2772

PROJECT SPECIFIC PLAN FOR THE AREA 2, PHASE I PRECERTIFICATION REAL-TIME SCAN

SOIL AND DISPOSAL FACILITY PROJECT

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

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U.S. DEPARTMENT OF ENERGY
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FOR THE AREA 2, PHASE I
PRECERTIFICATION REAL-TIME SCAN

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2

TABLE OF CONTENTS

2772

2772

LIST OF TABLES

LIST OF FIGURES

4

LIST OF ACRONYMS AND ABBREVIATIONS — 2772

A2PI	Area 2, Phase I
AFP	Active Flyash Pile
ASCOC	area-specific constituent of concern
ASL	analytical support level
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CDL	Certification Design Letter
COC	constituent of concern
CU	certification unit
DQO	Data Quality Objective
ECDC	Engineering/Construction Document Control
FEMP	Fernald Environmental Management Project
FRL	final remediation level
GPS	Global Positioning System
HPGe	high-purity germanium (detector)
IFP	Inactive Flyash Pile
IRDP	Integrated Remedial Design Package
LAN	Local Area Network
mg/kg	milligrams per kilogram
NaI	sodium iodide
OU2	Operable Unit 2
OU5	Operable Unit 5
pCi/g	picoCuries per gram
ppm	parts per million
PSP	Project Specific Plan
QA	Quality Assurance
RMS	Radiation Measurement Systems
RI	Remedial Investigation
RSS	Radiation Scanning System
RTIMP	Real-Time Instrumentation Measurement Program
RTRAK	Radiation Tracking System
SCQ	Sitewide CERCLA Quality Assurance Project Plan
SDFP	Soil and Disposal Facility Project
SED	Sitewide Environmental Database
SEP	Sitewide Excavation Plan
SF	South Field
SSOD	storm sewer outfall ditch
SWU	Southern Waste Unit
TAL	Target Analyte List
V/FCN	Variance/Field Change Notice
WAO	Waste Acceptance Organization

2772

1.0 INTRODUCTION

This project-specific plan (PSP) describes the data collection activities for the precertification of Soil Remediation Area 2, Phase I (A2PI), excluding the Southern Waste Unit (SWU) construction support area, at the Fernald Environmental Management Project (FEMP), as specified in the Sitewide Excavation Plan (SEP). The data collected under this plan will be used to determine preliminary certification units and whether the concentrations of primary radiological constituents of concern (COCs) are low enough to pass certification statistical analysis.

1.1 BACKGROUND

A portion of the southern area of the FEMP site has been identified as A2PI. Figure 1-1 depicts the A2PI boundary, as defined in the A2PI Integrated Remedial Design Package (IRDP). This area includes the SWU footprints of the Inactive Flyash Pile (IFP), Active Flyash Pile (AFP), and South Field (SF). Also included is the non-waste unit areas, which are adjacent areas south and northwest of the IFP/SF and east of the AFP. The footprints of the IFP/AFP/SF are considered part of the Operable Unit 2 (OU2) soils and the non-waste units are considered part of the Operable Unit 5 (OU5) soils (Figure 1-2).

The SWU construction support area is in the northwest portion of A2PI and includes asphalt and gravel parking areas, office trailers, storage containers and a tension support structure. Precertification measurements within this construction support area, the Equipment Wash Facility, including a small section of the haul road west of the Equipment Wash Facility and the entry/exit, and asphalt aprons will be addressed in a separate PSP. As a result, the modified A2PI boundary excludes the construction support and Equipment Wash Facility areas from precertification (Figure 1-2).

In addition, the utility corridor that runs beneath the road, splitting the AFP and SF footprints, will not be considered for precertification in this PSP. The asphalt road overlaying the utilities may be removed as part of the non-waste units remediation. If this occurs, a scan on the underlying soil will be conducted prior to reinstalling a gravel/asphalt road surface to ensure final remediation levels (FRLs) have been achieved. The utility corridor will need additional measurements prior to declaring readiness for certification. These additional precertification measurements will either be reflected in a different PSP or documented in a Variance/Field Change Notice (V/FCN) to this PSP.

Remediation within A2PI began with site preparation work in Fall 1997. Excavation within the IFP footprint began in Summer 1998 and concluded in Summer 1999. Excavation within the AFP footprint began in Fall 1998 and resumed in Fall 1999. Excavation within the SF footprint began in Summer 1999. Remediation of the AFP and SF is expected to be complete in Summer 2000 and will include any additional remediation within the non-waste units.

The excavation and remediation boundaries for the IFP/SF/AFP were established based on process knowledge, OU2 and OU5 Remedial Investigation (RI) data and predesign data. Non-waste unit excavation and remediation boundaries will also be established with these same inputs.

Final remediation boundaries prior to precertification are established based on final grade excavation monitoring real-time measurements. Since portions of A2PI may be ready for precertification at different times, precertification measurements over the area may be staggered over several months. Precertification measurements are expected to begin in Spring 2000 and continue into early Fall 2000.

The current 1999 topography of A2PI within the remediated footprints of the IFP/SF/AFP is depicted in Figure 1-3. Final topography prior to precertification will consist of graded slopes into the floodplain of the northern banks of the storm sewer outfall ditch (SSOD) and Paddys Run stream bed. Along the eastern boundary of the AFP and the western boundary of the IFP, the steep hillsides slope into the SSOD and Paddys Run respectively. The exact topography of the non-waste units during precertification is yet to be determined due to the current, unknown status of potential excavation boundaries. The non-waste unit post-excavation topography will be better defined upon completion of SWU excavation and predesign characterization.

Four well houses currently exist in the A2PI footprint: one northwest of the AFP (well house #15), one south of the AFP (well house #16), one south of Retention Basin 2 (well house #14), and one south of the IFP (well house #13). In addition, an injection/extraction well house is located just south of the AFP and west of Retention Basin 3. As mentioned previously, an asphalt road overlaying a utility corridor traverses through the A2PI area between the SF and AFP. The asphalt road will be removed during remediation, but the utility corridor will remain along with some new overlaying, temporary road surface (gravel, etc). Some of the well houses will remain in place during precertification, thus obstructing any scanning of soil beneath the well house foundations. As a result, the soil in the

underground utility corridor and beneath the aquifer restoration infrastructure footprints are not part of this precertification.

The certification process for A2PI will begin with precertification scanning, as described in this PSP.

1.2 PURPOSE

The objectives of precertification and FRL scanning activities detailed in this PSP are to: 1) provide information to help establish certification unit (CU) boundaries (as defined in the SEP), 2) identify and evaluate any patterns of residual surface soil contamination, and 3) determine if soil excavation prior to certification sampling is necessary. These objectives will be accomplished through two separate phases of precertification, as described in Section 2.0. Precertification data will be used to determine if A2PI is ready for certification activities. If data indicate primary radiological COCs are low enough to pass certification statistical analysis, then certification sampling will be initiated under a separate PSP. Areas that may fail certification or exceed hot spot criteria will be delineated for removal prior to the initiation of certification activities.

1.3 SCOPE

The scope of this PSP is limited to precertification and FRL scanning activities within A2PI excluding the construction support area, Equipment Wash Facility area, underground utility corridor and footprints of the existing well houses and piping. This includes scanning, confirmation measurements, and if necessary, hot-spot delineation. All precertification scanning activities will be consistent with Sections 3.3.3, 4.1 (Approach A) and 4.2 (Approach B) of the SEP. The real-time scanning approach will be consistent with the User Guidelines, Measurement Strategies, and Operational Factors for Deployment of In-Situ Gamma Spectrometry at the Fernald Site (Users Manual) except for one modification within the OU2 soil areas for total uranium data collection. This modification, detailed in Section 2 of the PSP, involves Phase 1 scanning with HPGe detectors to attain the detection of 10 parts per million (ppm) for total uranium. Field activities will be consistent with the Sitewide Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Quality Assurance Project Plan (SCQ), and Data Quality Objective (DQO) SL-056, Revision 0 (Appendix A).

FRL scanning conducted in support of the PSP for Predesign Sampling in A2PI Non-Waste Units and A2PII Part One may be used for precertification in areas undisturbed during remediation. The

scanning activities were consistent with Sections 3.3.3 and 4.5 of the SEP and the Users Manual. In non-waste unit areas, which do not require remediation and where applicable predesign real-time data demonstrates FRL attainment, no additional scanning under this precertification PSP will be necessary. The exact locations of these areas will be summarized in a V/FCN as the predesign data becomes available.

1.4 KEY PERSONNEL

Key personnel responsible for performance of the project are listed in Table 1-1.

