-tapered inlet	0.2
Box, Reinforced Concrete	
Headwall parallel to embankment (no wingwalls)	
Square-edged on 3 edges	0.5
Rounded on 3 edges to radius of 1/12 barrel dimension, or beveled edges on 3 sides	0.2
Wingwalls at 30° to 75° to barrel	
Square-edged at crown	0.4
Crown edge rounded to radius of 1/12 barrel dimension, or beveled top edge	0.2
Wingwall at 10° to 25° to barrel	
Square-edged at crown	0.5
Wingwalls parallel (extension of sides)	
Square-edged at crown	0.7
Side-or slope-tapered inlet	0.2

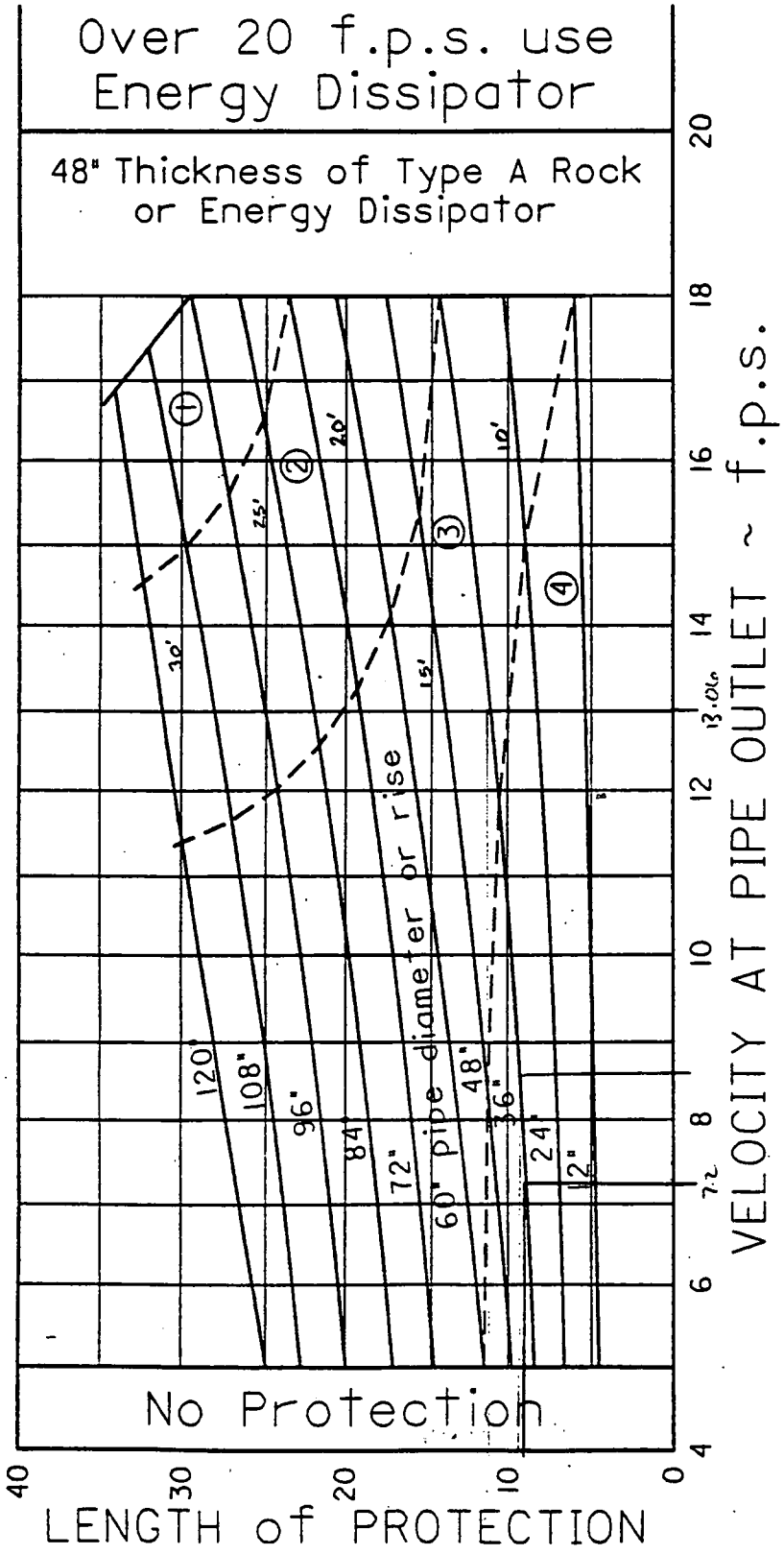
*Note: "End Section conforming to fill slope," made of either metal or concrete, are the sections commonly available from manufacturers. From limited hydraulic tests they are equivalent in operation to a headwall in both inlet and outlet control. Some end sections, incorporating a closed taper in their design have a superior hydraulic performance. These latter sections can be

CULVERT 2

ROCK CHANNEL PROTECTION AT CULVERT AND STORM SEWER OUTLETS

1107-1

REFERENCE SECTION
1107.2



ROCK TYPE
A
A
B
C

LEGEND
① 48" of 18" rock
② 36" of 18" rock
③ 30" of 12" rock
④ 18" of 6" rock

NOTES

Rock size (6", 12", 18") indicates the square opening on which 85% of the material, by weight, will be retained.

The width of protection shall be the width of the headwall, with 4' being the minimum.

(Where a stream bed will withstand the calculated velocity without erosion, no rock channel protection will be required.)

000496

B27

1728

Sediment Basin 1 Sump
Worksheet for Trapezoidal Channel

Project Description	
Project File	p:\engdata\c&sdata\po175\calc\swcalc2\convey.fm2
Worksheet	Culvert 2 Outfall
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	
Channel Slope	0.0833	ft/ft
Left Side Slope	6.00	H : V
Right Side Slope	6.00	H : V
Bottom Width	12.00	ft
Discharge	110.0	cfs

Results		
Depth	0.76	ft
Flow Area	12.68	ft²
Wetted Perimeter	21.30	ft
Top Width	21.18	ft
Critical Depth	1.13	ft
Critical Slope	0.019169	ft/ft
Velocity	8.67	ft/s
Velocity Head	1.17	ft
Specific Energy	1.93	ft
Froude Number	1.98	
Flow is supercritical.		

Notes:

Calculation for Outlet stabilization within the basin assumed to be similar to channel flow.

Assume dumped rock n = 0.035

Q25 = 110 cfs

000497

B28

Sediment Basin 1
Worksheet for Trapezoidal Channel

Project Description	
Project File	p:\engdata\c&sdata\po175\calc\swcalc2\convey.fm2
Worksheet	Culvert 2 Outfall
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	
Channel Slope	0.0167	ft/ft
Left Side Slope	6.00	H : V
Right Side Slope	6.00	H : V
Bottom Width	31.00	ft
Discharge	110.0	cfs

Results		
Depth	0.75	ft
Flow Area	26.45	ft^2
Wetted Perimeter	40.07	ft
Top Width	39.95	ft
Critical Depth	0.70	ft
Critical Slope	0.020974	ft/ft
Velocity	4.16	ft/s
Velocity Head	0.27	ft
Specific Energy	1.01	ft
Froude Number	0.90	
Flow is subcritical.		

Notes:

Calculation for Outlet stabilization within the basin assumed to be similar to channel flow.

Assume dumped rock n = 0.035

Q25 = 110 cfs

000498

Attachment C - DITCH 1

DRAINAGE AREA:

- Part of Subarea 2A = 6.37 ac.

CRITERIA:

- 10-Year, 24-hour Storm

SUMMARY:

Q_{10} = 10 cfs
V_{10} = 2.5 fps

COMMENTS:

The purpose of Ditch 1 is to control stormwater run on into the Trap Range. The CN is based on the assumption that the area remains mostly vegetated and undisturbed from its present condition, open space in good condition.

C2

Quick TR-55 Ver.5.46 S/N:
Executed: 10:10:52 04-18-1998

Ditch 1
Trap Range Area

RUNOFF CURVE NUMBER SUMMARY

::

Subarea Description	Area (acres)	CN (weighted)
Ditch 1	6.37	75

000500

C3

Quick TR-55 Ver.5.46 S/N:
Executed: 10:10:52 04-18-1998

1728

Ditch 1
Trap Range Area

RUNOFF CURVE NUMBER DATA

::

Composite Area: Ditch 1

SURFACE DESCRIPTION	AREA (acres)	CN	
CONSTRUCTION (bare soil)	0.21	91	
C/OPEN SPACE/GOOD	6.16	74	
COMPOSITE AREA --->	6.37	74.6	(75)

::

000501

C4

Quick TR-55 Ver.5.46 S/N:
Executed: 10:15:59 04-18-1998
p:\engdata\c&sdata\po175\calc\swcalc2\DITCH1.TCT

SUMMARY SHEET FOR Tc or Tt COMPUTATIONS
(Solved for Time using TR-55 Methods)

DITCH 1
TRAP RANGE AREA

Subarea descr.	Tc or Tt	Time (hrs)
DITCH1	Tc	0.44

C5

Quick TR-55 Ver.5.46 S/N:
Executed: 10:15:59 04-18-1998
p:[illegible]gdata\c&sdata\po175\calc\swcalc2\DITCH1.TCT

E-1728

DITCH 1
TRAP RANGE AREA

Tc COMPUTATIONS FOR: DITCH1

SHEET FLOW (Applicable to Tc only)

Segment ID		2-1	
Surface description		range	
Manning's roughness coeff., n		0.1300	
Flow length, L (total < or = 300)	ft	300.0	
Two-yr 24-hr rainfall, P2	in	3.000	
Land slope, s	ft/ft	0.0392	
$T = \frac{.007 * (n*L)^{0.8}}{P2^{0.5} * s^{0.4}}$	hrs	0.28	= 0.28

SHALLOW CONCENTRATED FLOW

Segment ID		2-2	
Surface (paved or unpaved)?		Unpaved	
Flow length, L	ft	487.0	
Watercourse slope, s	ft/ft	0.0068	
$Avg.V = Csf * (s)^{0.5}$	ft/s	1.3305	
where: Unpaved Csf = 16.1345			
Paved Csf = 20.3282			
T = L / (3600*V)	hrs	0.10	= 0.10

CHANNEL FLOW

Segment ID		2-3	
Cross Sectional Flow Area, a	sq.ft	7.26	
Wetted perimeter, Pw	ft	11.37	
Hydraulic radius, r = a/Pw	ft	0.639	
Channel slope, s	ft/ft	0.0100	
Manning's roughness coeff., n		0.0400	
$V = \frac{1.49 * r^{2/3} * s^{1/2}}{n}$	ft/s	2.7621	
Flow length, L	ft	570	
T = L / (3600*V)	hrs	0.06	= 0.06

000503

::

TOTAL TIME (hrs) 0.44

C6

Quick TR-55 Version: 5.46 S/N:

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 04-18-1998 10:21:56
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\DITCH1 .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\DITCH1.HYD

DITCH 1
TRAP RANGE AREA

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input	Ia/p used
Ditch 1	6.37	75.0	0.40	0.00	4.10	1.74	I.16	.16

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 6.37 acres or 0.00995 sq.mi
Peak discharge = 10 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
Ditch 1	0.44	0.00	0.40	0.00	Yes	--

* Travel time from subarea outfall to composite watershed outfall point.

Return Frequency: 10 years

E-1728

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 04-18-1998 10:21:56
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\DITCH1 .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\DITCH1.HYD

DITCH 1
TRAP RANGE AREA

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
Ditch 1	10	12.3
Composite Watershed	10	12.3

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 04-18-1998 10:21:56
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\DITCH1 .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\DITCH1.HYD

DITCH 1
TRAP RANGE AREA

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
Ditch 1	0	0	0	1	2	4	7	10	10
Total (cfs)	0	0	0	1	2	4	7	10	10

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
Ditch 1	7	5	4	3	2	1	1	1	1
Total (cfs)	7	5	4	3	2	1	1	1	1

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
Ditch 1	1	1	1	1	1	0	0	0	0
Total (cfs)	1	1	1	1	1	0	0	0	0

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
Ditch 1	0	0	0	0	0
Total (cfs)	0	0	0	0	0

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

1728

Executed: 04-18-1998 10:21:56
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\DITCH1 .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\DITCH1.HYD

DITCH 1
TRAP RANGE AREA

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	0	14.8	1
11.1	0	14.9	1
11.2	0	15.0	1
11.3	0	15.1	1
11.4	0	15.2	1
11.5	0	15.3	1
11.6	0	15.4	1
11.7	0	15.5	1
11.8	1	15.6	1
11.9	1	15.7	1
12.0	2	15.8	0
12.1	4	15.9	0
12.2	7	16.0	0
12.3	10	16.1	0
12.4	10	16.2	0
12.5	7	16.3	0
12.6	5	16.4	0
12.7	4	16.5	0
12.8	3	16.6	0
12.9	2	16.7	0
13.0	2	16.8	0
13.1	1	16.9	0
13.2	1	17.0	0
13.3	1	17.1	0
13.4	1	17.2	0
13.5	1	17.3	0
13.6	1	17.4	0
13.7	1	17.5	0
13.8	1	17.6	0
13.9	1	17.7	0
14.0	1	17.8	0
14.1	1	17.9	0
14.2	1	18.0	0
14.3	1	18.1	0

C10

14.4	1	18.2	0
14.5	1	18.3	0
14.6	1	18.4	0
14.7	1	18.5	0

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

1728

Executed: 04-18-1998 10:21:56
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\DITCH1 .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\DITCH1.HYD

DITCH 1
TRAP RANGE AREA

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	0	22.4	0
18.7	0	22.5	0
18.8	0	22.6	0
18.9	0	22.7	0
19.0	0	22.8	0
19.1	0	22.9	0
19.2	0	23.0	0
19.3	0	23.1	0
19.4	0	23.2	0
19.5	0	23.3	0
19.6	0	23.4	0
19.7	0	23.5	0
19.8	0	23.6	0
19.9	0	23.7	0
20.0	0	23.8	0
20.1	0	23.9	0
20.2	0	24.0	0
20.3	0	24.1	0
20.4	0	24.2	0
20.5	0	24.3	0
20.6	0	24.4	0
20.7	0	24.5	0
20.8	0	24.6	0
20.9	0	24.7	0
21.0	0	24.8	0
21.1	0	24.9	0
21.2	0	25.0	0
21.3	0	25.1	0
21.4	0	25.2	0
21.5	0	25.3	0
21.6	0	25.4	0
21.7	0	25.5	0
21.8	0	25.6	0
21.9	0	25.7	0
22.0	0	25.8	0
22.1	0	25.9	0

C 12

22.2	0
22.3	0

C13

E-1728

Table
Rating Table for Trapezoidal Channel

Project Description	
Project File	p:\engdata\c&sdata\po175\calc\swcalc2\trap.fm2
Worksheet	DITCH 1
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Constant Data		
Mannings Coefficient	0.040	
Left Side Slope	3.0	H : V
Right Side Slope	3.0	H : V
Bottom Width	2.00	ft

(ASSUME FOR ECM)

Input Data	Minimum	Maximum	Increment	
Channel Slope	0.005000	0.020000	0.001000	ft/ft
Discharge	6.00	10.00	1.00	cfs

