PROJECT SPECIFIC PLAN FOR PREDESIGN SAMPLING IN THE AREA 2, PHASE I NON-WASTE UNITS AND AREA 2, PHASE II - PART ONE

2364

SOIL AND DISPOSAL FACILITY PROJECT

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

INFORMATION ONLY

JULY 1999

U.S. DEPARTMENT OF ENERGY
FERNALD AREA OFFICE

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FERNALD ENVIRONMENTAL MONITORING PROJECT

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LIST OF ACRONYMS AND ABBREVIATIONS

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A2PI	Area 2, Phase I
A2PII	Area 2, Phase II
AFP	Active Flyash Pile
APM	Area Project Manager
ASCOC	area-specific constituent of concern
ASL	analytical support level
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COC	constituent of concern
CRDL	contract required detection limits
dpm	disintegrations per minute
DQO	Data Quality Objectives
ECDC	Engineering/Construction Document Control
FDF	Fluor Daniel Fernald
FEMP	Fernald Environmental Management Project
FRL	final remediation level
GPS	global positioning system
HPGe	high purity germanium detector
ICP/MS	Inductively Coupled Plasma/Mass Spectrometry
IFP	Inactive Flyash Pile
LAN	Local Area Network
MDC	minimum detectable concentration
NaI	Sodium Iodide
NISP	Non Impacted Soil Pile
NWUs	Non-Waste Units
OSDF	On-Site Disposal Facility
OU2	Operable Unit 2
OU5	Operable Unit 5
pCi/g	picocuries per gram
ppm	parts per million
PSP	Project Specific Plan
PWID	Project Waste Identification Document
QA	Quality Assurance
RI/FS	Remedial Investigation/Feasibility Study
RMS	Radiation Measurement System
RSS	Radiation Scanning System
RTIMP	Real-Time Instrumentation Measurement Program
RTRAK	Real-Time Radiation Tracking System
SDFP	Soil and Disposal Facility Project
SCQ	Sitewide CERCLA Quality Assurance Project Plan
SED	Sitewide Environmental Database
SEP	Sitewide Excavation Plan
SF	South Field
SWUs	Southern Waste Units
TALs	Target Analytes List
V/FCN	Variance/Field Change Notice

LIST OF ACRONYMS AND ABBREVIATIONS
(continued)

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WAC	Waste Acceptance Criteria
WAO	Waste Acceptance Organization

1.0 INTRODUCTION

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1.1 PURPOSE

The purpose of this project specific plan (PSP) is to provide details of the predesign sampling and real-time data collection activities to be conducted along the perimeter of the Southern Waste Units (SWUs). The SWUs include the Inactive Flyash Pile (IFP), South Field (SF), and Active Flyash Pile (AFP). Their locations at the Fernald Environmental Monitoring Project (FEMP) are depicted in Figure 1-1. This investigation area includes the remainder of Area 2, Phase I (A2PI) that was not included in the SWUs (i.e. known as the A2PI Non-Waste Units), and the extreme southern portion of Area 2, Phase II (A2PII) which lies up gradient from A2PI and has been designated as A2PII Part One (Figure 1-2). These sampling/real-time data collection activities are necessary to help determine if further excavation is needed in the perimeter areas around the SWUs after the waste units are excavated. Further excavation in these areas will be required if either of the following conditions exist:

- Sampling/real-time results indicate soil or soil like material has contamination levels exceeding Final Remediation Levels (FRLs)
- Visual examination of the soil cores indicate that flyash or other impacted material is still present.

The data collected will also be used to determine the appropriate disposition of the material if excavation is necessary (e.g. disposition in the On-Site Disposal Facility (OSDF) if the Waste Acceptance Criteria (WAC) are attained).

1.2 BACKGROUND

The A2PI Non-Waste Units (NWUs) and A2PII Part One areas are adjacent areas in the southwestern portion of the FEMP, surrounding the SWUs of Operable Unit 2 (OU2), and include a portion of the Operable Unit 5 (OU5) soils. Within the SWUs, various waste, materials including flyash, building rubble, gravel, asphalt, drums, and process waste may have been randomly dumped between the 1950s and 1980s. The surface features and area topography are depicted in Figure 1-3. Soil sampling/analysis projects for these areas have been conducted in the past, including a Characterization Investigation Study conducted by the Roy F. Weston Company, the OU2 and OU5 Remedial Investigation/Feasability Studies (RI/FS), Predesign Investigations for Site Preparation

(20401-PSP-001), Above-WAC Delineation (20400-PSP-0001), and Lead Delineation in the Firing Range (20402-PSP-0001).