TABLE 1-1
KEY PERSONNEL

Title	Primary	Alternate
DOE Contact	Rob Janke	Kathi Nickel
Project Manager	Tom Crawford	Jyh-Dong Chiou
Characterization Lead	Mike Rolfes	John Centers
Real-Time Program Manager	Joan White	Dave Allen
Real-Time Instrumentation Measurement Program (RTIMP) Field Lead	Brian McDaniel	Dave Allen
Surveying Lead	Jim Schwing	Jim Capannari
Data Management Contact	Deanna Diallo	Mike Rolfes
Waste Acceptance Organization (WAO) Contact	Linda Barlow	Vicky Zimmerman
Quality Assurance Contact	Reinhard Friske	Mary Eleton
Safety and Health Contact	Debbie Grant	Lewis Wiedeman

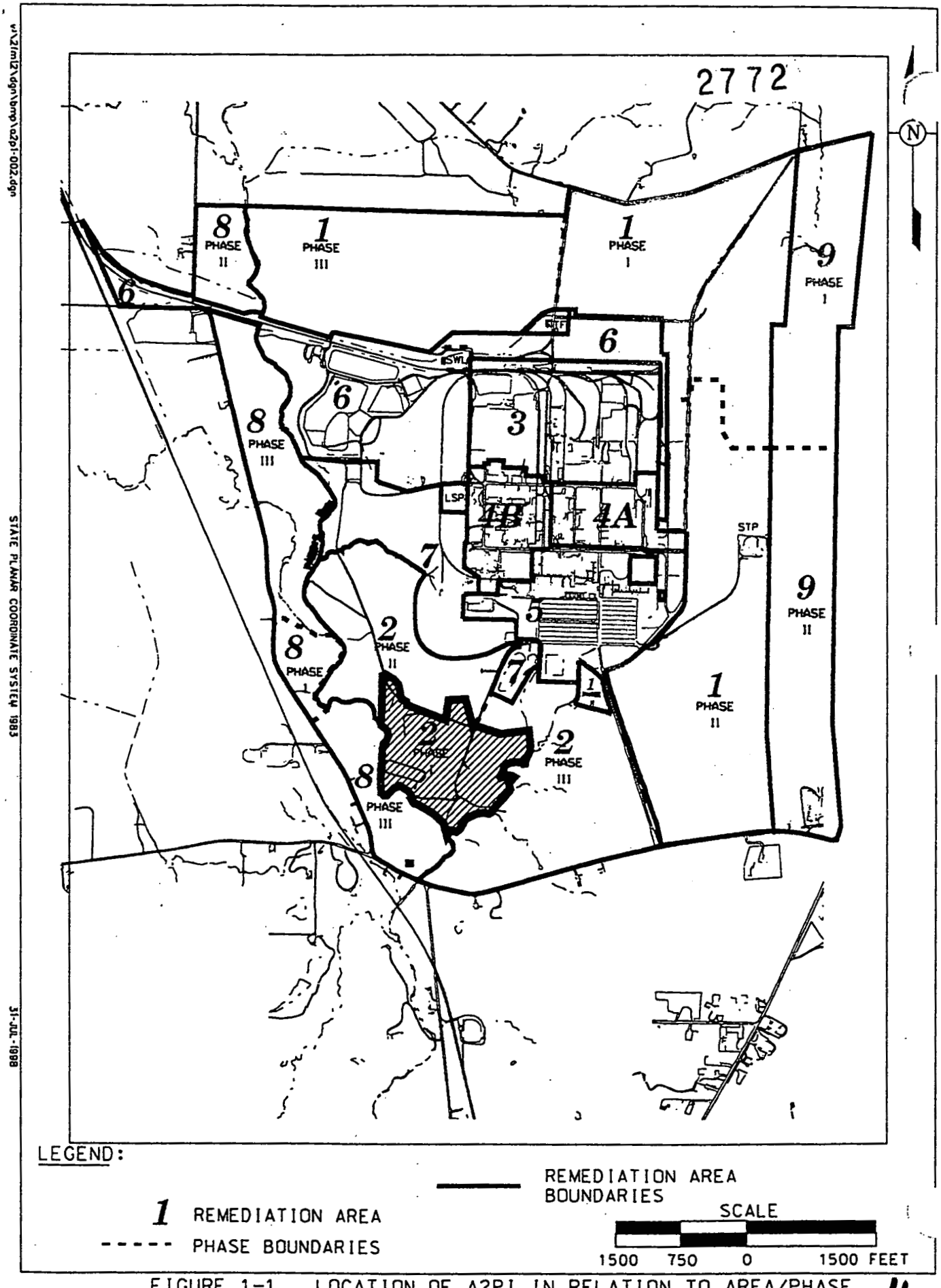


FIGURE 1-1. LOCATION OF A2PI IN RELATION TO AREA/PHASE REMEDIATION AREAS.

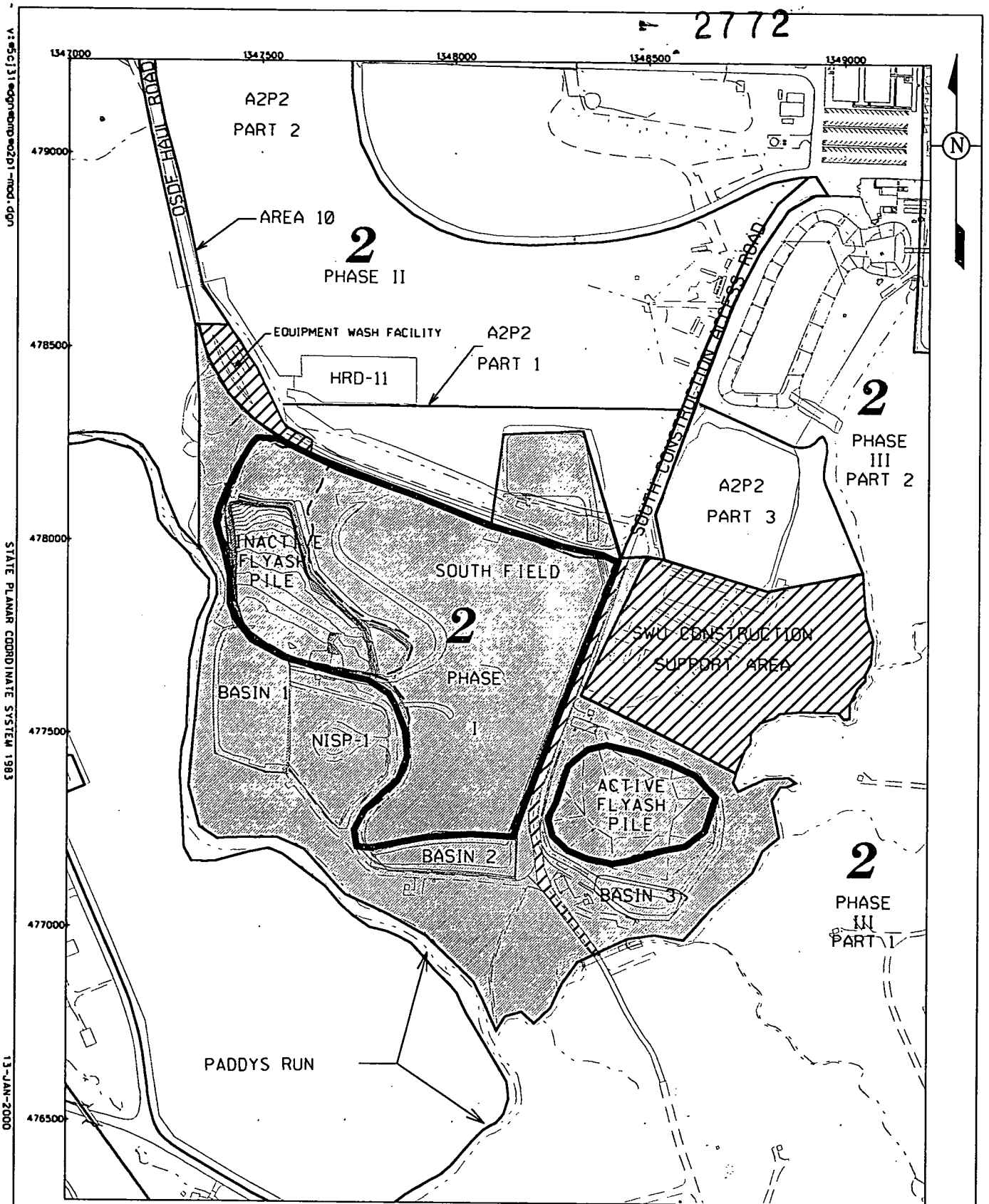


FIGURE 1-2. A2P1 MODIFIED BOUNDARY MAP
(EXCLUDES CONSTRUCTION SUPPORT AREA AND UTILITY CORRIDOR)