Rating Table

Discharge (cfs)	Channel Slope (ft/ft)	Depth (ft)	Velocity (ft/s)
6.00	0.005000	0.81	1.67
6.00	0.006000	0.78	1.78
6.00	0.007000	0.75	1.88
6.00	0.008000	0.73	1.98
6.00	0.009000	0.71	2.07
6.00	0.010000	0.69	2.15
6.00	0.011000	0.67	2.23
6.00	0.012000	0.66	2.30
6.00	0.013000	0.64	2.37
6.00	0.014000	0.63	2.43
6.00	0.015000	0.62	2.49
6.00	0.016000	0.61	2.55
6.00	0.017000	0.60	2.61
6.00	0.018000	0.60	2.66
6.00	0.019000	0.59	2.72
6.00	0.020000	0.58	2.77
7.00	0.005000	0.87	1.73
7.00	0.006000	0.84	1.85
7.00	0.007000	0.81	1.96
7.00	0.008000	0.78	2.06
7.00	0.009000	0.76	2.15
7.00	0.010000	0.74	2.24

000511

CK

Table
Rating Table for Trapezoidal Channel

Rating Table			
Discharge (cfs)	Channel Slope (ft/ft)	Depth (ft)	Velocity (ft/s)
7.00	0.011000	0.72	2.32
7.00	0.012000	0.71	2.39
7.00	0.013000	0.70	2.46
7.00	0.014000	0.68	2.53
7.00	0.015000	0.67	2.60
7.00	0.016000	0.66	2.66
7.00	0.017000	0.65	2.72
7.00	0.018000	0.64	2.78
7.00	0.019000	0.63	2.83
7.00	0.020000	0.63	2.89
8.00	0.005000	0.93	1.80
8.00	0.006000	0.89	1.92
8.00	0.007000	0.86	2.03
8.00	0.008000	0.83	2.14
8.00	0.009000	0.81	2.23
8.00	0.010000	0.79	2.32
8.00	0.011000	0.77	2.40
8.00	0.012000	0.76	2.48
8.00	0.013000	0.74	2.55
8.00	0.014000	0.73	2.62
8.00	0.015000	0.72	2.69
8.00	0.016000	0.71	2.76
8.00	0.017000	0.69	2.82
8.00	0.018000	0.69	2.88
8.00	0.019000	0.68	2.94
8.00	0.020000	0.67	2.99
9.00	0.005000	0.98	1.85
9.00	0.006000	0.94	1.98
9.00	0.007000	0.91	2.10
9.00	0.008000	0.88	2.20
9.00	0.009000	0.86	2.30
9.00	0.010000	0.84	2.39
9.00	0.011000	0.82	2.48
9.00	0.012000	0.80	2.56
9.00	0.013000	0.78	2.63
9.00	0.014000	0.77	2.71
9.00	0.015000	0.76	2.78
9.00	0.016000	0.75	2.84
9.00	0.017000	0.74	2.91
9.00	0.018000	0.73	2.97
9.00	0.019000	0.72	3.03
9.00	0.020000	0.71	3.09
Q_{10} = 10.00	0.005000	1.03	1.90 ←
10.00	0.006000	0.99	2.04
10.00	0.007000	0.95	2.16

000512

C 15

1728

Table
Rating Table for Trapezoidal Channel

Rating Table

Discharge (cfs)	Channel Slope (ft/ft)	Depth (ft)	Velocity (ft/s)
10.00	0.008000	0.92	2.26
10.00	0.009000	0.90	2.37
10.00	0.010000	0.88	2.46
10.00	0.011000	0.86	2.55
10.00	0.012000	0.84	2.63
10.00	0.013000	0.82	2.71
10.00	0.014000	0.81	2.78
10.00	0.015000	0.80	2.86
10.00	0.016000	0.79	2.92
10.00	0.017000	0.77	2.99
10.00	0.018000	0.76	3.05 ← OK w/ECM
10.00	0.019000	0.75	3.12
10.00	0.020000	0.74	3.17

000513

Attachment D - Ditch 2

DRAINAGE AREA:

- Part of Subarea 2, = 1.85 acres

CRITERIA:

- 10-Year, 24-hour Storm

SUMMARY:

Q_{10} = 6 cfs
V_{10} = 1.67 fps

COMMENTS:

The purpose of Ditch 2 is to control stormwater run off from the Trap Range. The CN is based on the assumption that the area remains mostly disturbed due to construction but has some vegetated and undisturbed areas from its present condition, open space in good condition.

While the velocity is well below the need for check dams, several will be used to limit the release of sediment from the area. A grass strip will be maintained between Ditch 2 and the work area in an effort to capture sediment .

D 2

Quick TR-55 Ver.5.46 S/N:
Executed: 10:12:23 04-18-1998

Ditch 2
Trap Range Area

RUNOFF CURVE NUMBER SUMMARY

Subarea Description	Area (acres)	CN (weighted)
Ditch 2	1.85	88

D-3

Quick TR-55 Ver.5.46 S/N:
Executed: 10:12:23 04-18-1998

1728

Ditch 2
Trap Range Area

RUNOFF CURVE NUMBER DATA

::

Composite Area: Ditch 2

SURFACE DESCRIPTION	AREA (acres)	CN	
CONSTRUCTION (bare soil)	1.50	91	
C/OPEN SPACE/GOOD	0.35	74	
COMPOSITE AREA --->	1.85	87.8	(88)

::

000516

D4

Quick TR-55 Ver.5.46 S/N:
Executed: 10:18:57 04-18-1998
p:\engdata\c&sdata\po175\calc\swcalc2\DITCH2.TCT

SUMMARY SHEET FOR Tc or Tt COMPUTATIONS
(Solved for Time using TR-55 Methods)

DITCH 2
TRAP RANGE AREA

Subarea descr.	Tc or Tt	Time (hrs)
DITCH2	Tc	0.33

000517

D5

Quick TR-55 Ver.5.46 S/N:
Executed: 10:18:57 04-18-1998
p:\[illegible]data\c&sdata\po175\calc\swcalc2\DITCH2.TCT

1728

DITCH 2
TRAP RANGE AREA

Tc COMPUTATIONS FOR: DITCH2

SHEET FLOW (Applicable to Tc only)

Segment ID		2-21	
Surface description		range	
Manning's roughness coeff., n		0.1300	
Flow length, L (total < or = 300)	ft	185.0	
Two-yr 24-hr rainfall, P2	in	3.000	
Land slope, s	ft/ft	0.0392	
$T = \frac{.007 * (n*L)^{0.8}}{P2^{0.5} * s^{0.4}}$	hrs	0.19	= 0.19

SHALLOW CONCENTRATED FLOW

Segment ID			
Surface (paved or unpaved)?			
Flow length, L	ft	0.0	
Watercourse slope, s	ft/ft	0.0000	
$Avg.V = Csf * (s)^{0.5}$	ft/s	0.0000	
where: Unpaved Csf = 16.1345			
Paved Csf = 20.3282			
T = L / (3600*V)	hrs	0.00	= 0.00

CHANNEL FLOW

Segment ID		2-22	
Cross Sectional Flow Area, a	sq.ft	5.06	
Wetted perimeter, Pw	ft	8.32	
Hydraulic radius, r = a/Pw	ft	0.608	
Channel slope, s	ft/ft	0.0050	
Manning's roughness coeff., n		0.0400	
$V = \frac{1.49 * r^{2/3} * s^{1/2}}{n}$	ft/s	1.8907	
Flow length, L	ft	985	
T = L / (3600*V)	hrs	0.14	= 0.14

000518

TOTAL TIME (hrs) 0.33

D6

Ditch 2 Tc Calc
Worksheet for Trapezoidal Channel

Project Description	
Project File	p:\engdata\c&sdata\po175\calc\swcalc2\trap.fm2
Worksheet	Ditch 2
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Mannings Coefficient	0.040	
Channel Slope	0.005000	ft/ft
Depth	1.00	ft
Left Side Slope	3.0	H : V
Right Side Slope	3.0	H : V
Bottom Width	2.00	ft

Results		
Discharge	9.35	cfs
Flow Area	5.00	ft^2
Wetted Perimeter	8.32	ft
Top Width	8.00	ft
Critical Depth	0.64	ft
Critical Slope	0.032363	ft/ft
Velocity	1.87	ft/s
Velocity Head	0.05	ft
Specific Energy	1.05	ft
Froude Number	0.42	
Flow is subcritical.		

Notes:

For Tc calc only

Assume n = 0.04 for grass & ECM

000519

Quick TR-55 Version: 5.46 S/N:

Return Frequency: 10 years

1728

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 04-18-1998 10:23:22
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\DITCH2 .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\DITCH2.HYD

DITCH 2
TRAP RANGE AREA

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
Ditch 2	1.85	88.0	0.30	0.00	4.10	2.82	I.07 .10

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 1.85 acres or 0.00289 sq.mi
Peak discharge = 6 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
Ditch 2	0.33	0.00	0.30	0.00	No	Computed Ia/p < .1

* Travel time from subarea outfall to composite watershed outfall point.

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 04-18-1998 10:23:22
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\DITCH2 .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\DITCH2.HYD

DITCH 2
TRAP RANGE AREA

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
Ditch 2	6	12.2
Composite Watershed	6	12.2

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

1728

Executed: 04-18-1998 10:23:22
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\DITCH2 .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\DITCH2.HYD

DITCH 2
TRAP RANGE AREA

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
Ditch 2	0	0	0	1	2	4	6	6	4
Total (cfs)	0	0	0	1	2	4	6	6	4

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
Ditch 2	2	2	1	1	1	1	0	0	0
Total (cfs)	2	2	1	1	1	1	0	0	0

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
Ditch 2	0	0	0	0	0	0	0	0	0
Total (cfs)	0	0	0	0	0	0	0	0	0

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
Di[illegible]2	0	0	0	0	0
Total (cfs)	0	0	0	0	0

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 04-18-1998 10:23:22
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\DITCH2 .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\DITCH2.HYD

DITCH 2
TRAP RANGE AREA

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	0	14.8	0
11.1	0	14.9	0
11.2	0	15.0	0
11.3	0	15.1	0
11.4	0	15.2	0
11.5	0	15.3	0
11.6	0	15.4	0
11.7	0	15.5	0
11.8	1	15.6	0
11.9	1	15.7	0
12.0	2	15.8	0
12.1	4	15.9	0
12.2	6	16.0	0
12.3	6	16.1	0
12.4	4	16.2	0
12.5	2	16.3	0
12.6	2	16.4	0
12.7	1	16.5	0
12.8	1	16.6	0
12.9	1	16.7	0
13.0	1	16.8	0
13.1	1	16.9	0
13.2	1	17.0	0
13.3	0	17.1	0
13.4	0	17.2	0
13.5	0	17.3	0
13.6	0	17.4	0
13.7	0	17.5	0
13.8	0	17.6	0
13.9	0	17.7	0
14.0	0	17.8	0
14.1	0	17.9	0
14.2	0	18.0	0
14.3	0	18.1	0

14.4	0	18.2	0
14.5	0	18.3	0
14.6	0	18.4	0
14.7	0	18.5	0

D11

1728

Quick TR-55 Version: 5.46 S/N:

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 04-18-1998 10:23:22
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\DITCH2 .MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\DITCH2.HYD

DITCH 2
TRAP RANGE AREA

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	0	22.4	0
18.7	0	22.5	0
18.8	0	22.6	0
18.9	0	22.7	0
19.0	0	22.8	0
19.1	0	22.9	0
19.2	0	23.0	0
19.3	0	23.1	0
19.4	0	23.2	0
19.5	0	23.3	0
19.6	0	23.4	0
19.7	0	23.5	0
19.8	0	23.6	0
19.9	0	23.7	0
20.0	0	23.8	0
20.1	0	23.9	0
20.2	0	24.0	0
20.3	0	24.1	0
20.4	0	24.2	0
20.5	0	24.3	0
20.6	0	24.4	0
20.7	0	24.5	0
20.8	0	24.6	0
20.9	0	24.7	0
21.0	0	24.8	0
21.1	0	24.9	0
21.2	0	25.0	0
21.3	0	25.1	0
21.4	0	25.2	0
21.5	0	25.3	0
21.6	0	25.4	0
21.7	0	25.5	0
21.8	0	25.6	0
21.9	0	25.7	0
22.0	0	25.8	0
22.1	0	25.9	0

000525

22.2	0
22.3	0

D13

1728

000526

D 14

Table
Rating Table for Trapezoidal Channel

Project Description	
Project File	p:\engdata\c&sdata\po175\calc\swcalc2\trap.fm2
Worksheet	Ditch 2 at Trap Range
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Constant Data		
Mannings Coefficient	0.040	
Left Side Slope	3.0	H : V
Right Side Slope	3.0	H : V
Bottom Width	2.00	ft
Discharge	6.00	cfs

Q10

Input Data	Minimum	Maximum	Increment
Channel Slope	0.005000	0.020000	0.001000 ft/ft

Rating Table

Channel Slope (ft/ft)	Depth (ft)	Velocity (ft/s)
0.005000	0.81	1.67
0.006000	0.78	1.78
0.007000	0.75	1.88
0.008000	0.73	1.98
0.009000	0.71	2.07
0.010000	0.69	2.15
0.011000	0.67	2.23
0.012000	0.66	2.30
0.013000	0.64	2.37
0.014000	0.63	2.43
0.015000	0.62	2.49
0.016000	0.61	2.55
0.017000	0.60	2.61
0.018000	0.60	2.66
0.019000	0.59	2.72
0.020000	0.58	2.77

000527

Attachment E - SEDIMENT BASIN 1

DRAINAGE AREA:

- For A1PII construction activities, the following drainage Subareas drain to Sediment Basin 1:

Subarea 1	40.72 acres
Subarea 2	26.11
Subarea 3B	6.36
Total	73.19 acres

The addition of other draiange areas into the basin will require additional storage which will be the responsibility of others. This would include the possible addition of flow from the OSDF Cell construction or OSDF Borrow Area construction.

CRITERIA:

The required volume of storage is based on the requirements of the ODNR *Rainwater and Land Development* manual. The requirements are as follows:

- Minimum volume of sediment basin equals 67 cubic yard per arcre of drainage area
- Maximum sediment storage before cleanout is equal to 27 cubic yard per acre of drainage area

Other criteria from ODNR is that the total stoarge volume before overtopping the embankment is less than 15 acre-feet. Ohio Dam Safety Laws may come into effect if the embankment is greater than 10 feet.

SUMMARY:

The required volume of storage and cleanout for A1PII are as follows:

• Minimum volume of sediment basin	4,904 cy 132,401 cf 3.04 ac-ft
• Maximum sediment storage (Cleanout volume)	1,976 cy 53,356 cf 1.22 ac-ft

E 2

Storage

Sediment Basin 1 has a sump below the base of the outlet riser and the 8" perforated cmp riser pipe. This sump is the maximum sediment storage volume (sediment clean out elevation) and is considered "dead storage" (ie. Not usable) for routing calculations. The 8" perforated cmp riser is assumed to be not operational as far as allowing water into the outlet structure during the storm but it is assumed to allow water to seep in after the storm. What this means is that no credit is taken for inflow through the 8" perforated riser during the storm, but it will dewater the basin over time so that the starting condition for the routing is based on the sediment clean out elevation. Maximum storage is considered to be at the elevation at which water starts to overtop the North Entrance Road (elevation 578.34 per field run survey). The area attributed to this elevation is an extrapolation of the previous readings and is likely low.