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Data queries for this investigation were retrieved from the Sitewide Environmental Database (SED) to identify sample locations that exhibited contamination levels greater than the FRLs. The locations of these above-FRL samples identified in the data query, along with the results, are plotted in Figure 1-4. Note there were no sample locations with technetium-99 concentrations above-FRL.

A review of the mapped data shows five samples with above-FRL estimated concentrations for n-nitroso-di-n-propylamine. These results are not conclusive about the presence of this organic compound because the validated above-FRL n-nitroso-di-n-propylamine estimated values are the result of contract required detection limits (CRDLs) which are greater than the FRL. Review of the data packages shows that these samples were diluted per method by the subcontractor laboratory, effectively raising the CRDL above the FRL concentrations. It should be noted that the soil FRLs were established after receipt of the analytical report with the high CRDLs, and the samples taken in 1989 and 1993 were no longer available for re-analysis. While these data are inconclusive with respect to exceeding FRLs, process knowledge and disposal practices indicate these organic compounds are not likely to be found in the proposed predesign study area. Based on this information, organic compounds will not be retained as area-specific constituents of concern (ASCOCs). Additional investigation of these samples will not occur under this PSP.

Samples 121033 and 200058 have beryllium and arsenic results, respectively, slightly above-FRL. The beryllium result for sample 121033 was 1.7 parts per million (ppm) while the FRL for beryllium 1.5 ppm. The arsenic result for sample 200058 was 12.3 ppm while the FRL for arsenic is 12.0 ppm. Since the results are very close to the FRL limits these sample points will not be bounded in this PSP. However, additional sample points have been placed in these areas to help determine the extent of impacted material.

Two samples (055446 and 055476) south of Basin 2 have thorium-232 and/or thorium-228 results greater than the FRL. The depth of contamination at 055446 is the 16.5-17 foot depth while 055476 is the 11-11.5 foot depth. Samples 055446 and 055476 were collected from borings 21192 and 21193, respectively, and the data are summarized in the OU5 Remedial Investigation/Feasibility Study (RI/FS).

Over fifteen other samples were collected from each of these borings to a depth of over 19.5 feet. All other samples analyzed exhibited below-FRL concentrations for isotopic thorium as well as other constituents of concern (COCs). The possible sources of the elevated thorium concentrations at 055446 and 055476 are vertical migration of contaminated perched water, cross contamination of the sample, laboratory error, or mislabeling of samples (OU5 RI/FS). Due to this uncertainty, only the highest isotopic thorium sample location (055476) will be investigated further in this PSP.

Ten samples clustered south of Basin 3 exhibited above-FRL values for radium-226 and thorium-232. The depth of contamination for the 10 clustered samples is within one foot of the surface. In this PSP, further investigation of these areas will involve sampling near the same locations and depth intervals, with some samples bounding the potential contamination. This process is described in Section 2.5. Further investigation below Basin 3 is not possible at this time to avoid breaching the basin liner.

During the A2PI site preparation activities, three special material locations were identified as having elevated beta-gamma counts, visual evidence of product material, and/or soil discoloration. They are located in the following areas shown on Figure 1-2:

A. The current parking area for dump trucks (covered with rip-rap), located just south of the cool-down trailer

B. South of Basin 3, next to the concrete pad that holds the electrical panels

C. Northeast of the AFP where the ditch lined with rip-rap meets the storm sewer outfall ditch tree line.

For items A and B, the contaminated material was removed and placed in white metal boxes. However, personnel were unable to confirm a complete excavation of the material in the ditch area northeast of the AFP due to the steepness of the terrain (Figure 1-2, C). Samples and real-time measurements will be collected in these areas to further investigate other potentially contaminated material.