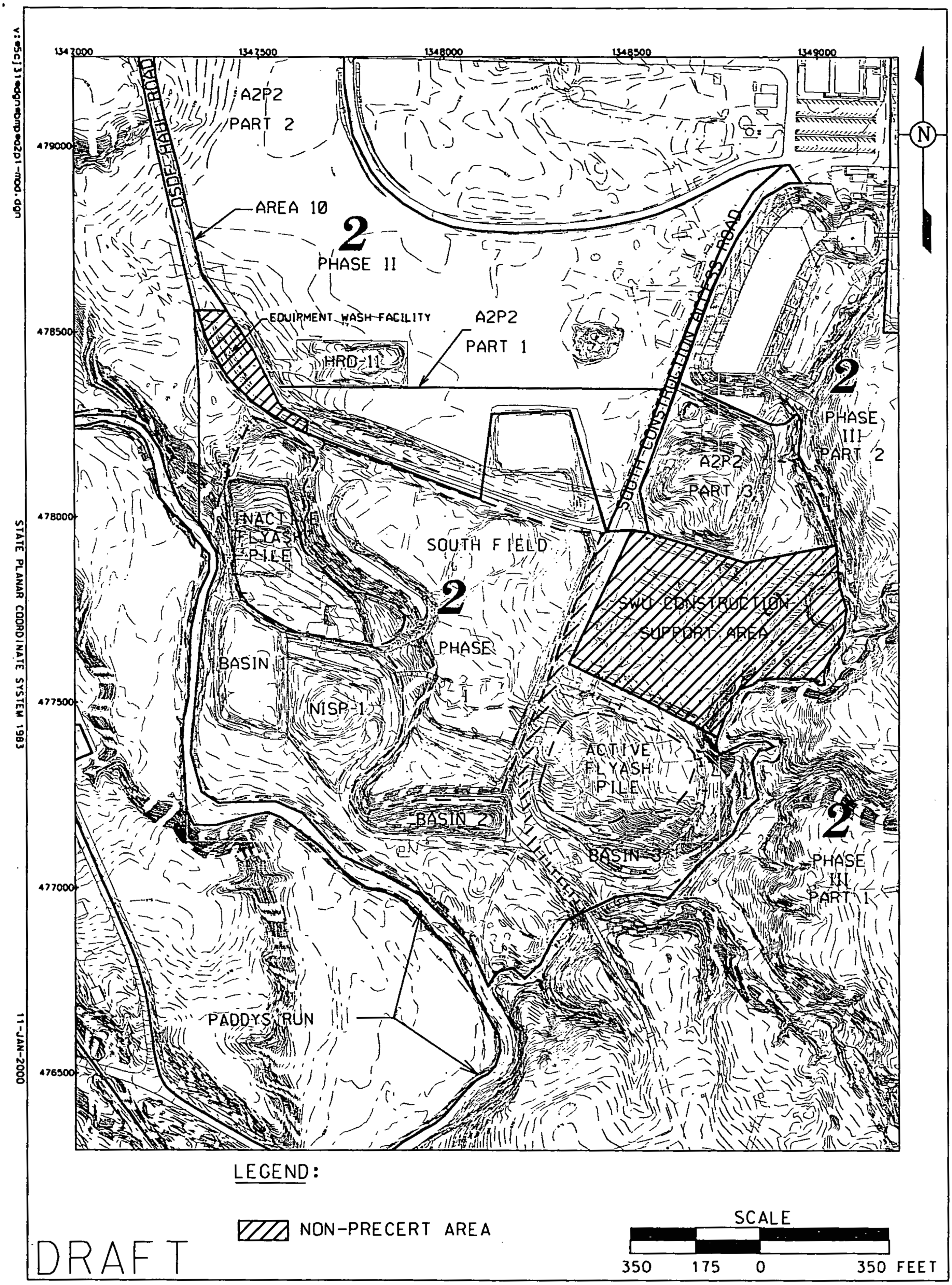


FIGURE 1-3. 1999 A2P1 TOPOGRAPHY AS OF DECEMBER 1999

2.0 PRECERTIFICATION SCANNING PROGRAM

The real-time precertification scanning of A2PI will be conducted as remediation footprints become available and will take place in two phases. Prior to starting precertification scanning, the Characterization Lead or designee will arrange for preparation, clearing, and access controls to the areas.

During Precertification Phase 1 several Radiation Measurement Systems (RMS) can be utilized. The Radiation Tracking System (RTRAK), Radiation Scanning System (RSS), and/or Gator will provide as close as possible to 100 percent coverage of the area to determine patterns of total gamma activity. RMS operations will be performed in accordance with procedure EQT-34, Radiological Scanning System. In areas that are physically inaccessible to the mobile sodium iodide (NaI) systems, the high-purity germanium (HPGe) detector will be used to scan surface soil. HPGe detector operations will be consistent with procedure EQT-23, High Purity Germanium Detectors. Precertification Phase 1 scan data will be considered when establishing or verifying previously established CU boundaries.

In the OU2 soil areas (IFP/AFP/SF) footprints, the total uranium FRL is 10 ppm. This concentration level cannot be detected using the 2-point running average of the RTRAK/RSS. As a result, the OU2 areas scanned using the RTRAK/RSS in Phase 1 will be further characterized with HPGe detectors. This modified Phase 1 scanning approach is detailed in Section 2.1.

Based on results of the Precertification Phase 1 scan, HPGe detectors will be used during Precertification Phase 2 to evaluate/confirm concentrations of the primary ASCOCs. A Phase 1 hot spot is suspect at 3xFRL with the RMS or 2xFRL with the HPGe. If the suspect Phase 2 hot spot is confirmed (2xFRL with HPGe), hot spot delineation will take place as another phase of precertification under this PSP. The real-time equipment and corresponding equipment configurations used during each phase of precertification are summarized in Table 2-1.

Soil moisture measurements, collected to support scanning activities, will be performed in accordance with procedure EQT-32, Troxler 3440 Series Surface Moisture/Density Gauge, or EQT-39, Zeltex Infrared Moisture Meter. Background radon monitoring will also take place in support of all real-time

measurements. System calibration operations for HPGe detectors will be performed in accordance with procedure EQT-22, High Purity Germanium Detector In-Situ Efficiency Calibration.

2.1 PRECERTIFICATION PHASE 1

Precertification Phase 1 scanning will consist of the maximum possible coverage of A2PI using real-time gamma sensitive RMS detector systems (RTRAK/RSS/Gator) to evaluate residual soil contamination patterns. Real-time RMS detector system coverage will be limited to the surface soil and will be as extensive as possible without jeopardizing worker safety (i.e. steep slopes). The RTRAK/Gator will be the primary tool used to collect surface soil total gamma activity data, and the RSS will be used in areas the RTRAK cannot access. The mobile RMS spectral acquisition time will be set to 4 seconds, and data will be collected with a detector speed of 1 mile per hour. Adjacent passes will be conducted with approximately a 0.4-meter overlap, which corresponds to a separation of the centerline of the passes by 2 meters. The detector system configuration and performance of the RSS will be equivalent to the RTRAK/Gator. The onboard Global Positioning System (GPS) will be used to obtain positioning information (i.e., northings and eastings) for each spectrum acquired.

Some portions of A2PI may be inaccessible to the mobile RMS system due to vegetation and/or steep hillsides (Figure 2-1). Under these conditions, the HPGe detectors will be used for surface scanning, and measurements will be obtained at a detector height of 1 meter and a count time of 900 seconds (15 minutes). At the discretion of the Characterization Lead and RTIMP, these readings may be obtained at the 31-centimeter detector height if a smaller field of view is required (i.e., topography or standing water in tributary, etc.). At a minimum, the 99.1 percent coverage option (see Section 4.10 of the Users Manual) will be employed to scan the required area.

Some of the east area of the AFP is inaccessible to RTRAK, RSS, and HPGe due to the steep hillside (Figure 2-1). Previously collected total uranium and thorium-232 measurements from predesign scanning in the accessible areas east of the AFP were below FRL. Three predesign HPGe measurements adjacent to this inaccessible area are greater than 1xFRL but less than 2xFRL for radium-226. Additional measurements at these three locations will be collected. If the confirmation measurements are less than 2xFRL, no additional precertification measurements will be conducted in the inaccessible area (less than 1 acre) east of the AFP. If these additional measurements confirm greater than 2xFRL concentrations, hot spot delineation will commence.

In the OU2 FRL soil areas, each Phase 1 RMS batch area will be further investigated with HPGe measurements to assess attainment of the 10 ppm total uranium FRL. The HPGe detector will be positioned over areas of highest total activity and/or total uranium concentrations for each RMS batch area. At least one 15-minute HPGe measurement will be collected for each RMS batch area. The determination of the detector height and frequency of HPGe measurements within each RMS batch area will be based on the size and number of elevated total activity zones and/or total uranium locations. This determination will be made by the Characterization Lead or designee and detailed in a V/FCN to this PSP. Certification readiness will be demonstrated in Phase 1 if the HPGe measurements within the RMS batch areas do not exceed hot spot criteria.

The data obtained from the Precertification Phase 1 scan will be used to determine patterns of total gamma activity in A2PI. A 2-point moving average of consecutive mobile NaI measurements will be mapped to determine if total uranium, radium-226 and/or thorium-232 hot spots are present. These data, along with other information as discussed in Section 3.3.3.2 of the SEP, will be considered when determining or verifying CU boundaries in A2PI. After reviewing the mapped data, the Characterization Lead will define CU boundaries and document this decision in the Certification Design Letter (CDL) for A2PI.

2.2 PRECERTIFICATION PHASE 2

All Precertification Phase 2 measurements will be taken using HPGe detectors. Precertification Phase 2 measurements will be obtained to confirm potential hot spots identified by RMS (i.e., 2-point moving average results above 3xFRL) and any HPGe potential hot spots (results above 2xFRL at the 1-meter height), as identified during Precertification Phase 1. The Characterization Lead is responsible for evaluating the mapped RTRAK/RSS/HPGe data from Phase 1 and determining preliminary certification unit boundaries.

Per guidelines established in Section 3.3.2 of the Users Manual, all RTRAK/RSS hot spot confirmation measurements will be obtained at two different detector heights: 31 cm (1 foot) and 1 meter. The spectral acquisition time will be set to 15 minutes for both readings. All HPGe hot spot confirmation measurements need only a 31-cm detector height measurement (the Phase 1 measurement was already obtained at 1 meter). The spectral acquisition time will also be 15 minutes for this measurement. All Phase 2 measurement locations will be surveyed and marked, as identified in Section 2.4. The

16

Precertification Phase 2 HPGe Target Analyte List (TAL) is shown in Table 2-2. A hot spot is confirmed if an HPGe measurement at either detector height exceeds 2xFRL for any area-specific constituent of concern (ASCOC).