Summary

- Peak Inflow, $Q_{10\text{-}yr}$ = 158 cfs
- Peak Outflow = 136 cfs
- Peak Elevation, $Q_{10\text{-}yr}$ = 576.8'

E 3

SEDIMENT BASIN 1
STORAGE VOLUME

1728

A1PII Sediment Basin

Elev	Area ft^2	Ave. Area	Ht. ft	Volume ft^3	Cum. Vol. ft^3	Cum. Vol. Above CO ft^3	ac.ft
567	12,728						
		14,835.5	1.0	14,836	14,836		
568	16,943						
		19,202.5	1.0	19,203	34,038		
569	21,462						
		23,334.0	0.8	18,201	52,239		
569.78	25,206					CO	
		24,945.5	0.22	5,488	57,727	5,488	0.1260
570	28,429						
		31,207.0	1.0	31,207	88,934	36,695	0.8424
571	33,985						
		37,729.5	1.0	37,730	126,663	74,425	1.7086
572	41,474						
		44,611.0	1.0	44,611	171,274	119,036	2.7327
573	47,748						
		50,986.0	1.0	50,986	222,260	170,022	3.9032
574	54,224						
		57,570.5	1.0	57,571	279,831	227,592	5.2248
575	60,917						
		61,883.5	0.3	17,327	297,158	244,919	5.6226
575.28	62,850						
		64,366.5	1.0	64,367	344,197	291,959	6.7024
576	67,816						
		71,368.0	1.0	71,368	415,565	363,327	8.3408
577	74,920						
		78,756.5	1	78,757	494,322	442083.01	10.1488
578	82,593						
		84,051.5	0.34	28,578	522,899	470660.52	10.8049
578.34	85,510						

NOTE:

1 Contours set for 48" riser at elev. 569.78.

2 Minimum storage volume is 132,401 cf

572	126,663	cf	
min storage elev	132,401	cf @ 67cy/ac	
573	171,274		
	5,738		0.13
	44,611		

min storage elev = 572.13

min storage elev - inv. = 2.35 ft.

3 CO is the cleanout volume @ 27 cy/ac

000530

E4

SEDIMENT BASIN 1
OUTLET CONTROL

AIPII Sediment Basin					
WEIR		ORIFICE		PIPE	
D_R (in.) =	48	D_R (in.) =	48	D (in.) =	48
INVERT	575.28	INVERT	575.28	NVERT IN	569.80
C =	9.739	C=	3.78	INV. OUT=	569.00
				LENGTH=	200
				AREA(sf)=	12.56
				H_O =	571.00
				g =	32.20
				KM =	1.00
				KP =	0.0168
				n =	0.024

WSE	H	Q_W	H	Q_O	H	Q_P	Q_{MIN}	2 X Q_{MIN}
	ft	cfs	ft	cfs	ft	cfs	cfs	cfs
569.00	N/A	0	N/A	0	N/A	0	0	0
570.00	N/A	0	N/A	0	N/A	0	0	0
571.00	N/A	0	N/A	0	N/A	0	0	0
572.00	N/A	0	N/A	0	N/A	0	0	0
573.00	N/A	0	N/A	0	N/A	0	0	0
574.00	N/A	0	N/A	0	N/A	0	0	0
575.00	N/A	0	N/A	0	N/A	0	0	0
576.00	0.72	24	0.72	51	5.00	97	24	48
577.00	1.72	88	1.72	79	6.00	107	79	159
578.00	2.72	175	2.72	100	7.00	115	100	200
578.34	3.06	209	3.06	106	7.34	118	106	212

$Q_w = 9.739*(D_R/12)*H^{3/2}$

$Q_o = 3.782*(D_R/12)^2*H^{1/2}$

Weir and orifice flow equations from ODNR *Rainwater and Land Development*, pg. 103.

$Q_P = a*(2gH/1+K_M+K_P*L)^{1/2}$

Pipe flow equation from SCS, *Engineering Field Manual fo Conservation Practices*, Chapter 3. (eq 3-12)

where

Q_P = discharge, cfs

g = acceleration of gravity, ft/sec^2

H = elevation of head differental, ft [ie. WSE-(INV_O + 1/2 dia)]

K_M = coefficient of minor losses (use 1.0 for bend and entrance)

K_P = pipe friction coefficient = $(5087*n^2)/d_i^{4/3}$ (eq 3-9)

L = pipe length, ft

000531

PARSONS ERA PROJECT

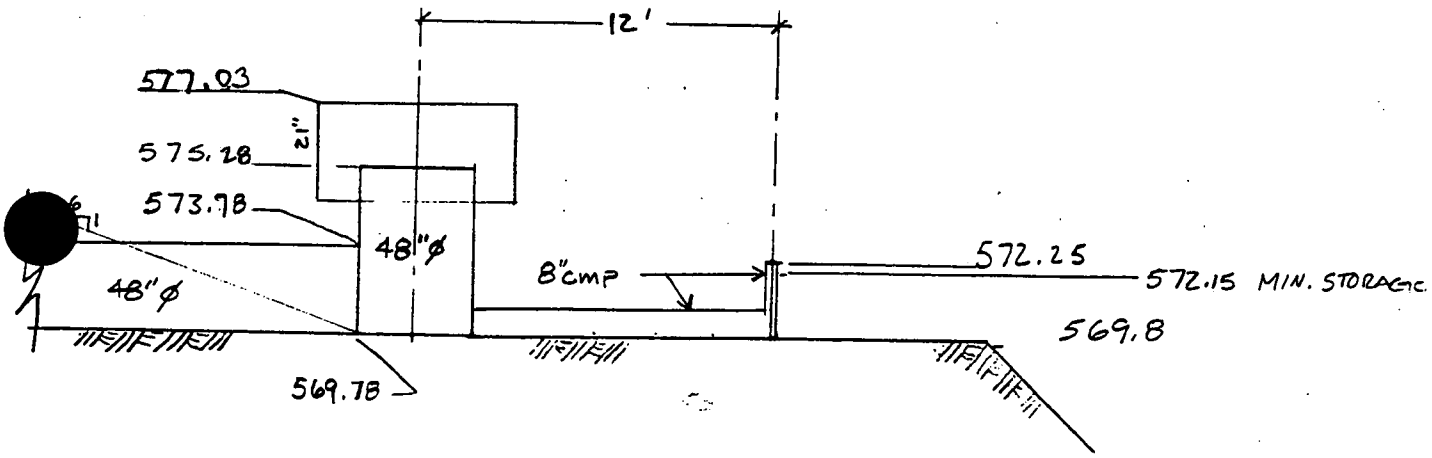
CALCULATION SHEET

1728

	BY	DATE	CK	DATE	TITLE A1 PII SP Pkg.	Project SEEP
0A	KG	2/20/98	MH	3/19/98	PRINCIPAL SPILLWAY	PO No. 175
0B	KG	5/2/98	MH	5/5/98	AUTHOR K.G 2/20/98 SHEET E5 OF	

ASSUME:
TWIN 48" BCCMP, $n = 0.024$ ODOT VOL II 1104.45
$S = 0.40\%$ CONTECH, CSP-101
$L = 200'$

8" CMP / RISER NOT OPERATING



$$Q_w = 9.739 * (D_R/12) * H^{3/2}$$
$$Q_o = 3.782 * (D_R/12)^2 * H^{1/2}$$

(from ODNR)

000532

04/96

NA/ENG025

TW calc using outlet channel, Q25=200 cf
Worksheet for Trapezoidal Channel

E 6

Project Description	
Project File	p:\engdata\c&sdata\po175\calc\swcalc2\sedbout.fm2
Worksheet	Principal Spillway Outfall Channel
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data			
Mannings Coefficient	0.035		
Channel Slope	0.008000	ft/ft	
Left Side Slope	3.000000	H : V	
Right Side Slope	3.000000	H : V	
Bottom Width	16.00	ft	
Discharge	200	cfs	(ASSUMED)

Results		
Depth	1.89	ft
Flow Area	40.87	ft²
Wetted Perimeter	27.93	ft
Top Width	27.32	ft
Critical Depth	1.53	ft
Critical Slope	0.017001	ft/ft
Velocity	4.89	ft/s
Velocity Head	0.37	ft
Specific Energy	2.26	ft
Froude Number	0.71	
Flow is subcritical.		

Notes:

For TW elev only

Assume: riprap n=0.035
Q25=200 cfs

000533

E 7

1728

Outlet Channel at Principal Spillway
Worksheet for Trapezoidal Channel

Project Description	
Project File	p:\engdata\c&sdata\po175\calc\swcalc2\sedbout.fm2
Worksheet	Outlet Channel - 16' Flat Bottom
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Mannings Coefficient	0.035	
Channel Slope	0.0080	ft/ft
Depth	2.00	ft
Left Side Slope	3.0	H : V
Right Side Slope	3.0	H : V
Bottom Width	16.0	ft

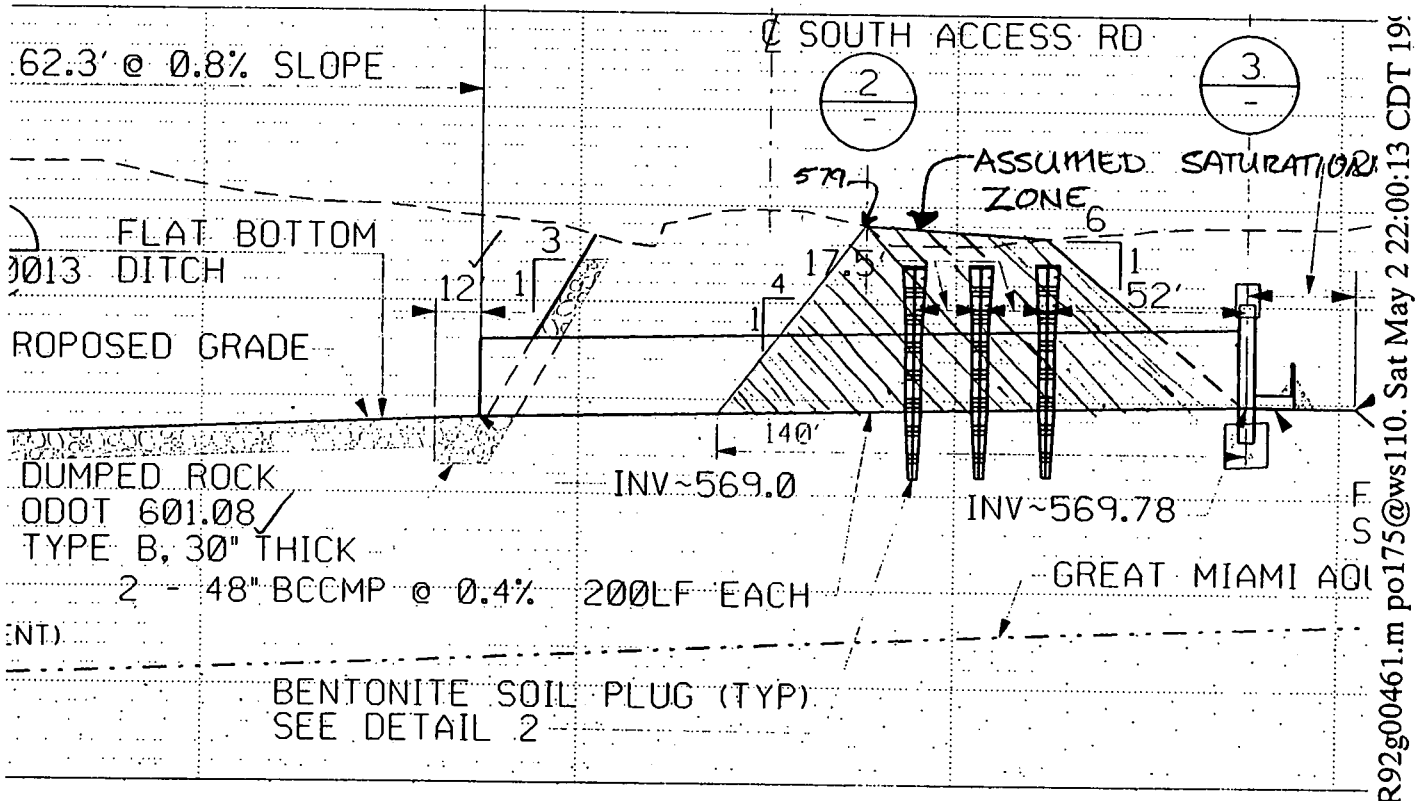
Results		
Discharge	222	cfs
Flow Area	44.00	ft^2
Wetted Perimeter	28.65	ft
Top Width	28.00	ft
Critical Depth	1.63	ft
Critical Slope	0.016711	ft/ft
Velocity	5.05	ft/s
Velocity Head	0.40	ft
Specific Energy	2.40	ft
Froude Number	0.71	
Flow is subcritical.		

Notes:

Discharge for proposed channel at 2.0 ft height of flow = height of proposed riprap.

Assume riprap n = 0.035

000534



SKETCH FOR ANTI SEEP COLLAR / BENTONITE SOIL PLUG DESIGN

1" = 50' H
1" = 5' V

R92g00461.m po175@ws110. Sat May 2 22:00:13 CDT 19

000537

E 11

48" BCCMP Outlet Protection
Worksheet for Pressure Pipe

E 1728

Project Description	
Project File	p:\engdata\c&sdata\po175\calc\swcalc2\sedbout.fm2
Worksheet	Outlet Protection for 48"BCCMP
Flow Element	Pressure Pipe
Method	Hazen-Williams Formula
Solve For	Pressure at 2

Input Data	
Pressure at 1	9.34 feet H20
Elevation at 1	569.80 ft
Elevation at 2	569.00 ft
Length	200.00 ft
C Coefficient	120.0
Diameter	48.00 in
Discharge	118 cfs

Results		
Pressure at 2	9.07	feet H20
Headloss	1.07	ft
Energy Grade at 1	580.51	ft
Energy Grade at 2	579.44	ft
Hydraulic Grade at 1	579.14	ft
Hydraulic Grade at 2	578.07	ft
Flow Area	12.57	ft^2
Wetted Perimeter	12.57	ft
Velocity	9.39	ft/s
Velocity Head	1.37	ft
Friction Slope	0.005356	ft/ft

Notes:

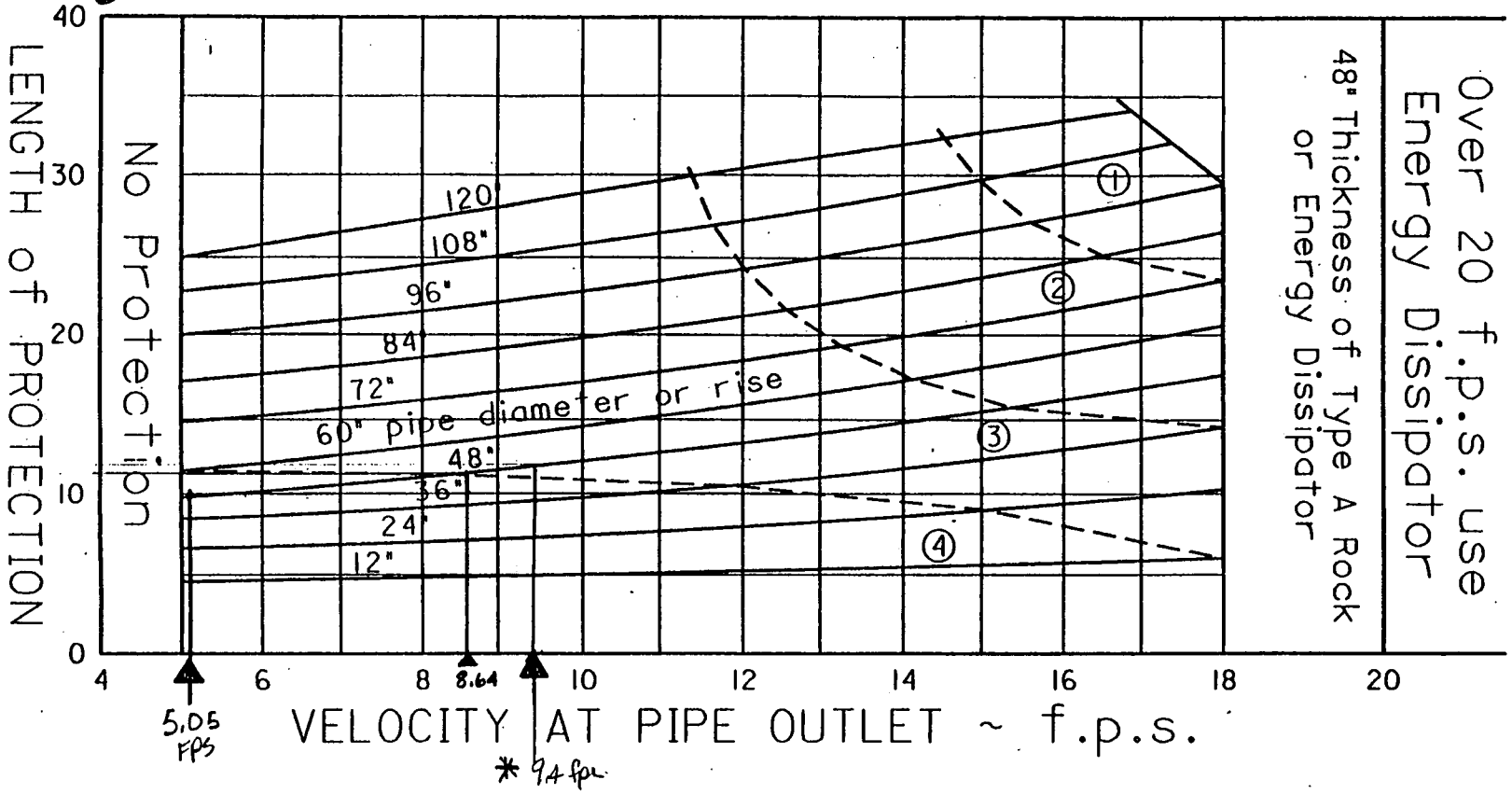
Rough calculation to establish a velocity for outlet protection. No entrance loss.