1.3 SCOPE

This PSP covers all data collection activities associated with predesign in the A2PI NWUs and A2PII Part One. This PSP supplements previous predesign investigations and does not cover any precertification or certification sampling. Fifty-two boring locations have initially been selected along the perimeter of the SWUs for radiological field frisking, lithological determination and potential submittal for radiological analysis. Portions of this perimeter area will be scanned with real-time *in situ* radiation measurement systems (RMS). All data collection activities will be consistent with the Sitewide Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Quality Assurance Plan (SCQ) and Section 3.1 of the Sitewide Excavation Plan (SEP). Physical samples will be collected in accordance with Data Quality Objectives (DQO) SL-048, Rev. 5 (Appendix A). Real-time data collection activities will be in accordance with DQO SL-054 and DQO SL-55 (Appendix A). The data will be utilized to assess whether COC concentrations in these areas are lower than the FRLs outlined in the OU5 Record of Decision. The data collected under this plan will also be utilized to determine whether soil and soil-like material from the area meet the WAC as defined in the SEP, the WAC Attainment Plan for the OSDF, and the Impacted Materials Placement Plan. All sampling activities and characterization data collection activities will conform to the requirements of the documents listed in Section 8.0.

1.4 KEY PERSONNEL

Personnel responsible for conducting work in accordance with this PSP are listed in Table 1-1.

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TABLE 1-1
KEY PERSONNEL

TITLE	PRIMARY	ALTERNATE
DOE Contact	Robert Janke	Kathi Nickel
Area 2 Project Manager	Tom Crawford	Jyh-Dong Chiou
Area 2 Characterization Lead	Mike Rolfes	John Centers
Real-Time Instrumentation Measurement Program (RTIMP) Manager	Joan White	Dave Allen
RTIMP Field Lead	Brian McDaniel	Dave Allen
Field Sampling Lead	Mike Frank	Tom Buhrlage
Surveying Lead	Jim Schwing	Jim Capannari
Data Management Lead	Deanna Diallo	Jeff Maple
Data Validation Contact	Jim Chambers	Jim Cross
Laboratory Contact	Bill Westerman	Denise Arico
Safety and Health Contact	Lewis Wiedeman	Debra Grant
Radiological Control Contact	Corey Fabricante	Dan Stempfley
Quality Assurance Contact	Reinhard Friske	Ervin O'Bryan
Waste Acceptance Organization (WAO) Contact	Linda Barlow	To Be Determined