2.3 HOT SPOT DELINEATION

If a hot spot is confirmed (i.e., a Phase 2 HPGe result above 2xFRL at either detector height), adequate time must be allowed to prepare for excavation activities. Excavation will continue until HPGe measurements indicate that precertification criteria have been met. The delineation approach will be determined by project management after considering all surrounding real-time results; however, the strategy must be consistent with guidelines documented in Section 3.3.3 of the Users Manual (detector height of 15 cm, count time of 15 minutes). Hot spot pre- and post-excavation real-time measurements will include elevation coordinates. Details of the hot-spot delineation, if necessary, will be documented in a V/FCN. This information and data will also be forwarded to WAO (via Data Group Form FS-F-5157) for waste tracking.

2.4 FRL SCAN MEASUREMENTS ON SURFACE OF UTILITY CORRIDOR

FRL real-time data collection on the surface beneath the asphalt road that overlays the utility corridor will be conducted using the same parameters detailed in Section 2.1. Any Phase 2 measurements will be at the discretion of the Characterization Lead or designee in consultation with the Project Manager and WAO representative or designees. If Phase 2 measurements are requested, the approach will follow Section 2.2.

2.5 PRECERTIFICATION MEASUREMENT IDENTIFICATION

All measurements will be assigned a unique identification for data tracking purposes. All data files will include the area and phase number in the file names. All measurements will contain some or all of the following designators.

Precertification Phase 1:

1.	Prefix designating the area name:	A2P1 = Area 2, Phase I
2.	Letter designating the purpose:	P1 = Precertification Phase 1 UC = Utility corridor surface scan

17

3.	RTRAK/RSS batch number (if applicable):	Sequential numbering of RTRAK or RSS analytical runs
4.	HPGe Measurement Number (if applicable):	Designates the sequential numbering of HPGe measurements. The first measurement taken is 1 and any subsequent measurements are numbered sequentially (2, 3, 4, etc.).
5.	HPGe Measurement designator (if applicable):	G = gamma measurements
6.	Quality control designator (as necessary):	D = duplicate measurement Note: One duplicate HPGe measurement will be collected per 20 measurements during precertification.

For example:

A2P1-P1-4-G-D

Where: A2P1 = Area 2, Phase I
P1 = Precertification Phase 1
4 = the fourth gamma reading obtained
G = gamma measurement
D = duplicate measurement (as necessary)

A2P1-P1-521

Where: A2P1 = Area 2, Phase I
P1 = Precertification Phase 1
521 = sequential RTRAK run

Precertification Phase 2:

1.	Prefix designating the area name:	A2P1 = Area 2, Phase I
2.	Letter designating the purpose:	P2 = Precertification Phase 2. UCP2 = Utility Corridor Phase 2 (if needed)
3.	Sequential location number within the CU/detector height:	Sequential numbering 1 through x Detector height - A = 1 meter B = 31 cm (ex. 1A or 1B)
4.	Measurement designator:	G = gamma measurements
5.	Quality control designator (as necessary):	D = duplicate measurement

18

For example:

A2P1-P2-1-1A-G-D

Where: A2P1 = Area 2, Phase I
P2 = Precertification Phase 2
1 = sequential numbering
1A = the first gamma reading obtained and at a detector height of 1 meter
G = gamma measurement
D = duplicate measurement (as necessary)

Hot Spot Delineation:

1.	Prefix designating the area name:	A2P1 = Area 2, Phase I
2.	Letter designating the purpose:	HS = Hot Spot UCHS = Utility Corridor Phase 2 (if needed)
3.	Sequential location number:	Sequential numbering 1 through x
4.	Hot Spot post removal measurement (if applicable):	Alpha numerically listed (A, B, C, etc.)
5.	Measurement designator:	G = gamma measurements
6.	Quality control designator (as necessary):	D = duplicate measurement

Example:

A2P1-HS-4-A-G-D

Where: A2P1 = Area 2, Phase I
HS = Hot Spot
4 = the fourth hot spot delineation
A = the first measurement after hot spot removal
G = gamma measurement
D = duplicate measurement (as necessary)

Radon Monitoring Measurement Designation:

1.	Prefix designating the area name:	A2P1 = Area 2, Phase I
2.	Letter designating the purpose:	P1 = Precertification Phase 1 P2 = Precertification Phase 2
3.	Monitoring activity:	RADON = Radon monitoring

4.	Detector Height:	A = 1 meter B = 31 cm C = 15 cm
5.	Sequential numbering of radon monitoring:	1, 2, 3, etc.

For example:

A2P3-P1-RN-A-1

Where: A2P1 = Area 2, Phase I
P1 = Precertification Phase I
RADON = Radon monitoring
A = 1 meter
1 = first radon monitoring event

2.6 DATA MAPPING

As the Survey and RTIMP Teams acquire measurements, the data will be electronically loaded into mapping software through manual file transfer or Ethernet. A set of maps or HPGe data summary printouts will be generated for the RTIMP and A2PI Characterization Leads or designees. Maps will be generated depicting the following, unless otherwise specified by the Characterization Lead or designee:

Surface Scan Coverage Map(s)

- RMS Location Map (colored squares) - indicating batch numbers
- RMS Total Activity Map (single spectra coverage) - to determine CU boundaries and OU2 FRL area HPGe measurements
- COCs Concentration Maps - radium-226 and thorium-232 (2-point running average to determine potential hot spots exceeding 3xFRL) depicting 1xFRL, 2xFRL, and 3xFRL concentrations in all areas. Total uranium concentrations will be depicted at 0.5xFRL, 1xFRL, 2xFRL, and 3xFRL in the non-waste unit FRL (82 ppm) area. Total uranium concentrations will be depicted at 1xFRL, 2xFRL, and 3xFRL in the OU2 FRL (10 ppm) soil area for the HPGe measurements. Total uranium concentrations will be depicted at 0-50, 51-100, and greater than 100 ppm in the OU2 FRL (10 ppm) soil area for the RMS.
- HPGe Location Map (bubble map showing field of view and number for each HPGe measurement) - including summary data printout for each HPGe measurement

  Note: HPGe location map can be combined with the previous maps if needed.

HPGe Confirmation/Delineation Map(s)

- HPGe Location Map (bubble map showing field of view and number for each HPGe measurement) - including summary data printout for each HPGe measurement

Hot Spot Post Removal Map(s)

- HPGe Location Map (bubble map showing field of view and number for each HPGe measurement) - including summary data printout for each HPGe measurement

The map and/or HPGe data summary printouts will be used to provide the Characterization Lead or designee with information to determine if additional scanning, confirmation, or delineation measurements are required.

2.7 SURFACE SOIL MOISTURE MEASUREMENTS

Surface moisture measurements will be collected to determine soil moisture content and used to correct the real-time data so it is comparable to a lab analysis (where data is reported on a dry weight basis). Moisture measurements can be collected using either the Troxler gauge or Zeltex moisture meter. Surface moisture measurements will be obtained at a minimum of two per acre where the mobile RMS detectors were used for the Precertification Phase 1 scan. When the HPGe is used during Precertification Phase 2, one surface moisture measurement will be obtained per HPGe reading. All surface moisture measurements will be conducted within 8 hours of collecting the real-time measurements and before ambient weather conditions change. When using the Troxler gauge, technicians cannot collect the moisture measurements simultaneously with the RMS or HPGe measurements because internal radioactive sources contained in the moisture gauge can cause interference with the HPGe or RMS measurements. If surface soil conditions are unsuitable for moisture measurements, a default moisture value may be used or a soil core will be collected to a depth of 4 inches and submitted to the on-site laboratory for moisture analysis. Refer to Section 3.8 of the Users Manual for more information on these measurements.

2.8 BACKGROUND RADON MONITORING

Background radon monitoring will be utilized during the collection of real-time measurements to obtain background radon information from the time that data collection begins until after the final measurement is completed. The monitor will be placed in one location for the day where it will be set at the same height as the detector being used to collect the soil radiation measurements (RMS detector height = 31 cm). The radon monitor must also be placed at approximately the same elevation as the real-time measurement. The background radon data will be used per Section 5.3 of the Users Manual to correct the radium-226 data.

2.9 PHYSICAL SAMPLES

Physical samples may be taken under this PSP in areas inaccessible to both the NaI systems and the HPGe detectors. The Characterization Lead or designee will document the sampling approach in a V/FCN. If collected, physical samples will follow the DQOs identified in DQO SL-048.

2.10 WASTE DISPOSITION

Because no wastes are anticipated to be generated during the real-time scan, a Project Waste Identification and Disposition report will not be prepared to support field activities under this PSP.

TABLE 2-1
REAL-TIME EQUIPMENT AND DETECTOR CONFIGURATIONS USED DURING EACH PHASE OF PRECERTIFICATION

Precertification Phase	Equipment Used	Detector Configuration
Phase 1 - Scanning	RMS	Speed = 1 mph, Acquisition Time = 4 seconds
	HPGe[a]	Height = 1 m, Acquisition Time = 15 minutes Height = 31 cm, Acquisition Time = 15 minutes
Phase 2 - Confirmation	HPGe	Height = 1 m, Acquisition Time = 15 minutes; and Height = 31 cm, Acquisition Time = 15 minutes
Hot Spot Delineation	HPGe	Height = 15 cm, Acquisition Time = 15 minutes

[a] The HPGe will only be used during Phase 1 in the RMS inaccessible areas or OU2 FRL areas. A 31-cm detector height may be used at the discretion of the Characterization Lead or designee.