Assume P1 at max before topping road
Assume C=120 for BCCMP

000538

000539

ROCK CHANNEL PROTECTION AT CULVERT AND STORM SEWER OUTLETS



TWIN - 48" BCCMP

NOTES

Rock size (6", 12", 18") indicates the square opening on which 85% of the material, by weight, will be retained.

The width of protection shall be the width of the headwall, with 4' being the minimum.

(Where a stream bed will withstand the calculated velocity without erosion, no rock channel protection will be required.)

LEGEND	ROCK TYPE
① 48" of 18" rock	A
② 36" of 18" rock	A
③ 30" of 12" rock	B
④ 18" of 6" rock	C

* USE 12' of 12" ROCK, 30" THICK

1107-1

REFERENCE SECTION 1107.2

E 12

POND ROUTING:

Purpose

The purpose of the pond routing is to determine how the design of the principal spillway and A1PII sediment basin configuration will function with the 10-year, 24-hour storm. This design was chosen based on it being the same as for the A1PII Conveyance Channel. Routing the storm through the sediment basin as if it were a pond will take into account the storage capacity of the sediment basin when the amount of runoff coming into the basin is greater than the amount that can leave. (Routing other storms may be necessary to confirm compliance with other design criteria not required by A1PII. Those calculations are beyond the scope of A1PII calculation.)

Drainage Area

Refer to the Drainage Area Map. The pond routing used the hydrograph generated for the following drainage areas:

Subarea 1 + OSDF Cell Construction
Subarea 2 + 3B
Subarea 3A (Phase I OSDF Borrow Area)

Calculations

Use Pond-2 ™ by Haestad Methods to calculate the pond routing based on the inflow hydrograph from QTR-55™ for the drainage areas indicated. The theory used is based on level-pool reservoir routing which is based on the equation:

$$S/t = I-O$$

Where:

t = Hydrograph time increment
I = Inflow into reservoir during increment t
O = Outflow from reservoir during increment t
S = Change in storage during increment t

The input information includes data from earlier Sediment Basin 1 Outlet Control table for Elevation Vs. Discharge relationships and the Storage Volume table for Elevation Vs. Storage Volume relationships.

Quick TR-55 Ver.5.46 S/N:
Executed: 10:46:15 02-13-1998

SEDIMENT BASIN 1
OSDF PHASE I
Includes OSDF Cell + A1PII + OSDF PHASE 1
BORROW AREA

RUNOFF CURVE NUMBER SUMMARY

Subarea Description	Area (acres)	CN (weighted)
Sub 1 & Cell	57.02	82
Sub 2 & 3A+3B	40.66	85

Quick TR-55 Ver.5.46 S/N:
Executed: 10:46:15 02-13-1998

E15

1728

SEDIMENT BASIN 1
OSDF PHASE I
Includes OSDF Cell + A1PII + OSDF PHASE 1
BORROW AREA

RUNOFF CURVE NUMBER DATA

::

Composite Area: Sub 1 & Cell

SURFACE DESCRIPTION	AREA (acres)	CN	
C / ROW CROPS C+CR / GOOD	12.34	81	
C / GRAVEL	1.18	89	
PAVEMENT	0.49	98	
C / CONSTRUCTION (bare soil)	7.58	91	
C / OPEN SPACE / GOOD	19.13	74	
C / CELL CONSTRUCTION	6.00	91	
C / REVEGETATED AREA	6.30	79	
C / GRAVEL SURFACE	2.00	89	
C / RIPRAP	2.00	89	
COMPOSITE AREA --->	57.02	81.7	(82)

::

Composite Area: Sub 2 & 3A+3B

SURFACE DESCRIPTION	AREA (acres)	CN	
C / GRAVEL	0.50	89	
C / CONSTRUCTION	11.20	91	
C / OPEN SPACE / GOOD	14.41	74	
C / OPEN SPACE / FAIR	1.23	79	
C / CONSTRUCTION (sed. basin)	12.97	91	
PAVEMENT	0.35	98	
COMPOSITE AREA --->	40.66	84.6	(85)

::

E16

```
  Quick TR-55 Ver.5.46   S/N:
  Executed: 10:48:54    02-13-1998
p:\engdata\c&sdata\po175\calc\swcalc2\OSDFSED1.TCT

                              SEDIMENT BASIN 1
                                OSDF PHASE I
                    Includes OSDF Cell + A1PII + OSDF PHASE I
                                BORROW AREA

                        Tc COMPUTATIONS FOR: Sub 1 & Cell

    SHEET FLOW (Applicable to Tc only)
        Segment ID                                       1
        Surface description                     Range
        Manning's roughness coeff., n              0.1300
        Flow length, L (total < or = 300)       ft     300.0
        Two-yr 24-hr rainfall, P2               in     3.000
        Land slope, s                           ft/ft  0.0233
                                    0.8
                .007 * (n*L)
        T =     -------------           hrs     0.34              =   0.34
                   0.5    0.4
                 P2   *   s

    SHALLOW CONCENTRATED FLOW
        Segment ID                                       2
        Surface (paved or unpaved)?                  Unpaved
        Flow length, L                          ft     1214.0
        Watercourse slope, s                    ft/ft  0.0186

                                 0.5
        Avg.V =  Csf *  (s)                     ft/s   2.2005
        where:   Unpaved Csf = 16.1345
                 Paved   Csf = 20.3282

        T = L / (3600*V)                        hrs     0.15              =   0.15

    CHANNEL FLOW
        Segment ID                                      3         4
        Cross Sectional Flow Area, a            sq.ft  15.27     20.00
        Wetted perimeter, Pw                    ft     12.97     15.79
        Hydraulic radius, r = a/Pw              ft     1.177     1.267
        Channel slope, s                        ft/ft  0.0040    0.0040
        Manning's roughness coeff., n                  0.0400    0.0400

                             2/3    1/2
                1.49  *  r   *  s
        V =     -------------------             ft/s   2.6268    2.7580
                         n

        Flow length, L              000543      ft      375      1125

        T = L / (3600*V)                        hrs     0.04  +   0.11     =   0.15
         ::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
                                                   TOTAL TIME (hrs)        0.65
```

Quick TR-55 Ver.5.46 S/N:
Executed: 10:48:54 02-13-1998
p gdata\c&sdata\po175\calc\swcalc2\OSDFSED1.TCT

E17

SEDIMENT BASIN 1
OSDF PHASE I
Includes OSDF Cell + A1PII + OSDF PHASE I
BORROW AREA

1728

Tc COMPUTATIONS FOR: Sub 2 & 3A+3B

SHEET FLOW (Applicable to Tc only)

Segment ID		2-1		
Surface description		Range		
Manning's roughness coeff., n		0.1300		
Flow length, L (total < or = 300)	ft	300.0		
Two-yr 24-hr rainfall, P2	in	3.000		
Land slope, s	ft/ft	0.0392		
$T = \frac{.007 * (n*L)^{0.8}}{P2^{0.5} * s^{0.4}}$	hrs	0.28	=	0.28

SHALLOW CONCENTRATED FLOW

Segment ID		2-2		
Surface (paved or unpaved)?		Unpaved		
Flow length, L	ft	487.0		
Watercourse slope, s	ft/ft	0.0068		
$Avg.V = Csf * (s)^{0.5}$	ft/s	1.3305		
where: Unpaved Csf = 16.1345				
Paved Csf = 20.3282				
T = L / (3600*V)	hrs	0.10	=	0.10

CHANNEL FLOW

Segment ID		2-3		2-4		
Cross Sectional Flow Area, a	sq.ft	7.26		11.65		
Wetted perimeter, Pw	ft	11.37		13.77		
Hydraulic radius, r = a/Pw	ft	0.639		0.846		
Channel slope, s	ft/ft	0.0100		0.0075		
Manning's roughness coeff., n		0.0400		0.0400		
$V = \frac{1.49 * r^{2/3} * s^{1/2}}{n}$	ft/s	2.7621		2.8857		
Flow length, L	ft	570		575		
T = L / (3600*V)	hrs	0.06	+	0.06	=	0.11

000544

::

TOTAL TIME (hrs) 0.49

Quick TR-55 Ver.5.46 S/N:
Executed: 10:48:54 02-13-1998
p:\engdata\c&sdata\po175\calc\swcalc2\OSDFSED1.TCT

E18

SUMMARY SHEET FOR Tc or Tt COMPUTATIONS
(Solved for Time using TR-55 Methods)

SEDIMENT BASIN 1
OSDF PHASE I
Includes OSDF Cell + A1PII + OSDF PHASE I
BORROW AREA

Subarea descr.	Tc or Tt	Time (hrs)
Sub 1 & Cell	Tc	0.65
Sub 2 & 3A+3B	Tc	0.49

Quick TR-55 Ver.5.46 S/N:
Executed: 10:49:58 02-13-1998

E19

SUMMARY SHEET FOR Tc or Tt COMPUTATIONS
(Solved for Time using Length/Velocity)

1728

SEDIMENT BASIN 1
OSDF PHASE I
Includes OSDF Cell + A1PII + OSDF PHASE I
BORROW AREA

Subarea descr.	Tc or Tt	Time (hrs)
	Tt	0.05

Quick TR-55 Ver.5.46 S/N:
Executed: 10:49:58 02-13-1998

E20

SEDIMENT BASIN 1
OSDF PHASE I
Includes OSDF Cell + A1PII + OSDF PHASE I
BORROW AREA

Tc or Tt DATA
::

Subarea: DESCRIPTION	LENGTH (feet)	VELOCITY (ft/sec)	TIME minutes		TIME hours
Culvert 2	190	7.50	0.4	=	0.01
Sediment basin	430	3.00	2.4	=	0.04
		TOTAL Tt --->	minutes 2.8	=	hours 0.05

::::::::::::::::::::::::::::::::::::

Quick TR-55 Version: 5.46 S/N:

E21

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

1728

Executed: 02-13-1998 10:53:11
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\OSDFSED1.MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\BA1-10.HYD

SEDIMENT BASIN 1
OSDF PHASE I
Includes OSDF Cell + A1PII + OSDF PHASE I
BORROW AREA

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input	Ia/p used
Sub 1 & Cell	57.02	82.0	0.75	0.00	4.10	2.29	I.11	.11
Sub 2 & 3A+3B	40.66	85.0	0.50	0.00	4.10	2.55	I.09	.10

* Travel time from subarea outfall to composite watershed outfall point.
I Subarea where user specified interpolation between Ia/p tables.

Total area = 97.68 acres or 0.15262 sq.mi
Peak discharge = 158 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
Sub 1 & Cell	0.65	0.05	0.75	0.00	Yes	--
Sub 2 & 3A+3B	0.49	0.00	0.50	0.00	No	Computed Ia/p < .1

* Travel time from subarea outfall to composite watershed outfall point.

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 02-13-1998 10:53:11
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\OSDFSED1.MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\BA1-10.HYD

SEDIMENT BASIN 1
OSDF PHASE I
Includes OSDF Cell + A1PII + OSDF PHASE I
BORROW AREA

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
Sub 1 & Cell	86	12.6
Sub 2 & 3A+3B	86	12.4
Composite Watershed	158	12.5

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

E-1728

Executed: 02-13-1998 10:53:11
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\OSDFSED1.MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\BA1-10.HYD

SEDIMENT BASIN 1
OSDF PHASE I
Includes OSDF Cell + A1PII + OSDF PHASE I
BORROW AREA

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
Sub 1 & Cell	3	3	5	7	9	13	23	38	59
Sub 2 & 3A+3B	3	4	5	9	15	28	50	76	86
Total (cfs)	6	7	10	16	24	41	73	114	145

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
Sub 1 & Cell	76	86	83	75	51	35	25	19	15
Sub 2 & 3A+3B	82	65	48	37	23	16	12	10	9
Total (cfs)	158	151	131	112	74	51	37	29	24

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
Sub 1 & Cell	13	10	9	7	6	6	5	5	4
Sub 2 & 3A+3B	8	7	6	5	5	4	4	3	3
Total (cfs)	21	17	15	12	11	10	9	8	7

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
Sub 1 & Cell	4	4	3	3	0

Sub 2 & 3A+3B	3	3	2	2	0	E2A
Total (cfs)	7	7	5	5	0	

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

1728

Executed: 02-13-1998 10:53:11
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\OSDFSED1.MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\BA1-10.HYD

SEDIMENT BASIN 1
OSDF PHASE I
Includes OSDF Cell + A1PII + OSDF PHASE I
BORROW AREA

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	6	14.8	13
11.1	6	14.9	13
11.2	7	15.0	12
11.3	7	15.1	12
11.4	8	15.2	12
11.5	9	15.3	11
11.6	10	15.4	11
11.7	12	15.5	11
11.8	14	15.6	11
11.9	16	15.7	11
12.0	24	15.8	10
12.1	41	15.9	10
12.2	73	16.0	10
12.3	114	16.1	10
12.4	145	16.2	10
12.5	158	16.3	9
12.6	151	16.4	9
12.7	131	16.5	9
12.8	112	16.6	9
12.9	93	16.7	9
13.0	74	16.8	8
13.1	62	16.9	8
13.2	51	17.0	8
13.3	44	17.1	8
13.4	37	17.2	8
13.5	33	17.3	7
13.6	29	17.4	7
13.7	26	17.5	7
13.8	24	17.6	7
13.9	22	17.7	7
14.0	21	17.8	7
14.1	20	17.9	7
14.2	18	18.0	7
14.3	17	18.1	7

000552

14.4	16	18.2	7
14.5	16	18.3	7
14.6	15	18.4	7
14.7	14	18.5	7

E26

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

1728

Executed: 02-13-1998 10:53:11
Watershed file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\OSDFSED1.MOP
Hydrograph file: -->
P:\ENGDATA\C&SDATA\PO175\CALC\SWCALC2\BA1-10.HYD

SEDIMENT BASIN 1
OSDF PHASE I
Includes OSDF Cell + A1PII + OSDF PHASE I
BORROW AREA

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	7	22.4	5
18.7	7	22.5	4
18.8	7	22.6	4
18.9	7	22.7	4
19.0	7	22.8	4
19.1	7	22.9	4
19.2	7	23.0	4
19.3	6	23.1	4
19.4	6	23.2	4
19.5	6	23.3	3
19.6	6	23.4	3
19.7	6	23.5	3
19.8	5	23.6	3
19.9	5	23.7	3
20.0	5	23.8	3
20.1	5	23.9	3
20.2	5	24.0	3
20.3	5	24.1	2
20.4	5	24.2	2
20.5	5	24.3	2
20.6	5	24.4	2
20.7	5	24.5	2
20.8	5	24.6	2
20.9	5	24.7	2
21.0	5	24.8	2
21.1	5	24.9	1
21.2	5	25.0	1
21.3	5	25.1	1
21.4	5	25.2	1
21.5	5	25.3	1
21.6	5	25.4	1
21.7	5	25.5	1
21.8	5	25.6	1
21.9	5	25.7	0
22.0	5	25.8	0
22.1	5	25.9	0

22.2	5
22.3	5

E 28

POND-2 Version: 5.17
S/N:

E29

SEDIMENT BASIN 1
OSDF PHASE I
Includes OSDF Cell, A1PII, & OSDF PH I
Borrow Area

1728

CALCULATED 03-06-1998 11:32:46
DISK FILE: p:\engdata\c&sdata\po175\calc\swcalc2\SB1 .VOL

Planimeter scale: 1 inch = 10 ft.