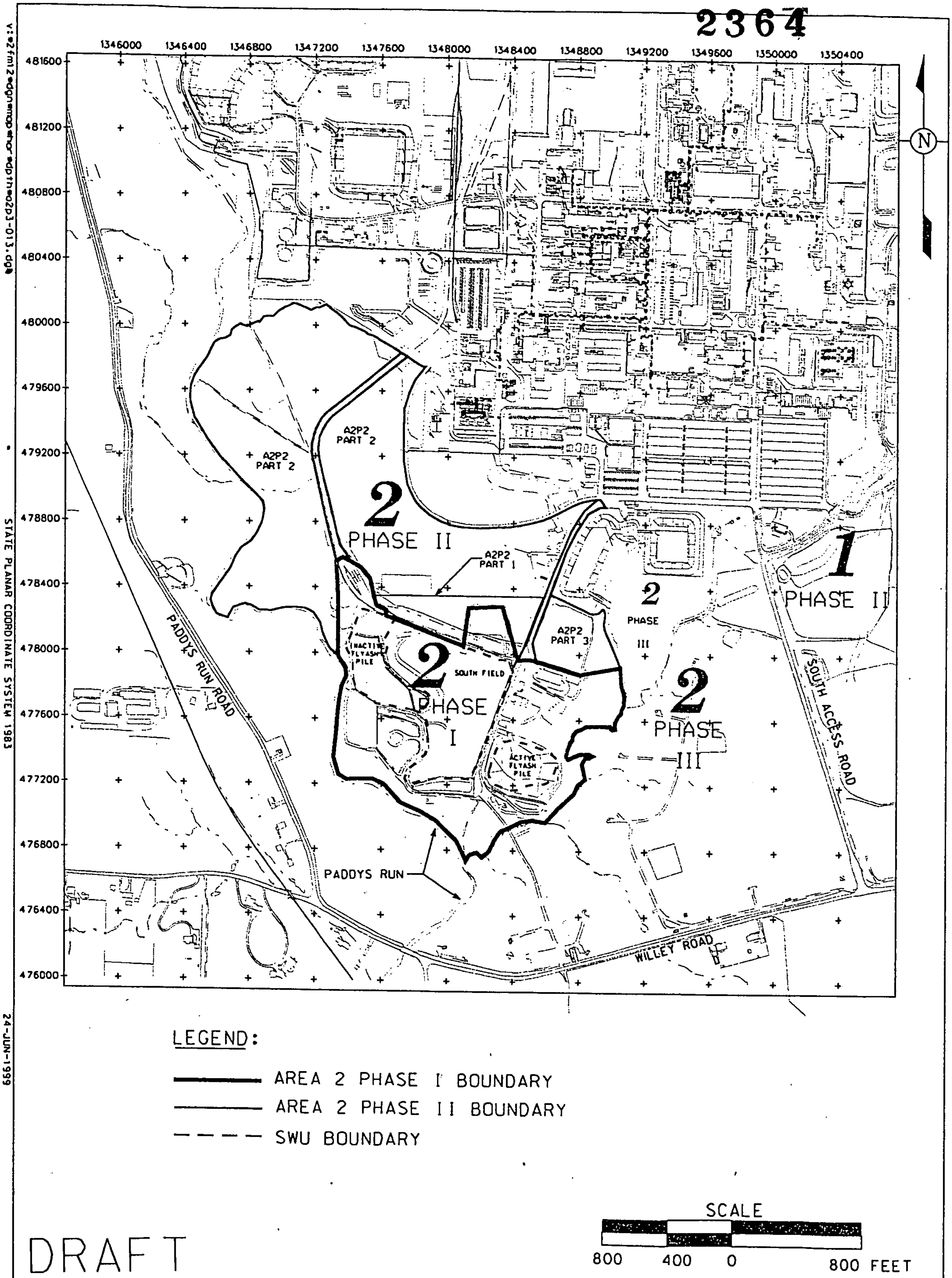

FIGURE 1-1. A2PI/A2PII LOCATION MAP