TABLE 2-2
TARGET ANALYTE LISTS FOR A2PI PRECERTIFICATION HPGe SCANNING

TAL A2P1-PRECERT-A

HPGe Detector Scanning		
1	ASL A	Total Uranium (OU2 FRL = 10 mg/kg) (Non-Waste Unit FRL = 82 mg/kg)
2	ASL A	Thorium-228 (FRL = 1.7 pCi/g)
3	ASL A	Thorium-232 (FRL = 1.5 pCi/g)
4	ASL A	Radium-226 (FRL = 1.7 pCi/g)
5	ASL A	Radium-228 (FRL = 1.8 pCi/g)

ASL - analytical support level
mg/kg - milligrams per kilogram
pCi/g - picoCuries per gram

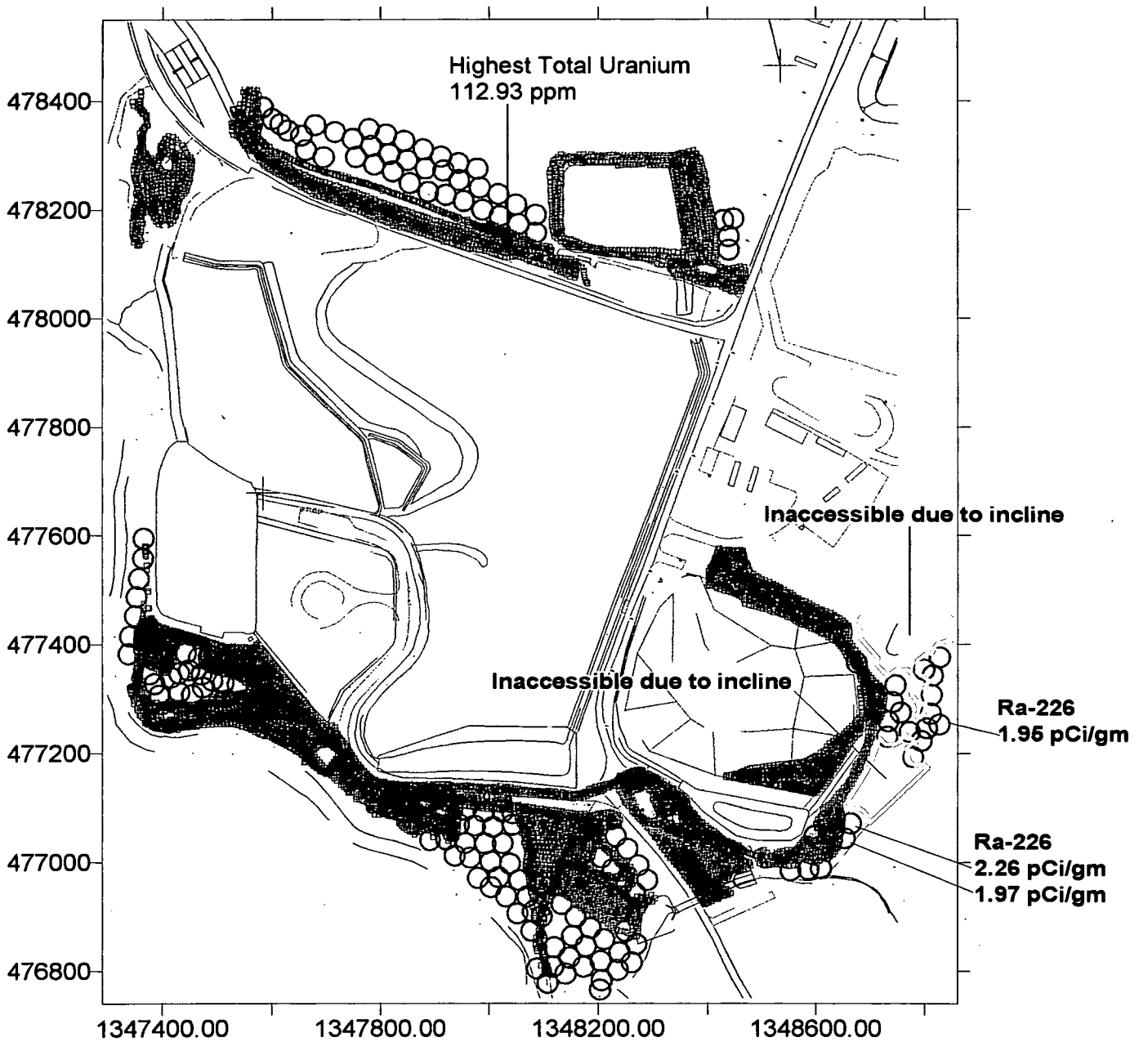
Figure 2-1
Inaccessible area East of AFP

2772

N

Moisture Corrected Total Uranium

RTRK batch#: 764,766,767,768,776
RSS batch#: 486,487,496,501,512,516,517
Measurement dates from 10/14/99 to 01/06/99
Field of View to scale



RMS
Total Uranium in ppm

- -54.00 to 41.00
- 41.00 to 82.00
- 82.00 to 164.00
- 164.00 to 246.00
- 246.00 to 10000.00

HPGe
Total Uranium in ppm

- 0.00 to 41.00
- 41.00 to 82.00
- 82.00 to 164.00
- 164.00 to 246.00
- 246.00 to 10000.00

RTIMP DWG Title: A2P1-NWU-Fig-2-1.srf
Project #: 20400-PSP-0002
Project Name: A2P1 NWU & A2P2 PT1 PreDesign Sampling
Prepared By: Brian McDaniel
File: A2P1_NWU_FIG_2-2.srf
Date Prepared: 01/11/00

3.0 QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS

3.1 QUALITY CONTROL MEASUREMENTS

In accordance with DQO SL-056, Revision 0 (Appendix A), all precertification real-time measurements will be classified as ASL A. Per the Users Manual, duplicate readings will be taken at a frequency of one for every 20 measurements.

3.2 PROJECT REQUIREMENTS FOR SURVEILLANCES

Project management has ultimate responsibility for the quality of the work processes and the results of the scanning activities covered by this PSP. The FEMP Quality Assurance (QA) organization may conduct independent assessments of the work process and operations to assure the quality of performance. The assessment encompasses technical and procedural requirements of this PSP and the SCQ. Independent assessments may be performed by conducting surveillances.

3.3 FIELD CHANGES TO THE PSP

If field conditions require changes or variances, written approval must be obtained from the Characterization Lead and QA before the changes may be implemented (electronic mail is acceptable). Changes to the PSP will be noted in the applicable Field Activity Logs and on a V/FCN. QA must receive the completed V/FCN, with the signatures of the Project Manager, Characterization Lead and the QA Representative or designee, within seven working days of granting approval. If a V/FCN is generated to delineate or confirm a hot spot location with soil samples, WAO approval must also be obtained.

3.4 TRAINING

Programs supporting this work are responsible for ensuring that team members work to and are trained to applicable documents. Additionally, programs supporting this work are responsible for ensuring team members in their organizations are qualified and maintain qualification for site access requirements. The project manager will be responsible for ensuring any project specific training required to perform work per this PSP is conducted.

4.0 SAFETY AND HEALTH

Personnel will conform to precautionary surveys by FEMP personnel representing the Utility Engineer, Industrial Hygiene, Occupational Safety, and Radiological Control.

All work performed on this project will be performed in accordance to applicable Environmental Monitoring project procedures, Radiological Control Requirements Manual (RM-0021), Safety Performance Requirements Manual, FDF work permit, radiological work permits, penetration permits, and other applicable permits. Concurrence with all applicable safety permits is required from all personnel in the performance of their assigned duties.

All personnel involved in the collection of soil samples will be briefed on this PSP and the briefing will be documented. Personnel who do not receive a briefing on these requirements will not participate in the execution of soil sampling activities related to the completion of assigned project responsibilities.

All emergencies shall be reported immediately on extension 911, or to the Site Communications Center at 648-6511 (if using a cellular phone), or by using a radio and contacting "CONTROL" on Channel 11.

5.0 DATA MANAGEMENT

The RTIMP group will provide hard copy maps and/or summary reports to the Characterization Lead and Data Management Lead or designees. All real-time data will be collected and reported at a minimum ASL A and require no data validation. All physical samples measurements will be collected and reported at ASL B and will require 10 percent data validation/100 percent field validation. All electronically recorded field data will have the RMS or HPGe Data Verification Checklist (Section 5.4 of the Users Manual), which will be completed after each data collection event. Field documentation, such as the Nuclear Field Density/Moisture Worksheet, will undergo an internal review by the RTIMP.

Electronically recorded data from the GPS, HPGe, and RMS systems will be downloaded on a daily basis to disks, or to the Local Area Network (LAN) using the Ethernet connection. The Characterization Lead or designee will be informed by the RTIMP Lead or designee when RTIMP measurements do not meet data quality control checklist criteria. The Characterization Lead or designee will determine whether additional scanning, confirmation, or delineation measurements are required.