Elevation (ft)	Planimeter (sq.in.)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	* Volume (acre-ft)	Volume Sum (acre-ft)
569.78	252.06	0.58	0.00	0.00	0.00
570.00	284.29	0.65	1.85	0.14	0.14
571.00	339.85	0.78	2.15	0.72	0.85
572.00	414.74	0.95	2.59	0.86	1.72
573.00	477.48	1.10	3.07	1.02	2.74
574.00	542.24	1.24	3.51	1.17	3.91
575.00	609.17	1.40	3.96	1.32	5.23
575.28	628.50	1.44	4.26	0.40	5.63
576.00	678.16	1.56	4.50	1.08	6.71
577.00	749.20	1.72	4.91	1.64	8.34
578.00	825.93	1.90	5.42	1.81	10.15
578.34	855.10	1.96	5.79	0.66	10.81

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

POND-2 Version: 5.17
S/N:

E 30

SEDIMENT BASIN 1
OSDF PHASE I
Includes OSDF Cell, A1PII, & OSDF PH I
Borrow Area

CALCULATED 03-06-1998 17:03:41
DISK FILE: c:\po175\BA1 .VOL

Planimeter scale: 1 inch = 10 ft.

Elevation (ft)	Planimeter (sq.in.)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	* Volume (acre-ft)	Volume Sum (acre-ft)
569.78	252.06	0.58	0.00	0.00	0.00
570.00	284.29	0.65	1.85	0.14	0.14
571.00	339.85	0.78	2.15	0.72	0.85
572.00	414.74	0.95	2.59	0.86	1.72
573.00	477.48	1.10	3.07	1.02	2.74
574.00	542.24	1.24	3.51	1.17	3.91
575.00	609.17	1.40	3.96	1.32	5.23
575.28	628.50	1.44	4.26	0.40	5.63
576.00	678.16	1.56	4.50	1.08	6.71
577.00	749.20	1.72	4.91	1.64	8.34
578.00	825.93	1.90	5.42	1.81	10.1[illegible]
578.34	855.10	1.96	5.79	0.66	10.81

IA = (sq.rt(Area1) + ((Ei-E1)/(E2-E1))*(sq.rt(Area2)-sq.rt(Area1)))^2

where: E1, E2 = Closest two elevations with planimeter data
Ei = Elevation at which to interpolate area
Area1,Area2 = Areas computed for E1, E2, respectively
IA = Interpolated area for Ei

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

POND-2 Version: 5.17 S/N:
EXECUTED: 03-06-1998 17:11:33

```
*****************************************
*                                       *
*            SEDIMENT BASIN 1           *
*              OSDF PHASE I             *
*  Includes OSDF Cell, A1PII, & OSDF PH I *
*              Borrow Area              *
*                                       *
*****************************************
```

1728

Inflow Hydrograph: c:\po175\BA1-10 .HYD
Rating Table file: c:\po175\BA1 .PND

10-YEAR

----INITIAL CONDITIONS----
Elevation = 575.28 ft
Outflow = 0.00 cfs
Storage = 5.63 ac-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
569.78	0.0	0.000
570.00	0.0	0.140
571.00	0.0	0.850
572.00	0.0	1.720
573.00	0.0	2.740
574.00	0.0	3.910
575.00	0.0	5.230
575.28	0.0	5.630
576.00	48.0	6.710
577.00	159.0	8.340
578.00	200.0	10.150
578.34	212.0	10.810

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
33.9	33.9
205.7	205.7
416.2	416.2
663.1	663.1
946.2	946.2
1265.7	1265.7
1362.5	1362.5
1623.8	1671.8
2018.3	2177.3
2456.3	2656.3
2616.0	2828.0

Time increment (t) = 0.100 hrs.

POND-2 Version: 5.17 S/N:
EXECUTED: 03-06-1998 17:11:33

Pond File: c:\po175\BA1 .PND
Inflow Hydrograph: c:\po175\BA1-10 .HYD
Outflow Hydrograph: c:\po175\BA1 .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
11.000	6.00	-----	1362.5	1362.5	0.00	575.28
11.100	6.00	12.0	1370.7	1374.5	1.86	575.31
11.200	7.00	13.0	1377.1	1383.7	3.30	575.33
11.300	7.00	14.0	1382.2	1391.1	4.45	575.35
11.400	8.00	15.0	1386.4	1397.2	5.40	575.36
11.500	9.00	17.0	1390.7	1403.4	6.36	575.38
11.600	10.00	19.0	1395.1	1409.7	7.33	575.39
11.700	12.00	22.0	1400.1	1417.1	8.47	575.41
11.800	14.00	26.0	1406.4	1426.1	9.88	575.43
11.900	16.00	30.0	1413.4	1436.4	11.47	575.45
12.000	24.00	40.0	1425.2	1453.4	14.11	575.49
12.100	41.00	65.0	1450.6	1490.2	19.82	575.58
12.200	73.00	114.0	1501.8	1564.6	31.36	575.75
12.300	114.00	187.0	1585.4	1688.8	51.74	576.03
12.400	145.00	259.0	1672.6	1844.4	85.89	576.34
12.500	158.00	303.0	1746.2	1975.6	114.71	576.60
12.600	151.00	309.0	1790.8	2055.2	132.18	576.76
12.700	131.00	282.0	1800.7	2072.8	136.06	576.79
12.800	112.00	243.0	1784.4	2043.7	129.66	576.74
12.900	93.00	205.0	1753.9	1989.4	117.73	576.63
13.000	74.00	167.0	1715.5	1920.9	102.70	576.49
13.100	62.00	136.0	1676.6	1851.5	87.46	576.36
13.200	51.00	113.0	1641.9	1789.6	73.86	576.23
13.300	44.00	95.0	1612.3	1736.9	62.28	576.13
13.400	37.00	81.0	1587.9	1693.3	52.72	576.04
13.500	33.00	70.0	1566.2	1657.9	45.83	575.97
13.600	29.00	62.0	1545.7	1628.2	41.23	575.90
13.700	26.00	55.0	1526.8	1600.7	36.97	575.83
13.800	24.00	50.0	1510.3	1576.8	33.26	575.78
13.900	22.00	46.0	1496.1	1556.3	30.07	575.73
14.000	21.00	43.0	1484.3	1539.1	27.41	575.69
14.100	20.00	41.0	1474.8	1525.3	25.27	575.66
14.200	18.00	38.0	1466.1	1512.8	23.32	575.63
14.300	17.00	35.0	1458.1	1501.1	21.52	575.60
14.400	16.00	33.0	1451.2	1491.1	19.96	575.58
14.500	16.00	32.0	1445.7	1483.2	18.73	575.56
14.600	15.00	31.0	1441.3	1476.7	17.73	575.55
14.700	14.00	29.0	1436.8	1470.3	16.73	575.53
14.800	14.00	28.0	1433.0	1464.8	15.88	575.52
14.900	13.00	27.0	1429.8	1460.0	15.14	575.51
15.000	12.00	25.0	1426.1	1454.8	14.32	575.49
15.100	12.00	24.0	1422.9	1450.1	13.60	575.48
15.200	12.00	24.0	1420.7	1446.9	13.10	575.48
15.300	11.00	23.0	1418.5	1443.7	12.61	575.47
15.400	11.00	22.0	1416.3	1440.5	12.11	575.46

POND-2 Version: 5.17 S/N:
EXECUTED: 03-06-1998 17:11:33

1728

[redacted] File: c:\po175\BA1 .PND
[redacted]low Hydrograph: c:\po175\BA1-10 .HYD
Outflow Hydrograph: c:\po175\BA1 .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
15.500	11.00	22.0	1414.8	1438.3	11.76	575.46
15.600	11.00	22.0	1413.7	1436.8	11.53	575.45
15.700	11.00	22.0	1413.0	1435.7	11.36	575.45
15.800	10.00	21.0	1411.8	1434.0	11.10	575.45
15.900	10.00	20.0	1410.3	1431.8	10.76	575.44
16.000	10.00	20.0	1409.2	1430.3	10.52	575.44
16.100	10.00	20.0	1408.5	1429.2	10.36	575.44
16.200	10.00	20.0	1408.0	1428.5	10.25	575.43
16.300	9.00	19.0	1407.0	1427.0	10.02	575.43
16.400	9.00	18.0	1405.6	1425.0	9.70	575.43
16.500	9.00	18.0	1404.6	1423.6	9.48	575.42
16.600	9.00	18.0	1403.9	1422.6	9.33	575.42
16.700	9.00	18.0	1403.5	1421.9	9.23	575.42
16.800	8.00	17.0	1402.5	1420.5	9.00	575.42
16.900	8.00	16.0	1401.1	1418.5	8.69	575.41
17.000	8.00	16.0	1400.1	1417.1	8.48	575.41
[redacted]100	8.00	16.0	1399.5	1416.1	8.33	575.40
[redacted]200	8.00	16.0	1399.0	1415.5	8.23	575.40
17.300	7.00	15.0	1398.0	1414.0	8.00	575.40
17.400	7.00	14.0	1396.6	1412.0	7.69	575.40
17.500	7.00	14.0	1395.7	1410.6	7.48	575.39
17.600	7.00	14.0	1395.0	1409.7	7.33	575.39
17.700	7.00	14.0	1394.6	1409.0	7.23	575.39
17.800	7.00	14.0	1394.3	1408.6	7.16	575.39
17.900	7.00	14.0	1394.1	1408.3	7.11	575.39
18.000	7.00	14.0	1393.9	1408.1	7.07	575.39
18.100	7.00	14.0	1393.8	1407.9	7.05	575.39
18.200	7.00	14.0	1393.7	1407.8	7.04	575.39
18.300	7.00	14.0	1393.7	1407.7	7.02	575.39
18.400	7.00	14.0	1393.6	1407.7	7.02	575.39
18.500	7.00	14.0	1393.6	1407.6	7.01	575.39
18.600	7.00	14.0	1393.6	1407.6	7.01	575.39
18.700	7.00	14.0	1393.6	1407.6	7.01	575.39
18.800	7.00	14.0	1393.6	1407.6	7.00	575.39
18.900	7.00	14.0	1393.6	1407.6	7.00	575.39
19.000	7.00	14.0	1393.6	1407.6	7.00	575.39
19.100	7.00	14.0	1393.6	1407.6	7.00	575.39
19.200	7.00	14.0	1393.6	1407.6	7.00	575.39
19.300	6.00	13.0	1392.9	1406.6	6.85	575.38
19.400	6.00	12.0	1391.7	1404.9	6.58	575.38
19.500	6.00	12.0	1390.9	1403.7	6.40	575.38
19.600	6.00	12.0	1390.4	1402.9	6.28	575.37
[redacted]700	6.00	12.0	1390.0	1402.4	6.19	575.37
[redacted]00	5.00	11.0	1389.0	1401.0	5.98	575.37
19.900	5.00	10.0	1387.7	1399.0	5.67	575.37
20.000	5.00	10.0	1386.8	1397.7	5.46	575.36

POND-2 Version: 5.17 S/N:
EXECUTED: 03-06-1998 17:11:33

Pond File: c:\po175\BA1 .PND
Inflow Hydrograph: c:\po175\BA1-10 .HYD
Outflow Hydrograph: c:\po175\BA1 .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
20.100	5.00	10.0	1386.1	1396.8	5.32	575.36
20.200	5.00	10.0	1385.7	1396.1	5.22	575.36
20.300	5.00	10.0	1385.4	1395.7	5.15	575.36
20.400	5.00	10.0	1385.2	1395.4	5.11	575.36
20.500	5.00	10.0	1385.0	1395.2	5.07	575.36
20.600	5.00	10.0	1384.9	1395.0	5.05	575.36
20.700	5.00	10.0	1384.8	1394.9	5.03	575.36
20.800	5.00	10.0	1384.8	1394.8	5.02	575.36
20.900	5.00	10.0	1384.8	1394.8	5.02	575.36
21.000	5.00	10.0	1384.7	1394.8	5.01	575.36
21.100	5.00	10.0	1384.7	1394.7	5.01	575.36
21.200	5.00	10.0	1384.7	1394.7	5.01	575.36
21.300	5.00	10.0	1384.7	1394.7	5.00	575.36
21.400	5.00	10.0	1384.7	1394.7	5.00	575.36
21.500	5.00	10.0	1384.7	1394.7	5.00	575.36
21.600	5.00	10.0	1384.7	1394.7	5.00	575.36
21.700	5.00	10.0	1384.7	1394.7	5.00	575.36
21.800	5.00	10.0	1384.7	1394.7	5.00	575.36
21.900	5.00	10.0	1384.7	1394.7	5.00	575.36
22.000	5.00	10.0	1384.7	1394.7	5.00	575.36
22.100	5.00	10.0	1384.7	1394.7	5.00	575.36
22.200	5.00	10.0	1384.7	1394.7	5.00	575.36
22.300	5.00	10.0	1384.7	1394.7	5.00	575.36
22.400	4.00	9.0	1384.0	1393.7	4.84	575.35
22.500	4.00	8.0	1382.8	1392.0	4.58	575.35
22.600	4.00	8.0	1382.0	1390.8	4.40	575.35
22.700	4.00	8.0	1381.5	1390.0	4.28	575.34
22.800	4.00	8.0	1381.1	1389.5	4.19	575.34
22.900	4.00	8.0	1380.8	1389.1	4.13	575.34
23.000	4.00	8.0	1380.6	1388.8	4.09	575.34
23.100	4.00	8.0	1380.5	1388.6	4.06	575.34
23.200	4.00	8.0	1380.4	1388.5	4.04	575.34
23.300	3.00	7.0	1379.7	1387.4	3.87	575.34
23.400	3.00	6.0	1378.5	1385.7	3.60	575.33
23.500	3.00	6.0	1377.6	1384.5	3.42	575.33
23.600	3.00	6.0	1377.1	1383.6	3.29	575.33
23.700	3.00	6.0	1376.7	1383.1	3.20	575.33
23.800	3.00	6.0	1376.4	1382.7	3.14	575.33
23.900	3.00	6.0	1376.2	1382.4	3.09	575.33
24.000	2.00	5.0	1375.4	1381.2	2.91	575.32
24.100	2.00	4.0	1374.1	1379.4	2.63	575.32
24.200	2.00	4.0	1373.3	1378.1	2.43	575.32
24.300	2.00	4.0	1372.7	1377.3	2.30	575.31
24.400	2.00	4.0	1372.3	1376.7	2.21	575.31
24.500	2.00	4.0	1372.0	1376.3	2.14	575.31
24.600	2.00	4.0	1371.8	1376.0	2.10	575.31