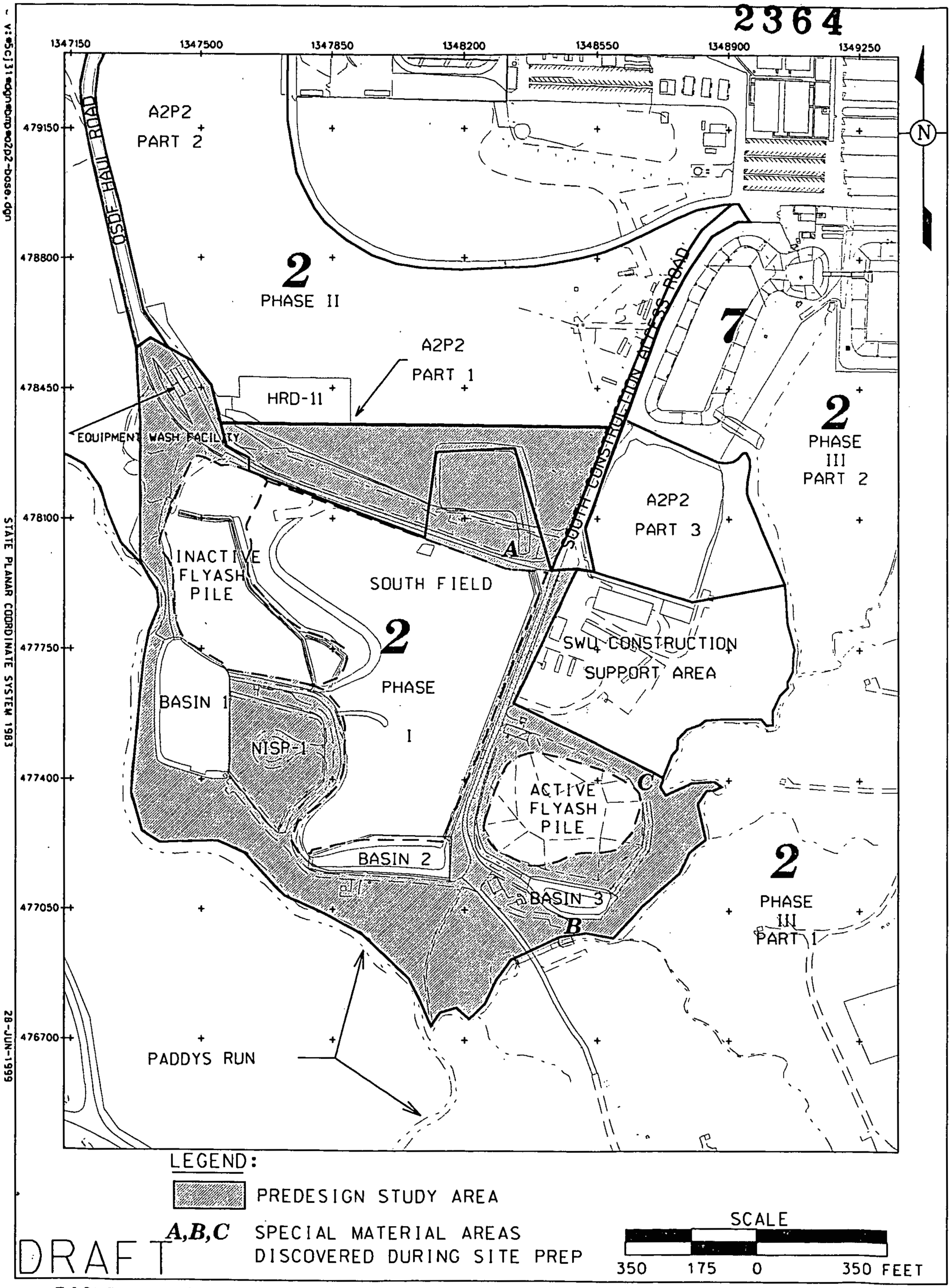

FIGURE 1-2. A2PI-NWU/A2PII PART ONE PREDESIGN INVESTIGATION ZONE