Once the electronic data have been placed on the LAN and Sitewide Environmental Database (SED), the Data Management Lead will perform an evaluation prior to placement on the Soil and Disposal Facility Project (SDFP) web site. The evaluation may involve a comparison check between the electronic data, hard copy maps and summary reports for accuracy and completeness. The evaluation will be documented on the Real-Time Electronic Data Quality Control checklist (Figure 5-1), dated and signed. After confirmed and delineated hot spot data (requiring remediation) are entered in the SED, the Data Group Form (FS-F-5157) will be completed by the Characterization Lead or designee with concurrence from a WAO respresentative.

Copies of field documentation shall be generated and provided to the Characterization Lead or Data Management Lead upon request and maintained in SDFP project files until dispositioned to Engineering/Construction Document Control (ECDC). RTIMP will maintain all the real-time files and survey data will be maintained by the Survey Lead or designee. All records associated with this PSP will reference the PSP number and eventually be forwarded to ECDC to be placed in the project file.

PSP/Project #: _____

Batch Numbers: 2772

HPGe file Numbers: _____

REAL-TIME ELECTRONIC DATA QUALITY CONTROL CHECKLIST

#	ITEM TO BE CHECKED	✔ or No	Modification/Correction with explanation	Date Corrected
1	Receive the Characterization Request form, Monitoring Form (MF), coverage maps, real-time verification checklist, and/or HPGe parameter summary report from the Characterization field personnel			
2	Verify the signatures and all blanks on the MF are complete through Section 6 and complete on the Real-Time Verification Checklist			
3	Check loader to ensure the data transferred from the LAN to the SED (if the data files are in the SED, the loader is working properly)			
4	Check to ensure data transferred into the correct fields by looking at the data on the LAN in comparison with the data transferred to the SED (to verify this, all data fields for a few runs in each file will be reviewed)			
5	Check that the project number is correct and is consistent on the MF, the LAN, and the SED in both the worksheet files and the results/data files			
6	Check that the MF, the LAN, and the SED have the correct location identifier in both the worksheet files and the results/data files			
7	Check that worksheet on the LAN and in the SED have the correct elevation documented from the surveying group			
8	Verify northing and easting coordinates, look at the plotted map and the coordinates in the SED and verify the coordinates are within the boundary on the plotted map			
9	Check data files to ensure all files are received			
10	Attach this checklist and documentation for modifications to the EMF, initial and date all forms and documentation		X	X
11	Insert USE into the "QC Field" on the SED after all this has been checked and verified correct		X	X

Sign and Date _____ 29

FIGURE 5-1

PSP/Project #:_____

Batch Numbers:_____

HPGe file Numbers:_____

2772

1. If no, check with the Characterization Lead or designee to get needed forms.

2. If no, contact Characterization Lead and return MF to be completed and/or signed.

3. If no, check with SED Database Manager (ext. 7544) to find out why.

4. If no, check with the Real-Time Field Lead to see if any additional fields were added. If so, call SED Database Manager (ext. 7544) to have the field added into the SED tables. If not, check with SED Database Manager (ext. 7544) to see why the fields loaded incorrectly.

5. If no, verify the correct project number with the Characterization Lead and insert the project number into the worksheet on the LAN and the worksheet in the SED; attach the documentation to the form.

6. If no, verify with the Characterization Lead the correct identifier and correct the identifier both in the worksheet on the LAN and in the SED; attach the documentation to the form.

7. If no, check with the Surveying group to verify the elevation; If incorrect, change the elevation in the worksheet on the LAN and in the SED and attach the documentation to the form.

8. If no, check with Characterization Lead or designee to resolve the problem.

9. Run query in SED. The number of RTRAK/RSS files can be checked with the number of records (files) listed in the SRDIG directory under Real-Time Lab View files. No sequential gaps are anticipated; if gaps are found, check with the Real-Time Field Lead. The Real-Time Field Lead will verify gaps or will investigate to find out why the files are missing. For HPGe shots, an HPGe Data Verification Checklist is attached to the MF listing all the files. This Checklist can be used to ensure all the files were received in the SED.

Sign and Date_____ 30

FIGURE 5-1

6.0 APPLICABLE DOCUMENTS, METHODS, AND STANDARDS

Work performed under this PSP will be conducted in accordance with the following procedures and documents:

- ADM-16, In-Situ Gamma Spectrometry Quality Control
- ADM-17, In-Situ Gamma Spectrometry Data Management
- ADM-18, Gamma Vision Software for In-Situ Gamma Spectrometry
- ADM-19, In-Situ Gamma Spectrometry Prerequisites
- EQT-05, Geodimeter® 4000 Surveying System
- EQT-10, AC Portable Generator
- EQT-22, High Purity Germanium Detector In-Situ Efficiency Calibration
- EQT-23, High Purity Germanium Detectors
- EQT-32, Troxler® 3440 Series Surface Moisture/Density Gauge
- EQT-33, Real-time Differential Global Positioning System Operation
- EQT-34, Radiation Scanning System
- EQT-39, Zeltex® Infrared Moisture Meter
- EQT-41, Radiation Measuring Systems
- RM-0021, Radiological Control Requirements Manual
- A2PI Certification Design Letter
- A2PI Integrated Remedial Design Package
- PSP for Predesign Sampling of A2PI Non-Waste Units and A2PII Part One
- Sitewide Excavation Plan
- User Guidelines, Measurement Strategies, and Operational Factors for Deployment of In-Situ Gamma Spectrometry at the Fernald Site (Users Guide)
- RTRAK Applicability Study
- Calibration Report for the Mobile Sodium Iodide System Known as the Gator

APPENDIX A

DATA QUALITY OBJECTIVES SL-056, Rev. 0

Control Number 2772

Fernald Environmental Management Project

Data Quality Objectives

Title: Real Time Final Remediation Level (FRL) Monitoring

Number: SL-056

Revision: 0

Effective Date: 9/01/99

Contact Name: Joan White

Approval: _____ Date: 9/1/99
James Chambers
DQO Coordinator

Approval: _____ Date: 9/1/99
Joan White
Real-Time Instrumentation Measurement
Program Manager

Rev. #	0						
Effective Date:	9/01/99						

Data Quality Objectives
Real Time Final Remediation Level (FRL) Monitoring

1.0 Statement of Problem

Conceptual Model of the Site

The general soil remediation process at the Fernald Environmental Management Project (FEMP) includes real-time *in-situ* gamma spectrometry (real-time) measurements and physical sampling during different phases of the remediation process. Initially, pre-design investigations define excavation boundaries. During excavation, real-time measurements and/or sampling for waste disposition issues occurs. After planned excavations are complete, real-time measurements and/or physical sampling precertification activities are carried out to verify that residual contamination is below final remediation levels (FRLs).

This DQO describes the real-time in-situ gamma spectrometry methods used for gamma resolvable Area Specific Contaminants of Concern (ASCOC) FRL monitoring to support remedial design and precertification. Any physical soil samples collected to support remedial design will be collected under a separate DQO. Real-time FRL measurements involve field surveys of the surface soil using mobile and stationary gamma-discernable real-time equipment. Real-time FRL measurements are collected within an area when above-FRL radiological contamination is anticipated to be minimal based on process knowledge or previous investigations.

FRL scanning activities must follow the guidelines established in the *Sitewide Excavation Plan* (SEP) and the most current version of the document *User Guidelines, Measurement Strategies, and Operational Factors for Deployment of In-Situ Gamma Spectrometry at the Fernald Site* (hereinafter referred to as the Real Time Users Manual). As discussed in these documents, FRL measurements are conducted in two separate activities:

- FRL Phase I includes a mobile sodium iodide (NaI) detector scan of as much of the area as accessible at a 31 cm detection height at 1 mile per hour. If parts of the area of interest are inaccessible to the mobile NaI detectors, then the stationary High Purity Germanium (HPGe) detector will be used to obtain measurements in those areas. Target parameters for FRL Phase I NaI measurements are gross gamma activity and 3-times the FRL (3x FRL) values of total uranium, radium-226 and/or thorium-232, as calculated by a moving two-point average of consecutive measurements, or as indicated by 2x FRL in single measurements using the HPGe detectors at a 1 meter detector height.

- FRL Phase II includes stationary HPGe "hot spot evaluation" measurements at Phase I locations where the two-point average of total uranium, radium-226 and/or thorium-232 has identified resolvable ASCOC concentrations

greater than 3-times the FRL (3x FRL) using the RMS systems, or where single HPGe measurement from Phase I are greater than 2x FRL. Target parameters for FRL Phase II are all gamma resolvable radiological ASCOCs.

Available Resources

Time: FRL investigation of remediation areas or phased areas must be accomplished by the field team of real-time instrumentation operators (and samplers if necessary), to provide required information in time to support the design effort.

Project Constraints: FEMP remediation activities are being performed in support of the Accelerated Remediation Plan, and soil remediation activities must be consistent with the SEP. FRL scanning, and if necessary, sampling and analytical testing, must be performed with existing manpower and instrumentation, considering instrument availability, to support the remediation and certification schedule. The results of FRL Phase I will determine Phase II HPGe measurement location and if necessary, will determine physical sample location. Design and execution of potential remediation is dependent on successful completion of this work.

Instrumentation: Real-time monitoring includes mobile sodium iodide (NaI) systems referred to as the Radiation Measurement Systems (RMS). In addition, stationary germanium detectors mounted on a tripod (the HPGe), are also used. These instruments can significantly accelerate the pace of necessary characterization by detecting soil contaminated with gamma resolvable radiological ASCOCs in a rapid and non-intrusive manner.