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[redacted] File: c:\po175\BA1 .PND
[redacted]ow Hydrograph: c:\po175\BA1-10 .HYD
Outflow Hydrograph: c:\po175\BA1 .HYD

INFLOW HYDROGRAPH

TIME (hrs)	INFLOW (cfs)
24.700	2.00
24.800	2.00
24.900	1.00
25.000	1.00
25.100	1.00
25.200	1.00
25.300	1.00
25.400	1.00
25.500	1.00
25.600	0.00
25.700	0.00
25.800	0.00
25.900	0.00

ROUTING COMPUTATIONS

I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
4.0	1371.7	1375.8	2.07	575.31
4.0	1371.6	1375.7	2.05	575.31
3.0	1370.8	1374.6	1.88	575.31
2.0	1369.6	1372.8	1.60	575.30
2.0	1368.8	1371.6	1.42	575.30
2.0	1368.2	1370.8	1.29	575.30
2.0	1367.8	1370.2	1.20	575.30
2.0	1367.5	1369.8	1.14	575.30
2.0	1367.3	1369.5	1.09	575.30
1.0	1366.5	1368.3	0.91	575.29
0.0	1365.2	1366.5	0.63	575.29
0.0	1364.4	1365.2	0.43	575.29
0.0	1363.8	1364.4	0.30	575.28

POND-2 Version: 5.17 S/N:
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********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: c:\po175\BA1 .PND
Inflow Hydrograph: c:\po175\BA1-10 .HYD
Outflow Hydrograph: c:\po175\BA1 .HYD

Starting Pond W.S. Elevation = 575.28 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow = 158.00 cfs
Peak Outflow = 136.06 cfs
Peak Elevation = 576.79 ft

***** Summary of Approximate Peak Storage *****

Initial Storage = 5.63 ac-ft
Peak Storage From Storm = 2.37 ac-ft

Total Storage in Pond = 8.00 ac-ft

Warning: Inflow hydrograph truncated on left side.

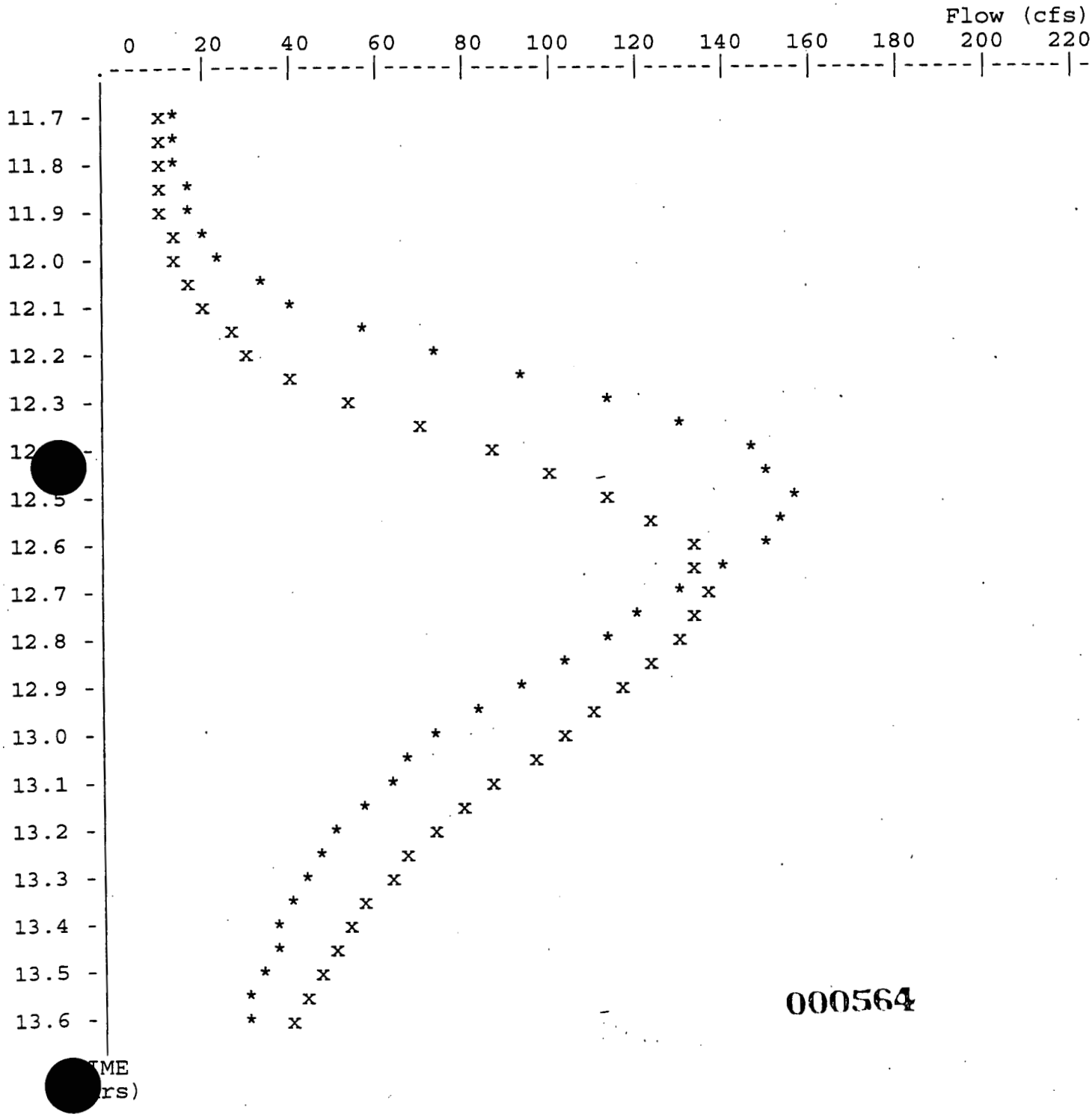
E-1728

POND-2 Version: 5.17 S/N:

Pond File: c:\po175\BA1 .PND
Inflow Hydrograph: c:\po175\BA1-10 .HYD
Outflow Hydrograph: c:\po175\BA1 .HYD

EXECUTED: 03-06-1998
17:11:33

Peak Inflow = 158.00 cfs
Peak Outflow = 136.06 cfs
Peak Elevation = 576.79 ft



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* File: c:\po175\BA1-10 .HYD Qmax = 158.0 cfs
x File: c:\po175\BA1 .HYD Qmax = 136.1 cfs

Attachment F - SEDIMENT TRAP 1

DRAINAGE AREA:

- From DA Map, the area is 0.67 acres

CRITERIA:

The required volume of storage is based on the requirements of the ODNR *Rainwater and Land Development* manual. The requirements for sediment traps are as follows:

- Minimum volume of sediment basin equals 67 cubic yard per arcre of drainage area
- Maximum height must not exceed 5 feet
- Spillway width 4 feet
- Cleanout depth is 40% of the volume which ODNR assumes to be no greater than one-half the depth
- Maximum side slope is 2:1

SUMMARY:

The storage volumes are as follows:

- Minimum volume required 1,212 cf
- Volume provided 1,519 cf

F2

Sediment Trap
Storage Volume

Outfall Trap							
Elev	Area	Ave.	Ht.	Volume	Cum. Vol.	Cum. Vol. Above CO	
	ft^2	Area	ft	ft^3	ft^3	ft^3	ac.ft
563	100						
		270.5	1.0	270.5	270.5		
564	441						
		704.5	1.0	704.5	975.0		
565	968						
		1,088.5	0.50	544.3	1,519.3		
565.5	1,209						

NOTE:

1 Drainage area 0.67 ac.

2 Minimum storage vol 45 cy
1212 cf

3 Volume calculated is based on average end area method.

4 Cleanout, CO, elevation is 1/2 design depth per ODNR.

SOILS MAP

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HAMILTON COUNTY, OHIO

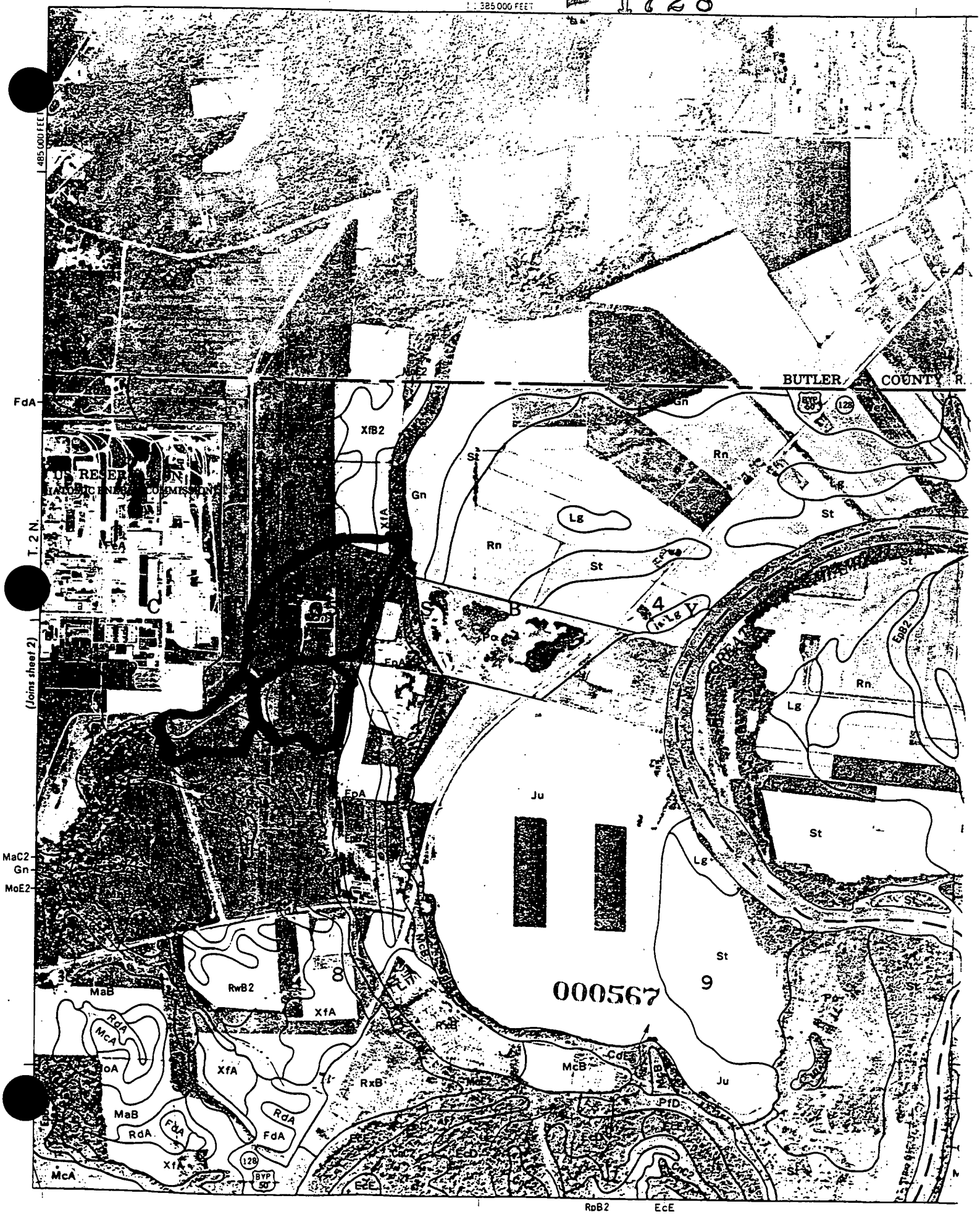

TABLE 18.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
ArA, ArB2, ArC2---Ava	C	None---------	---	---	2.0-4.0	Perched	Mar-Jun	>60	---	High-----	Moderate	High.
AsB*, AsC*:												
Ava----------	C	None---------	---	---	2.0-4.0	Perched	Mar-Jun	>60	---	High-----	Moderate	High.
Urban land.												
AvA---------- Avonburg	D	None---------	---	---	1.0-3.0	Perched	Jan-Apr	>60	---	High-----	High-----	High.
AwA*:												
Avonburg---------	D	None---------	---	---	1.0-3.0	Perched	Jan-Apr	>60	---	High-----	High-----	High.
Urban land.												
BoD, BoE, BoF----- Bonnell	C	None---------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
CcC2, CdD, CdE, CdF---------- Casco	B	None---------	---	---	>6.0	---	---	>60	---	Low------	Low------	Low.
CnB2, CnC2-------- Cincinnati	C	None---------	---	---	>4.0	Perched	Jan-Apr	>60	---	High-----	Moderate	High.
DaB---------- Dana	B	None---------	---	---	3.0-6.0	Perched	Mar-Apr	>60	---	High-----	Moderate	Moderate.
EcB2, EcC2, EcD, EcE, EdF--------- Eden	C	None---------	---	---	>6.0	---	---	20-40	Soft	High-----	Moderate	Low.
EeB*, EeC*, EeD*:												
Eden----------	C	None---------	---	---	>6.0	---	---	20-40	Soft	High-----	Moderate	Low.
Urban land.												
EpA, EpB2, EpC2--- Eldean	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
ErA*, ErB*:												
Eldean----------	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
Urban land.												
FdA---------- Fincastle	C	None---------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Moderate.

See footnotes at end of table.

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TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
XfA, XfB2--------- Xenia	B	None--------	---	---	2.0-6.0	Apparent	Mar-Apr	>60	---	High-----	High-----	Moderate.

* See description of the map unit for composition and behavior characteristics of the map unit.
** The plus sign preceding the range in depth to the water table means that the range in this soil is from .5 foot above the surface to 2.0 feet below.