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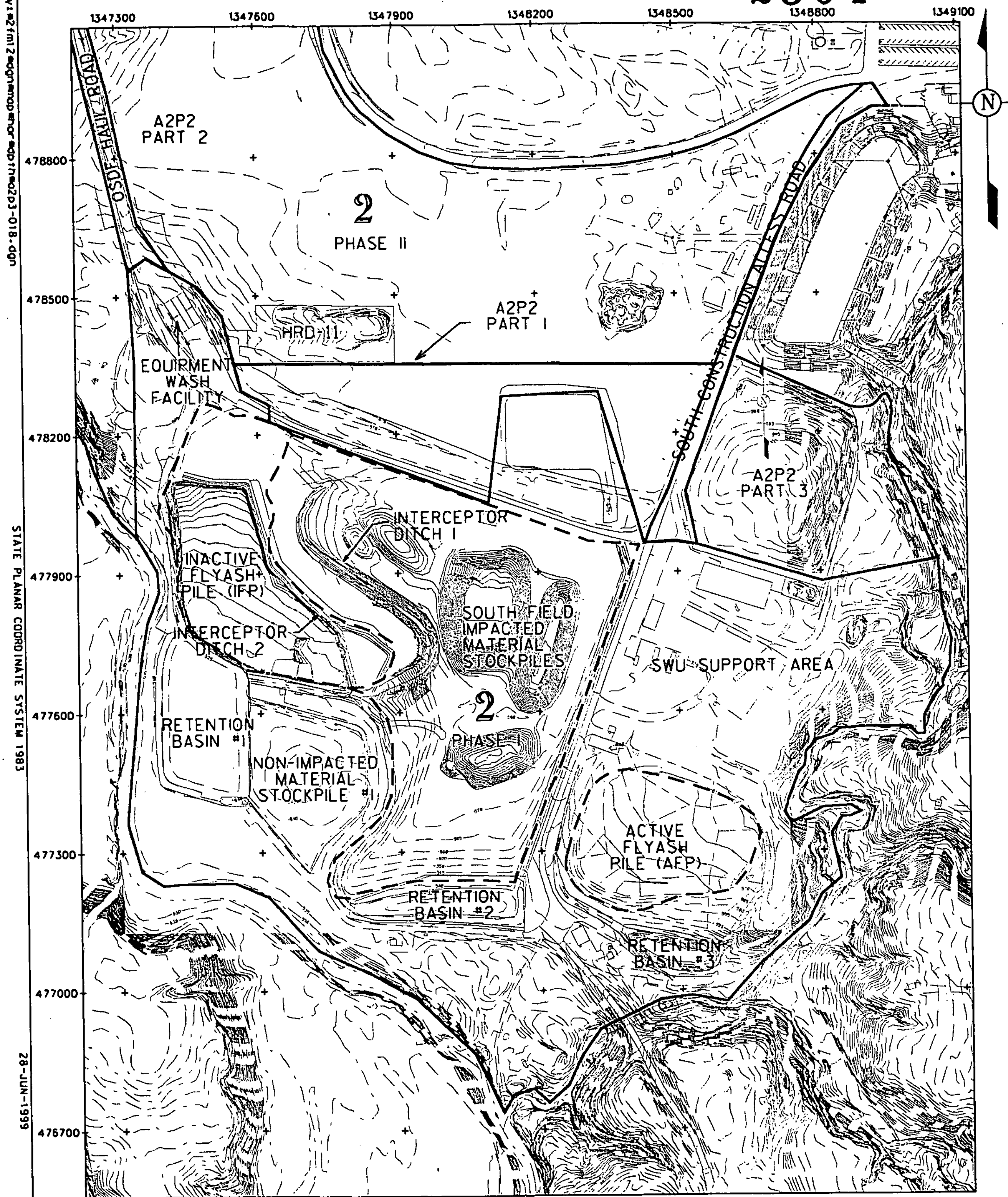