2.0 Identify the Decision

Decision

Delineate the horizontal extent of above-FRL (hot spot criteria) radiological contamination in the area soil. In addition, determine the need for Phase II real-time measurements to further assist in the above-FRL delineation.

3.0 Identify Inputs That Affect the Decision

Required Informational Input

Real-time FRL measurements will be used to estimate the surface soil contamination and the variation in surface soil contamination in areas scheduled for design, modeling, precertification, or certification activities. In addition, RTIMP data may be used to determine physical sampling collection location and/or a review of existing physical sample data, process knowledge, or visible observation.

Sources of Informational Input

FRL measurements for gamma discernible radiological COCs will involve measurements from mobile and stationary in-situ gamma spectrometry equipment. Physical samples may be collected to verify real-time measurements, or to investigate non-gamma resolvable ASCOCs.

Action Levels

FRLs established in the OU2 and OU5 Records of Decision are specific for radiological COC, and in some cases, vary between remediation areas. The FRLs were developed to account for health risks, cross media impact, background concentrations, and applicable or relevant and appropriate requirements (ARARs) and represent not-to-exceed contaminant-specific average soil concentrations. Real-time HPGe measurements may also be taken to support excavation to ALARA requirements. Physical samples may be used to verify HPGe readings and to precertify for non-gamma resolvable ASCOCs.

The 3x FRL concentrations/activities obtained through two-point averaging of mobile NaI measurements have been developed based on the ability of the instrumentation to resolve these levels. Refer to the Real-Time User's Manual for additional details.

Methods of Data Collection

FRL Phase I measurements will be utilized to obtain as close to complete coverage of the areas of concern. Hot spot confirmation and delineation measurements will be obtained during FRL Phase II by strategically placed stationary HPGe measurements. Analysis and data management for FRL Phase I data will be conducted at ASL A. FRL Phase II data may be conducted at either ASL A or ASL B, at the discretion of the Project. The decision to collect Phase II data at ASL A, or ASL B will depend on the Project's need for validated data. Only ASL B data is subject to validation, at project request. Real-time data collection for Phase II ASL A and ASL B measurements are identical. All measurements will be performed in compliance with operating procedures, the Real-Time User's Manual, the SEP, and the SCQ.

The FRL Phase I data will be utilized to establish general radiological concentration patterns and detect areas of elevated total gamma activity, as well as provide isotopic information for resolvable ASCOCs. The FRL Phase II HPGe gamma detectors will be used to confirm and delineate Phase I potential hot spot measurements, as needed. All real-time Phase I and Phase II measurements will be collected in accordance with the procedures identified in Section 7.0 of this DQO.

Surface physical samples may be collected to verify HPGe measurements for

non-gamma resolvable ASCOCs. If physical sampling is needed, it will be identified in PSPs. The data quality of these samples will be consistent with the latest sampling DQO.

4.0 The Boundaries of the Situation

Spatial Boundaries

Domain of the Decision: Boundaries are limited to surface soils of areas planned for certification, and adjacent areas, as defined in the individual work plans.

Population of Soils: The soils affected are surface soils (to a nominal depth of 6 inches), which include recently excavated surfaces and undisturbed soils associated with excavation areas as designated in the individual work plans.

Temporal Boundaries

Time Constraints on Real-Time Measurements: The scheduling of FRL scanning is closely associated with the design process and excavation schedule. FRL real-time scanning must be conducted prior to design, excavation, if any, and before certification activities begin. The scanning data must be returned and processed into useable format in time for the information to be useful within the current remediation schedule.

Practical Considerations: In-situ gamma spectrometry measurements cannot be made during snow coverage or standing water conditions or during precipitation. Field analytical methods should also be limited to unsaturated soils. Most areas undergoing scanning are flat, open terrain, and are readily accessible to the equipment. Some areas may require preparation, such as cutting of grass or removal of undergrowth, fencing and other obstacles. In situ measurements will require coordination with appropriate maintenance personnel for site preparation. Physical and environmental parameters will be recorded and assessed during data collection. Refer to the Real-Time User's Manual for additional details.

5.0 Develop a Logic Statement

Parameters of Interest

For FRL Phase I, parameters of interest are gross gamma activity and 3-times the FRL values of total uranium, radium-226 and thorium-232, as calculated by a moving two-point average of consecutive readings. For FRL Phase II, parameters of interest are all HPGe-discernable radiological ASCOCs.

FRL Target Levels

For FRL Phase I, target levels are the highest gross gamma activity readings, 3x FRL for total uranium, radium-226 and thorium-232, and WAC trigger levels for total uranium. For FRL Phase II, target levels are the FRLs of all gamma discernable radiological ASCOCs including the WAC trigger level for total uranium.

Decision Rules

Following FRL Phase I, any Phase I NaI scanned areas exhibiting patterns of high gross gamma activity will be measured with the HPGe. Also, any Phase I HPGe measurements greater than 3x FRL will be scanned with the HPGe for hot spot evaluation per section 3.3 of the Real-Time User's Manual.

Following FRL Phase II, if HPGe results indicate an area could fail FRLs, the soil may be evaluated further with additional HPGe measurements or physical samples, or undergo remedial excavations. If remedial excavations are performed, the excavated area will be measured with post-excavation HPGe measurements to ensure removal of the contamination. Once the remediation is complete, FRL attainment is confirmed by the HPGe.

6.0 Establish Constraints on the Uncertainty of the Decision

Range of Parameter Limits

The range of surface soil concentrations anticipated will be from background (natural concentrations) to greater than 3X FRL.

Types of Decision Errors and Consequences

Decision Error 1: This decision error occurs when the decision maker decides an area meets FRLs when the average soil concentration in an area is above the FRL, or the soil contains ASCOC concentrations above the hot spot criteria (3x FRL for hot spots ≤ 10 m^2, or 2x FRL for hot spots > 10 m^2). This decision error would lead to the area failing certification for average radiological COC concentrations above the FRL or for hot spot criteria. If an area fails certification sampling and analytical testing, remobilization and further excavation, precertification, and certification sampling would be necessary.

Decision Error 2: This decision error occurs when the decision maker decides that additional HPGe and/or physical samples are necessary based on FRL Phase II results; or the decision maker directs the excavation (or additional excavation) of soils, when they actually have average radiological COC concentrations below the FRLs and no ASCOC hot spots (3x FRL for hot spots ≤ 10 m^2, or 2x FRL for hot spots > 10 m^2). This would result in added sampling and analytical costs and/or added costs due to the excavation of clean soils and an increased volume in the OSDF. This is not as severe as Decision Error 1. The addition of clean soil to the

OSDF would result in further reduction, although minimally, to human health risk in the remediated areas.

True State of Nature for the Decision Errors

The true state of nature for Decision Error 1 is that the actual concentrations of radiological ASCOCs are greater than their FRLs and/or the hot spot criteria. The true state of nature for Decision Error 2 is that the true concentrations of COCs are below their FRLs and/or hot spot criteria. Decision Error 1 would be the more severe error.

7.0 Optimize a Design for Obtaining Quality Data

As discussed in Section 3.3.3 of the SEP, FRL scanning consists of two separate activities. Refer to Section 1.0 of this DQO for a general overview of FRL Phase I and FRL Phase II activities.

Real-time measurements are generated by two methods: 1) the mobile sodium iodide (NaI) detection systems which provide semi-quantitative radiological data, and 2) the stationary high purity germanium (HPGe) system that provides quantitative measurements of radiological COCs. If necessary, physical samples may also be collected for HPGe data verification, and to precertify for non-gamma resolvable ASCOCs.

Surface moisture readings are obtained in conjunction with Phase I and Phase II the NaI and HPGe system measurements using the Troxler nuclear moisture and density gauge or the Zeltex moisture meter. If conditions do not permit the use of the moisture meters, a soil moisture sample may be collected and submitted to the on-site laboratory for percent moisture analysis, or a default moisture value of 20% may be used. The soil moisture data will be used as is discussed in Sections 3.8, 4.11 and 5.2 of the Real-Time User's Manual. The gamma data will be corrected to a dry weight equivalent.

Background radon monitoring will also occur in conjunction with Phase I and Phase II NaI and HPGe system measurements, as specified in the PSP. Refer to the Section 5.3 of the Real-Time User's Manual for a discussion on radium-226 corrections.

Sodium Iodide (NaI) System

The mobile NaI detector systems are collectively called the Radiation Measurement Systems (RMS). They are used to achieve as close to complete coverage of the area as possible, taking into consideration the topographic and vegetative constraints which limit access. The NaI systems currently are used to obtain measurements over an area specified in a PSP to detect radiological total activity

patterns and elevated radiological activity. The NaI detector systems are used at a 31 cm detector height at 1 mph for a 4 second acquisition with a 0.4 meter overlap, and are consistent with the Real-time User's Manual. If the total uranium FRL is 20 ppm or lower, the NaI systems should not be used for FRL attainment, the HPGe system should be used.

The mobile NaI systems are electronically coupled with a global positioning system (GPS) rover and base unit to record each measurement location. Counting and positioning information is recorded continuously on a field personal computer (PC) and stored on disk or hard drive for future downloading on the site soil database and Graphical Information System (GIS) system, or transferred directly to the Local Area Network (LAN) by Ethernet.