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SEDIMENT BASIN 1
OUTLET CONTROL

AIPII Sedime

WEIR		ORIFICE		PIPE	
D_R (in.) =	48	D_R (in.) =	48	D (in.) =	48
INVERT=	575.28	INVERT=	575.28	INVERT IN=	569.8
C =	9.739	C=	3.782	INV. OUT=	569
				LENGTH=	200
				AREA(sf)=	=(3.14*(G3/12)^2)/4
				H_o =	=G5+(G3/2)/12
				g =	32.2
				KM =	1
				KP =	=(5087*G12^2)/G3^(4/3)
				n =	0.024

WSE	H	Q_W	H	Q_O	H	Q_P	Q_{MIN}	2 X Q_{MIN}
	ft	cfs	ft	cfs	ft	cfs	cfs	cfs
569	N/A	0	=B16	0	=D16	0	=MIN(C16,E16,G16)	=(H16*2)
570	N/A	0	=B18	0	=D18	0	=MIN(C18,E18,G18)	=(H18*2)
571	N/A	0	=B20	0	=D20	0	=MIN(C20,E20,G20)	=(H20*2)
572	N/A	0	=B22	0	=D22	0	=MIN(C22,E22,G22)	=(H22*2)
573	N/A	0	=B24	0	=D24	0	=MIN(C24,E24,G24)	=(H24*2)
574	N/A	0	=B26	0	N/A	0	=MIN(C26,E26,G26)	=(H26*2)
575	N/A	0	=B28	0	N/A	0	=MIN(C28,E28,G28)	=(H28*2)
576	=A30-$C$4	=($C$5)*($C$3/12)*B30^1.5	=$A30-$E$4	=($E$5)*(($E$3/12)^2)*D30^0.5	=A30-$G$8	=($G$7)*((2*$G$9*F30)/(1+$G$10+($G$11*$G$6)))^0.5	=MIN(C30,E30,G30)	=(H30*2)
577	=A32-$C$4	=($C$5)*($C$3/12)*B32^1.5	=$A32-$E$4	=($E$5)*(($E$3/12)^2)*D32^0.5	=(A32-G8)	=($G$7)*((2*$G$9*F32)/(1+$G$10+($G$11*$G$6)))^0.5	=MIN(C32,E32,G32)	=(H32*2)
578	=A34-$C$4	=($C$5)*($C$3/12)*B34^1.5	=$A34-$E$4	=($E$5)*(($E$3/12)^2)*D34^0.5	=(A34-G8)	=($G$7)*((2*$G$9*F34)/(1+$G$10+($G$11*$G$6)))^0.5	=MIN(C34,E34,G34)	=(H34*2)
578.34	=A36-$C$4	=($C$5)*($C$3/12)*B36^1.5	=$A36-$E$4	=($E$5)*(($E$3/12)^2)*D36^0.5	=(A36-G8)	=($G$7)*((2*$G$9*F36)/(1+$G$10+($G$11*$G$6)))^0.5	=MIN(C36,E36,G36)	=(H36*2)

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SEDIMENT BASIN 1
STORAGE VOLUME

1728

	A	B	C	D	E	F	G	H
1	A1PII Sediment Basi							
2	Elev	Area	Ave.	Ht.	Volume	Cum. Vol.	Cum. Vol. Above CO	
3		ft^2	Area	ft	ft^3	ft^3	ft^3	ac.ft
4	567	12728						
5			=(B4+B6)/2	=A6-A4	=C5*D5	=E5		
6	568	16943						
7			=(B6+B8)/2	=A8-A6	=C7*D7	=E7+F5		
8	569	21462						
9			=(B8+B10)/2	=A10-A8	=C9*D9	=E9+F7		
10	569.78	25206					CO	
11			=(B8+B12)/2	=A12-A10	=C11*D11	=E11+F9	=E11	=G11/43560
12	570	28429						
13			=(B12+B14)/2	=A14-A12	=C13*D13	=E13+F11	=G11+E13	=G13/43560
14	571	33985						
15			=(B14+B16)/2	=A16-A14	=C15*D15	=E15+F13	=G13+E15	=G15/43560
16	572	41474						
17			=(B16+B18)/2	=A18-A16	=C17*D17	=E17+F15	=G15+E17	=G17/43560
18	573	47748						
19			=(B18+B20)/2	=A20-A18	=C19*D19	=E19+F17	=G17+E19	=G19/43560
20	574	54224						
21			=(B20+B22)/2	=A22-A20	=C21*D21	=E21+F19	=G19+E21	=G21/43560
22	575	60917						
23			=(B22+B24)/2	=A24-A22	=C23*D23	=E23+F21	=G21+E23	=G23/43560
24	575.28	62850						
25			=(B22+B26)/2	=A26-A22	=C25*D25	=E25+F21	=G21+E25	=G25/43560
26	576	67816						
27			=(B26+B28)/2	=A28-A26	=C27*D27	=E27+F25	=G25+E27	=G27/43560
28	577	74920						
29			=(B28+B30)/2	=A30-A28	=C29*D29	=E29+F27	=G27+E29	=G29/43560
30	578	82593						
31			=(B30+B32)/2	=A32-A30	=C31*D31	=E31+F29	=G29+E31	=G31/43560
32	578.34	85510						
33								
34	NOTE:							
35	1	Contours set for 48" ri						
36								
37	2	Minimum storage vol		=[SEDBASIN.XLS]A	cf			
38								
39			572	=F15	cf			
40			min storage elev	=D37	cf @ 67cy/ac			
41			573	=F17				
42				=D40-D39	=D42/D43			
43				=D41-D39				
44								
45			min storage elev =	=C39+E42				
46								
47		min storage elev - inv		=D45-569.78	ft.			
48								

000571

Se[illegible] Trap
Stora[illegible]umes
(Formulas)

	A	B	C	D	E	F	G	H
1	Outfall Trap							
2	Elev	Area	Ave.	Ht.	Volume	Cum. Vol.	Cum. Vol. Above CO	
3		ft^2	Area	ft	ft^3	ft^3	ft^3	ac.ft
4								
5								
6	563	100						
7			=(B6+B8)/2	=A8-A6	=C7*D7	=E7+F5		
8	564	441						
9			=(B8+B10)/2	=A10-A8	=C9*D9	=E9+F7		
10	565	968						
11			=(B10+B12)/2	=A12-A10	=C11*D11	=E11+F9		
12	565.5	1209						
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
31								
32								
33								
34	NOTE:							
35	1	Drainage area		0.67	ac.			
36								
37	2	Minimum storage vol		=$D$35*67	cy			
38				=$D$37*27	cf			
39								
40								
41	3	Volume calculated is bas						
42								
43	4	Cleanout, CO, elevation is						
44								

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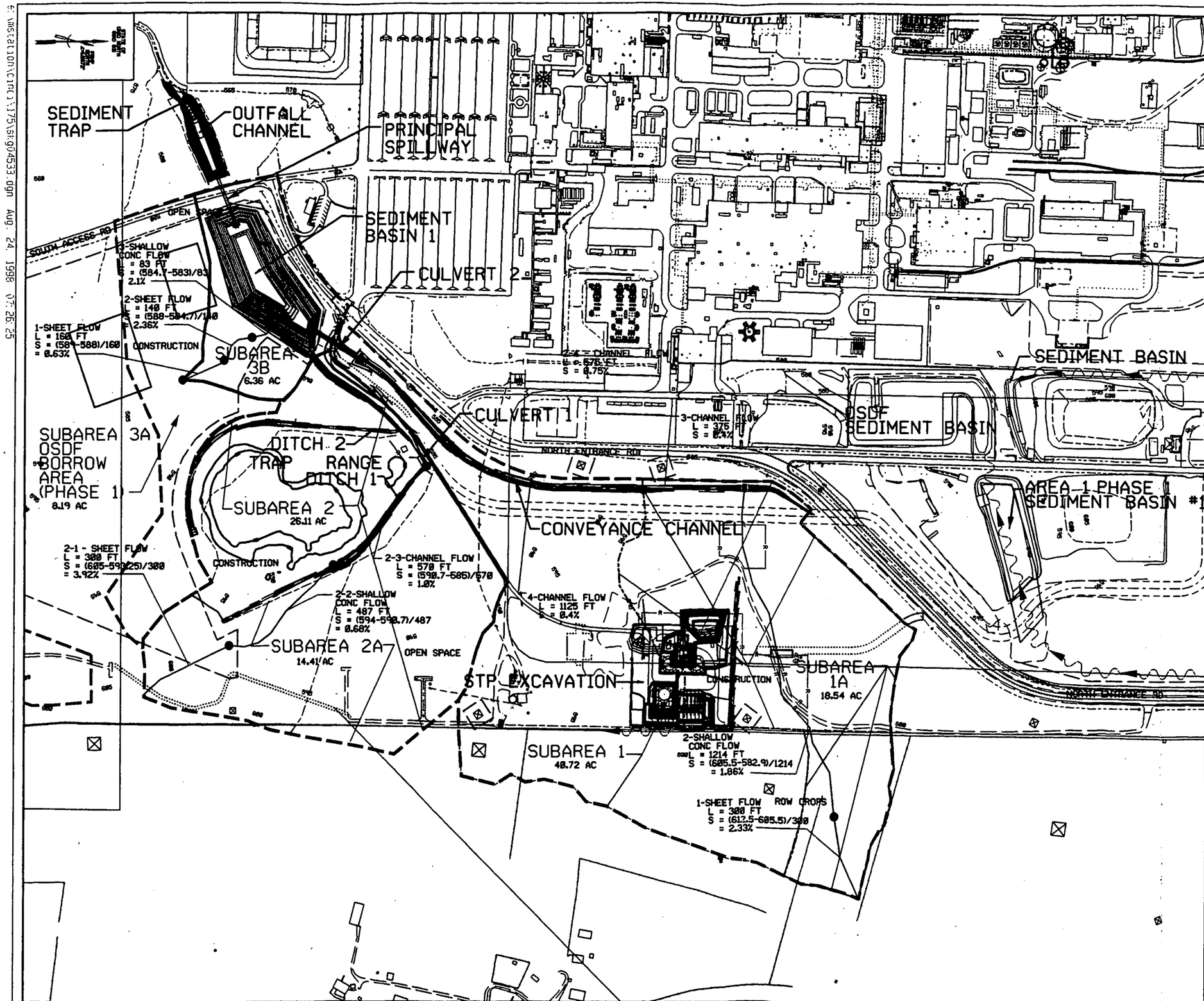
APPENDIX B

DRAINAGE AREA MAP



DRAINAGE AREA MAP

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APPENDIX C

DIRECT PRECIPITATION INTO STP EXCAVATION

PARSONS

ENGINEERING CALCULATIONS TITLE AND SUMMARY SHEET

1728

Date 8/26/98

Sheet 1 of 4

Proj. Order No. TOP-012 Calculation No. 15-13

Project Title AIPII

Calculation Subject DIRECT PRECIPITATION INTO STP DEEP EXCAVATION Date Verified/Checked Frank Parker 8/26/98

STATUS: PRELIMINARY _____ FINAL X SUPERSEDED _____ VOID _____

STATEMENT OF PROBLEM

1) Determine amount of precipitation which falls into STP deep excavation area during 2-yr, 24-hr, 10-yr, 24-hr, and 25-yr, 24-hr precipitation events.

SUMMARY OF CONCLUSIONS

r, 24-hr event = 268,727 gallons
-yr, 24-hr event = 367,268 gallons
25-yr, 24-hr event = 421,004 gallons

Originator's Signature and Date: 8/26/98

CHECKING METHOD

1. Review _____
2. Alternate Calculation _____

Checker's Signature and Date: Frank Parker 8/26/98

Lead Discipline Engineer's Signature and Date

Rev. No.	Sheet No.	Description	Reviser's Signature/Date	Checker's Signature/Date	Approved by Signature/Date
				000576	

05/93

ENG080

PARSONS

ENGINEERING CALCULATIONS BASIS SHEET

Revision No. 0

Proj. Order No. TOP-012 Calculation No. 15-13

Project Title AIPII

Calculation Subject: DIRECT PRECIPITATION INTO STP EXCAVATION AREA Date Verified/Checked Frank Padoy 8/26/98

Prepared By: T. Brown TJB Checked/Verified By:

Date 8/26/98

SUMMARY OF DATA SOURCES - CODES - ASSUMPTIONS

DATA SOURCES

1. PARSONS DWGs. (used to create drainage area maps)
2. U.S. Weather Bureau, *Rainfall Frequency Atlas of the United States*

CODES

N/A

ASSUMPTIONS

1. Calculation assumes that the entire STP excavation area is open and fully developed as shown on the grading plan.
2. Calculation assumes that there is no infiltration into exposed soil.
3. Infiltration of groundwater is assumed to be negligible for 24-hour duration storm and subsequent time required to pump excavation dry.

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PARSONS

CALCULATION SHEET

1728

REV	BY	DATE	CK	DATE	TITLE: DIRECT PRECIPITATION INTO STP DEEP EXCAVATION	
0	TJB	8/26/98		8/26/98		OU - 2
					AUTHOR: T. Brown SHEET: 3 of 4	TOP-012

Surface runon will be held to a minimum through the use of a diversion ditch and berms around the perimeter of the excavation. The only other source of surface water at the STP excavation area will be through direct precipitation. This calculation assumes that the STP Deep Excavation Area is fully developed according to the grading plan. This also assumes that there is no infiltration into the soil. The volume of direct precipitation into the excavation is calculated as follows:

STP Excavation Area: = 143,703 sq.ft. = 3.3 ac

Depth of Rainfall (P) = 3.0 inches
(2-yr., 24-hr. rainfall event)

Depth of Rainfall (P) = 4.1 inches
(10-yr., 24-hr. rainfall event)

Depth of Rainfall (P) = 4.7 inches
(25-yr., 24-hr. rainfall event)

1. (2-yr., 24-hr. rainfall event = 143,703 sq.ft. x 3.0 inches/12 inches per ft.
= 35,926 cu.ft.
= 35,926 cu.ft.x 7.48 gal/cu.ft.
Volume of rainfall into excavation = 268,727 gallons

2. (10-yr., 24-hr. rainfall event = 143,703 sq.ft. x 4.1 inches/12 inches per ft.
= 49,100 cu.ft.
= 49,100 cu.ft.x 7.48 gal/cu.ft.
Volume of rainfall into excavation = 367,268 gallons

3. (25-yr., 24-hr. rainfall event = 143,703 sq.ft. x 4.7 inches/12 inches per ft.
= 56,284 cu.ft.
= 56,284 cu.ft.x 7.48 gal/cu.ft.
Volume of rainfall into excavation = 421,004 gallons

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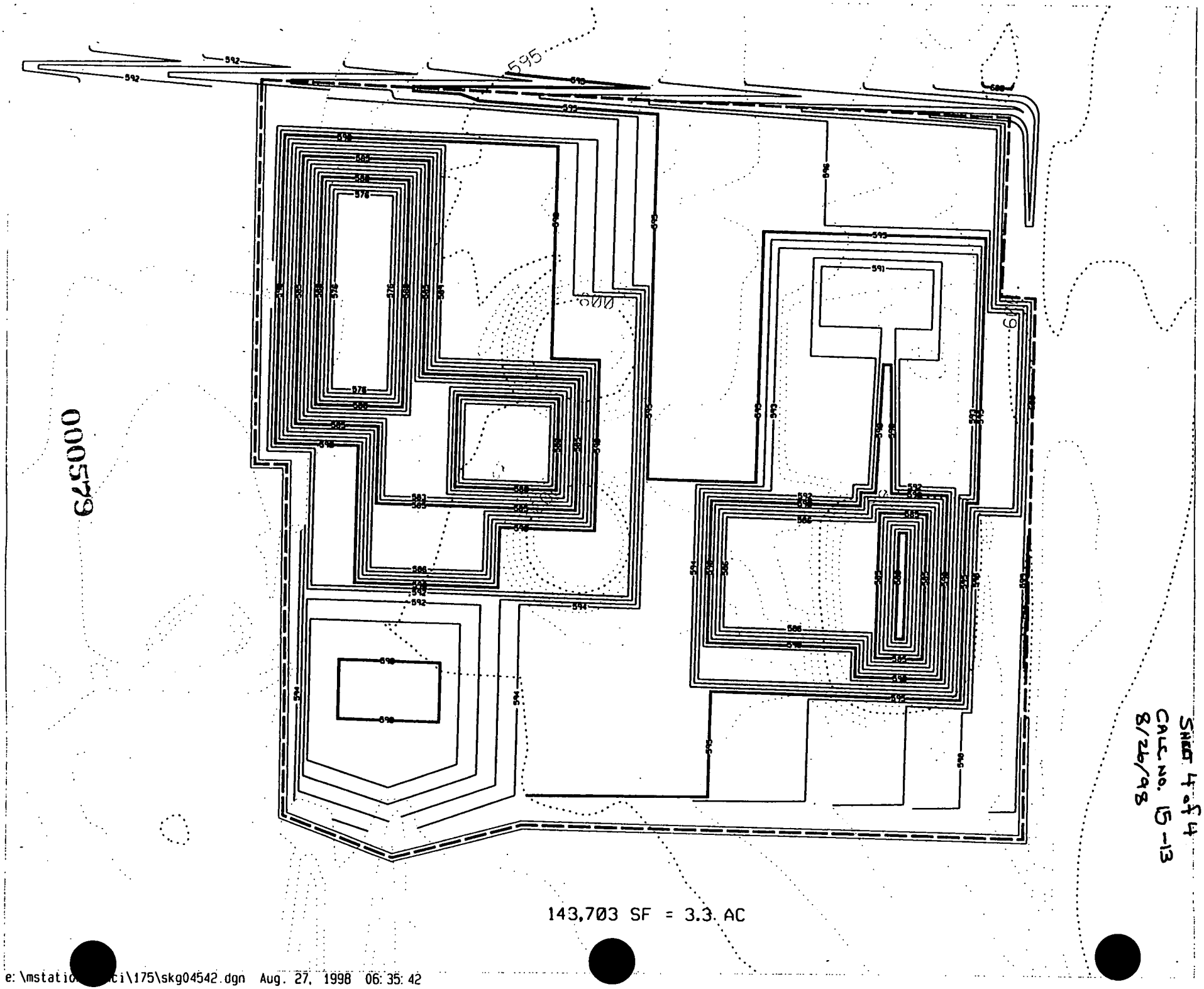

SHEET 4 of 4
CALC No. 15-13
8/24/98

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APPENDIX D

SYSTEMS PLAN

1728

Systems Plan
for
Remediation Area 1, Phase II

FDF Project No: 20712
Document No.: 20712-PL-0003

August 1998
Revision F
Design Review

Environmental Remedial Action Project
Fernald Environmental Management Project
Fernald, Ohio
FDF Subcontract No. 2-21487
Project Order 175 / Task Order P-012

PARSONS

4055 Executive Park Drive
Cincinnati, Ohio 45241

000581

Systems Plan for Groundwater Collection and Transfer
Remediation Area 1, Phase II

CONTENTS

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- 1.1 Purpose of Systems Plan 1

2.0 System Description and Intended Performance 2

3.0 Operation 3
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- 3.2 Pre-Startup 3
- 3.3 Startup (By Contractor) 5
- 3.4 System Procedures 6
- 3.5 Potential Problems 6
- 3.6 Maintenance 7

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4-2 Equipment Maintenance and Calibration Schedule

LIST OF ACRONYMS AND ABBREVIATIONS

ARWWP	Aquifer Restoration Wastewater Project
FDF	Fluor Daniel Fernald, Inc.
FEMP	Fernald Environmental Management Project
HDPE	High Density Polyethylene
kVA	Kilo Volt Amperes
LCS	Leachate Conveyance System
MWI	Maintenance Work Instructions
O&M	Operations and Maintenance
OSDF	On-Site Disposal Facility
PLS	Permanent Lift Station
STP	Sewage Treatment Plant
V	Volts

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1.0 INTRODUCTION

The Fernald Environmental Management Project (FEMP) is a 1,050-acre facility located in southwestern Ohio approximately 18 miles northwest of downtown Cincinnati. The mission of the facility was to provide high-purity uranium metal products to support United States defense programs. Production operations were discontinued in 1989. Subsequently, the Department of Energy decided to decontaminate and dismantle the facility and began environmental remediation of the site.

To facilitate management of the environmental remediation activities, the site was divided into seven sitewide remediation areas. Several of these areas will be remediated in phases. Area 1 is subdivided into two major phases (Phase I and Phase II). Remediation of Area 1, Phase I was completed in March 1997.

Area 1, Phase II, encompasses approximately 153 acres and is located in the southeastern part of the FEMP. It is bordered on the east and south by the FEMP boundary; on the west by the South Access Road, an unnamed stream and former production area; and on the north by Area 1, Phase I, and the On-Site Disposal Facility. The terrain in the project area is rolling pasture. The Sewage Treatment Plant (STP) and Phase I of the North Entrance Road are either partially or completely located in this area. A former trap shooting range is also located in the area. The remediation activities within the Area 1, Phase II project will include: demolition of below grade structures, removal of subsurface utility lines, and excavation at the STP; demolition of concrete pads, and excavation of lead contaminated soils at the former Trap Range Area; surface stripping around the STP excavation area (see Construction Drawings for location); and miscellaneous activities including removal of agricultural drain tiles, and removal of sediments from existing sediment basins used during the Area 1, Phase I remedial activities.

1.1 Purpose of Systems Plan

This systems plan describes the STP Water Handling System and its performance requirements. The selected Contractor will prepare a Systems Implementation Manual that presents the processes, methods, and details to implement their portion of this plan.

2.0 SYSTEM DESCRIPTION AND INTENDED PERFORMANCE

The STP Water Handling System (see construction drawings and specifications for detailed information) consists of the following:

1) STP Excavation Dewatering Transfer Sump Pump (Dewatering Pump): The Dewatering Pump will transfer water from the Excavation Sump to the Leachate Transmission Line from the On-Site Disposal Facility (OSDF) (operated by FDF). Water is transferred into the Excavation Sump by the Contractor using three portable submersible pumps (Contractor's Dewatering Pumps).

2) Remediation Generated Water Transfer Line: Under normal operation, water collected in the Excavation Sump will be pumped via a 3-inch High Density Polyethylene (HDPE) pipeline to the Leachate Transmission Line (Operated by FDF).

The STP Water Handling System will be used to collect, store, analyze, and transfer water collected in the STP area and influent/effluent pipeline excavations.

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3.0 OPERATION

3.1 Description of Equipment

A 480 volt, three-phase, power will be supplied for the required services from a switchgear breaker at substation N18-2, now serving the Dissolved Oxygen Building. The power will be provided via an overhead cable. A tap off that cable will be made to the Dewatering Pump combination starter and local transformer/panel combination, located on a rack at the pole near the Radiation Control Facility. All electrical equipment enclosures are rated type 3R or 4, according to National Electrical Manufacturers Association 250. A 15 kVA, 480-120/240V, single-phase transformer/panel combination will be provided, with a primary 60 amp, 480 volt breaker, three 20 amp branch circuits and seventeen spaces for single pole breakers for future heat tracing, and an 80 amp secondary main breaker (rated 240 volts). These provide 120 volt power for instrumentation, outdoor lighting, and a local duplex receptacle. The Dewatering Pump will be served from this starter via overhead cable to a disconnect switch on the pole at the fence, and then to the pump via interlocked armor cable. Motor overloads in the combination starter will protect the motor.

The Dewatering Pump and the Excavation Pumps are each a portable, submersible, electric motor-driven, centrifugal pump with a cast iron impeller, cast iron housing, carbon steel shaft, and mechanical seals. Automatic level control is provided. Valves are the manually operated type. A run-time meter at the STP and a flow indicating light at both the STP and Leachate Conveyance System (LCS) area are provided for the Dewatering Pump.

Local starters for the Excavation Pumps will be provided, also on the pole at the fence, from a tap to the 480 V aerial line.

A tap to the 480 V aerial line will serve a 480 - 120/208 dry type transformer and the 480 V loads in the Radiological Control Facility. Another tap will be made to a fused disconnect switch for the Contractor's construction trailer.

Submersible power and control cables will be furnished by the Contractor with the submersible pumps. Cable entry seals are designed to be watertight for submersible use.

3.2 Pre-Startup

The Contractor shall install, test and check the system in accordance with the construction drawings and specifications. Before the system is started, the following checks will be performed by Fluor Daniel Fernald, Inc. (FDF).

1) Check the construction acceptance documents to ensure that every component is constructed according to the plans and specifications and acknowledge acceptance.

2) Check the accuracy of the documents for all applicable and relevant functional technical tests (shop or field) for the electrical and mechanical equipment and acknowledge acceptance.

3) Make sure that all relevant site-specific procedural requirements, permits, and coordinations are complete.

Pre-startup tests shall be performed in the following order: (1) electrical and (2) mechanical. The Contractor shall install and electrically test the system to ensure it is functional prior to turn over to Aquifer Restoration Wastewater Project (ARWWP) Operations.

3.2.1 Electrical Pre-Startup Tests and Inspections

1) Close main 480 Volt circuit breaker no. 2 at Unit Substation N18-2.

2) Check voltage at the main Dewatering Pump Control Panel, the Contractor Dewatering Starters, and the Mini-Power Zone panel main circuit breakers. Voltage should measure a minimum of 475 volts between phases.

   For each starter:

   a) Visually inspect the interior of the starter for completion of installation, including fuses, control power transformer, lights, run-time meter, and switch. Verify installation of motor overload heaters sized in accordance with the pump manufacturer's instructions.
   b) Throw the circuit breaker to the "ON" position to supply power to the starter.
   c) Switch on the distribution panel main circuit breaker, secondary main breaker, and branch circuit breakers for the instrumentation, lighting, and receptacle. Verify 120 volts available at receptacle, with correct polarity and grounding. Verify operation of Ground Fault Circuit Interrupter circuit breaker.
   d) Open the main circuit breakers at the completion of the electrical pre-startup test.

3.2.2 Mechanical Pre-Startup Tests and Inspections

1) Visually inspect the mechanical installation and equipment, noting completion of construction.

2) Open manual discharge valves V100 and V102.

3) Make sure that the PMP-1 discharge hose is connected to the steel pipe and ensure that pumps, PMP-2, 3 and 4, have discharge hoses connected and routed to an appropriate discharge point.

4) Ensure HDPE pipe is secured and discharges into existing LCS Permanent Lift Station (PLS).

3.3 Startup

The following are the steps needed for startup of the STP Water Handling System. The steps should be followed in the order listed. The following procedures are written for pump PMP-1. Start-up for pumps PMP-2, 3, and 4 should be performed in a similar manner, except that discharge flow will not be to the LCS.

3.3.1 Electrical (By Contractor)

The FDF lockout/tagout procedures shall be followed during the testing phases of construction to safeguard personnel from electrical hazards. Construction acceptance testing shall be witnessed and documented by the FDF Quality Assurance/Quality Control Department.

NOTE: To prevent operation of the pumps during the following tests 1 through 3, temporarily disconnect power leads to the pump motors at the contactor terminals, remove overload heaters, or open local disconnect switch.

1) Throw the starter and lighting panel circuit breaker to the "ON" position, applying power to the starter and associated control circuits. Verify that the correct voltage is present.

2) Place the selector switch to "HAND" (momentary). Verify that the main contactor energizes.

3) Disconnect the power by opening the circuit breakers, check for voltage on the load side of breaker; if no voltage then reinstall the motor wiring or heater elements for normal operation of the pumps. If voltage is present, open circuit breaker at N18-2 unit substation and replace circuit breaker.

4) Turn the system over to FDF (ARWWP Operations) for performance of the remaining start-up steps.

3.3.2 Mechanical/Instrumentation (By FDF)

1) Fill portion of the STP Excavation Sump with clean water.

2) Place the selector switch to "HAND" (momentary) and observe the following:
   (1) Check the pump for normal operation.
   (2) Check for leakage.
   (3) Check for green "RUNNING" indicating light on the Dewatering Pump control panel and at the LCS PLS pump control panel.

3) Release the selector switch to "OFF" if any unusual conditions are observed. Correct any problem encountered before proceeding further with the startup.

4) Place the selector switch to "AUTO". Continue filling the Excavation Sump until the level switch actuates and starts the pump. Ensure that level switch actuates at the proper setting. Also ensure that the flow switch actuates, indicated by the flow indicating light at the local control panel and the LCS PLS pump control panel.

5) Visually verify flow to the LCS PLS.

6) Continue monitoring the level in the sump. Ensure that the pump stops at the proper low level setting and the flow indicating light goes off.

7) Working with the Contractor, perform acceptance operating test to demonstrate the ability of the pump to meet operating point as shown on pump curve.

3.3.3 Shutdown (By FDF)

At the successful completion of the above tests and checks, place the selector switch to "OFF".

3.4 System Procedures

During remediation, the Dewatering Pump and the Excavation Pumps start and stop automatically. Operation of the pumps is indicated by a green "run" indicating light at its respective local starter, and at the LCS PLS for the Dewatering Pump only. Operating procedures for the Dewatering Pump, for the Excavation Pumps, and for the system are the responsibility of ARWWP Operations.

Operation of the pressure washer should be by a qualified person in accordance with the manufacturer's operation manual.

3.5 Potential Problems

1) Description and Remedy:
Caution: Comply with current FDF lockout/tagout procedures before attempting a remedy.

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Problem	Result	Remedy
Pump fails to start	No Flow	1) Refer to vendor Operations and Maintenance (O&M) Manual. 2) Check if 480 volt power is energized. 3) Check operation of level switch. 4) Check for tripped overload relay. 5) Check continuity of motor internal protection circuits (repair motor).
Pump fails to stop	Pump runs dry	1) Refer to vendor O&M Manual. 2) Check operation of level switch. 3) Check/repair contactor for welded contacts.
Pipeline plugs	1) No flow	1) Determine where plug is located. Drain water to a tank truck and transport for treatment.
	2) Pump deadheads	2) Clean out pipeline.
Flow Light fails to operate with pump running (Dewatering Pump only)	Unable to verify system flow	1) Push-to-test lamp to see if bulb is blown. 2) Check to see if 120 volt power is at light. 3) Refer to vendor O&M Manual for flow switch. 4) Check operation of flow switch.

3.6 Maintenance

1) Valve: Follow procedures given in current applicable maintenance work instructions.
2) Pump: Refer to pump vendor O&M manuals and current applicable maintenance work instructions.
3) Drain the system prior to freezing weather conditions.
4) Perform the maintenance activities described in Table 4-2.

4.0 ACTIVITIES, RECORDS, AND REPORTS

Table 4-1 provides a list of activities, records, and reports associated with the STP Water Handling System, which will be performed and maintained by ARWWP Operations. The frequency of each activity is also included in the table. Further details on maintenance and calibration frequencies associated with system equipment are provided in Table 4-2.

Table 4-1 - Summary of Records and Reports

Report	Frequency
MAINTENANCE AND CALIBRATION	
Pump Inspection Report	Annually
Piping Inspection Report	Annually
Valve System Inspection Report	Annually

Table 4-2 - Equipment Maintenance and Calibration Schedule

Item	Maintenance Schedule
Main Disconnect Switch and Starter	Inspect monthly for moisture
Local Disconnect Switch	Monthly
Flow Switch	Semi-annually
Water Level Switch Calibration	Semi-annually
Pump Motor Run Time Meter	Semi-annually
Motor Starter and Controls	Annually
Pump	Inspect annually per FDF MWI PCP100

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