Information from the NaI/GPS system is recorded on the PC and transferred to the Unix system through the local area network on a regular (at least daily) basis. The information is plotted on the FEMP GIS system, or in the field using Surfer software. With the output, patterns of elevated total activity, and locations of elevated concentrations can be identified.

Data reduction is an important aspect of NaI system data use. Individual total uranium, radium-226 and thorium-232 concentrations will undergo two-point averaging. The two-point averaged values will be mapped and evaluated with respect to 3x FRL.

NaI measurements may be used for design, excavation during remediation, and precertification decision making if the measurements clearly indicate below FRL criteria have been met. They may also be used to determine the location and number of FRL Phase II HPGe measurements, if required.

<u>In-Situ HPGe Detectors</u>

The HPGe detector is used during FRL Phase I or FRL Phase II, as follows:

- During FRL Phase I, the HPGe is used in areas where topographic or vegetative constraints prevent mobile NaI detector access or if the NaI systems are out of service. The HPGe is used in a 99.1% coverage grid over the accessible area. Detector height is 1 meter with a count time of 15 minutes.

- During FRL Phase II, the HPGe detector is used at strategic locations established thorough the FRL Phase I screening. These locations are where the highest readings of gross gamma activity were identified and/or where individual ASCOC concentrations were identified as hot spots. The HPGe is used to identify radiological COC levels, which in turn provide information concerning the ability to pass FRLs. The number of Phase II HPGe

measurements to delineate the hot spot boundary varies based on the size of extent of contamination. If the area potentially exceeding the 2x FRL or 3x FRL exhibits a visible contamination boundary, the Project may determine that Phase II measurements may not need to be collected.

Physical Soil Sampling

Physical samples may be collected and analyzed for target radiological COCs to verify the HPGe measurements and/or to precertify for non-gamma discernable ASCOCs. If physical samples are required, they will be collected in compliance with the applicable sampling DQO. Criteria for obtaining physical samples, such as sample density, will be specified in the PSP, if necessary. The minimum data quality acceptable for this purpose will be identified in the applicable sampling DQO. Field QC, ASL and Validation requirements will be consistent with the SCQ and SEP requirements.

Data Quality Objectives
Real Time FRL Measurements

1A. Task/Description: FRL real-time measurements.

1B. Project Phase: (Put an X in the appropriate selection.)

RI ☐ FS ☐ RD ☐ RA ☒ R_vA ☐ OTHER ☐

1.C. DQO No.: SL-056, Rev. 0 DQO Reference No.: Current Sampling DQO

---

2. Media Characterization: (Put an X in the appropriate selection.)

Air ☐ Biological ☐ Groundwater ☐ Sediment ☒ Soil ☒

Waste ☐ Wastewater ☐ Surface water ☐ Other (specify) _____

---

3. Data Use with Analytical Support Level (A-E): (Put an X in the appropriate Analytical Support Level selection(s) beside each applicable Data Use.)

Site Characterization
A ☒ B ☒ C ☐ D ☐ E ☐

Risk Assessment
A ☐ B ☐ C ☐ D ☐ E ☐

Evaluation of Alternatives
A ☐ B ☐ C ☐ D ☐ E ☐

Engineering Design
A ☒ B ☒ C ☐ D ☐ E ☐

Monitoring during remediation activities
A ☒ B ☒ C ☐ D ☐ E ☐

Other: Precertfication
A ☒ B ☒ C ☐ D ☐ E ☐

4.A. Drivers: Applicable or Relevant and Appropriate Requirements (ARARs), Operable Unit 5 Record of Decision (ROD), the Real-Time User's Manual, the Sitewide Excavation Plan and the Project-Specific Plan (PSP).

4.B. Objective: To determine if the area of interest is likely to pass FRLs for all HPGe discernable radiological COCs

---

5. Site Information (Description): The OU2 and OU5 RODs have identified areas at the FEMP that require remediation activities. The RODs specify that the soils in these areas will be clean and demonstrated to be below the FRLs.

6.A. Data Types with appropriate Analytical Support Level Equipment Selection and SCQ Reference: (Place an "X" to the right of the appropriate box or boxes selecting the type of analysis or analyses required. Then select the type of equipment to perform the analysis if appropriate. Please include a reference to the SCQ Section.)

1.	pH	☐	2.	Uranium	☒*	3. BTX	☐
	Temperature	☐		Full Rad.	☒*	TPH	☐
	Spec.Conductance	☐		Metals	☐	Oil/Grease	☐
	Dissolved Oxygen	☐		Cyanide	☐		
	Technetium-99	☐		Silica	☐		
4.	Cations	☐	5.	VOA	☐	6. Other (specify)	
	Anions	☐		ABN	☐	Percent Moisture	
	TOC	☐		Pesticides	☐		
	TCLP	☐		PCB	☐		
	CEC	☐					
	COD	☐					

* If specified in the PSP for NaI and HPGe detectable rad's.

6.B. Equipment Selection and SCQ Reference:

Equipment Selection	Refer to SCQ Section
ASL A Mobile NaI, HPGe and HPGe*	SCQ Section: Not Applicable
ASL B HPGe*	SCQ Section: App. G , Table 1
ASL C _____	SCQ Section: _____
ASL D _____	SCQ Section: _____
ASL E _____	SCQ Section: _____

* Choosing the ASL level for Phase II FRL HPGe measurements is at the discretion of the project considering the project need for validated data.

7.A. Sampling Methods: (Put an X in the appropriate selection.)

Biased [X] Composite [ ] Environmental [ ] Grab [X] Grid [X]

Intrusive [ ] Non-Intrusive [X] Phased [ ] Source [ ]

7.B. Sample Work Plan Reference: The DQO is being established prior to completion of the Project-Specific Plans.
Background samples: OU5 RI/FS

7.C. Sample Collection Reference:
-EQT-22, *Characterization of Gamma Sensitive Detectors*
-EQT-23, *Operation of High Purity Germanium Detectors*
-EQT-32, *Troxler 3440 Series Surface Moisture Gauge*
-EQT-33, *Real Time Differential Global Positioning System*
-EQT-39, *Zeltex Infrared Moisture Meter*
-EQT-40, *Satloc Real-time Differential Global Positioning System*
-EQT-41, *Radiation Measurement Systems*
-ADM-16, *In-Situ Gamma Spectrometry Quality Control*
-User Guidelines, Measurement Strategies, and Operational Factors for Deployment of In-Situ Gamma Spectrometry at the Fernald Site, 20701-RP-0006

---

8. Quality Control Samples: (Place an "X" in the appropriate selection box.)

8.A. Field Quality Control Samples:

Trip Blanks	[ ]	Container Blanks	[ ]
Field Blanks	[ ]	Duplicate Samples	[X] *
Equipment Rinsate Samples	[ ]	Split Samples	[ ]
Preservative Blanks	[ ]	PE Samples	[ ]

Other (specify) Radon Monitoring, moisture *
* If specified in the PSP.

8.B. Laboratory Quality Control Samples:

Method Blank	[ ]	Matrix Duplicate/Replicate	[ ]
Matrix Spike	[ ]	Surrogate Spikes	[ ]

Other (specify) _____

---

9. Other: Please provide any other germane information that may impact the data quality or gathering of this particular objective, task or data use.

APPENDIX B

TARGET ANALYTE LISTS

APPENDIX B
TARGET ANALYTE LISTS

TAL 20450-PSP-0001-A
(ASL B)

Analyte	Method	FRL limit	MDC
Total Uranium	ICP/MS or Alpha or Gamma Spectroscopy	82 ppm	8 ppm
Thorium-228	Alpha or Gamma Spectroscopy	1.7 pCi/g	0.17 pCi/g
Thorium-232	Alpha or Gamma Spectroscopy	1.5 pCi/g	0.15 pCi/g
Radium-226	Alpha or Gamma Spectroscopy	1.7 pCi/g	0.17 pCi/g
Radium-228	Alpha or Gamma Spectroscopy	1.8 pCi/g	0.18 pCi/g

TAL 20450-PSP-0001-B
(ASL B)

Analyte	Method	FRL limit	MDC
Total Uranium	ICP/MS or Alpha or Gamma Spectroscopy	82 ppm	8 ppm
Thorium-228	Alpha or Gamma Spectroscopy	1.7 pCi/g	0.17 pCi/g
Thorium-232	Alpha or Gamma Spectroscopy	1.5 pCi/g	0.15 pCi/g
Radium-226	Alpha or Gamma Spectroscopy	1.7 pCi/g	0.17 pCi/g
Radium-228	Alpha or Gamma Spectroscopy	1.8 pCi/g	0.18 pCi/g
Total Arsenic	ICP/MS or AES	12 ppm	1.2 ppm

TAL 20450-PSP-0001-C
(ASL B)

Analyte	Method	FRL limit	MDC
Total Uranium	ICP/MS or Alpha or Gamma Spectroscopy	82 ppm	8 ppm
Thorium-228	Alpha or Gamma Spectroscopy	1.7 pCi/g	0.17 pCi/g
Thorium-232	Alpha or Gamma Spectroscopy	1.5 pCi/g	0.15 pCi/g
Radium-226	Alpha or Gamma Spectroscopy	1.7 pCi/g	0.17 pCi/g
Radium-228	Alpha or Gamma Spectroscopy	1.8 pCi/g	0.18 pCi/g
Total Beryllium	ICP/MS or AES	1.5 ppm	0.15 ppm

MDC - minimum detection concentration