LEGEND:

——— AREA 2 PHASE I/PHASE II BOUNDARIES

- - - - - - SOUTHERN WASTE UNITS

SCALE

300 150 0 300 FEET

DRAFT

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FIGURE 1-3. A2PI-NWU/A2PII PART ONE TOPOGRAPHY/SURFACE FEATURES

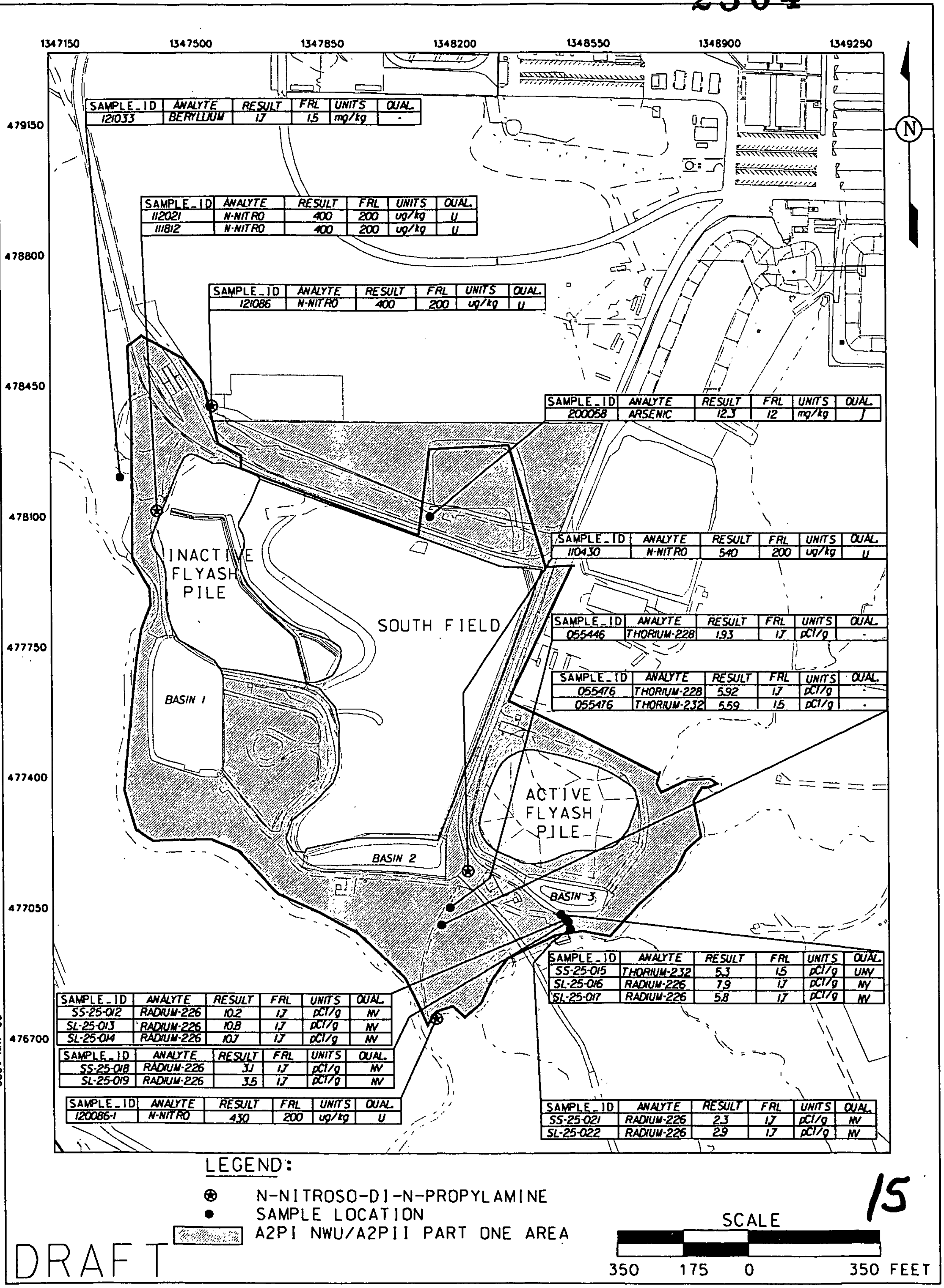

FIGURE 1-4. HISTORICAL ABOVE-FRL SAMPLE LOCATIONS

2.0 FIELD ACTIVITY

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2.1 SURVEYING SAMPLE POINTS

The sampling locations will be marked by the Fluor Daniel Fernald (FDF) Surveying and Mapping group. Northing (Y) and easting (X) coordinate values (NAD83, Ohio South Zone, #3402) will be determined using standard survey practices and standard positioning instrumentation [electronic total stations and Global Positioning System (GPS) receivers]. Field locations will be marked in a manner easily identifiable by all field personnel using survey stakes or flags. Survey information (coordinate data) will be downloaded at the completion of each survey job or at the end of each day and transferred electronically to the Survey Lead. This information will be forwarded to the Characterization Lead or Data Management Contact.

2.2 PHYSICAL SAMPLE COLLECTION

Forty-five locations will be sampled in A2PI along the western, southern and eastern perimeters surrounding the IFP, SF and the AFP. Seven locations in A2PII Part One, just north of the IFP and SF excavation boundaries, will also be sampled. The 52 boring locations (45 borings in A2PI and 7 borings in A2PII Part One) are shown in Figure 2-1 and are listed with identification numbers in Table 2-1. Boring locations were designed to determine the extent of impacted material (if any) around the perimeter of the SWUs. Additionally, some borings were placed south of Basins 2 and 3 to bound the above-FRL isotopic radium and thorium locations that were discovered during previous investigations. Placement of borings around Non-Impacted Soil Pile (NISP) 1 are needed to determine anticipated depth of excavation in this area. Based on previous sampling data for Basin 1, excavation is anticipated to go at least 18 inches underneath the NISP 1 liner.

The estimated depth for each boring varies depending on the topography and the amount of fill material expected. The depth for each boring was estimated based on process knowledge along with overlaying a 1952 topographical map with a current topographical map and calculating the differences in elevations for any given area. The depth of fill material in each area was estimated using this method as well as process knowledge. The estimated depth of the boring at each location is also listed in Table 2-1.

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Additional boring and sample locations may be identified by the Characterization Lead or designee based on the results of field measurement and analytical data. All boring and sample additions and/or field modifications will be documented in a Variance/Field Change Notice (V/FCN). Samples will be submitted to the FEMP on-site laboratory for analysis of the target analyte lists (TALs) identified in Appendix B.

2.2.1 Sample Collection and Screening Requirements

Samples will primarily be collected using the Geoprobe® Model 5400 and a Macro-core® sampler in accordance with procedure EQT-06, *Geoprobe Model 5400-Operation and Maintenance*. The sampling technicians will remove all existing surface vegetation within an approximate 6-inch radius of the sample point using a stainless steel trowel or clean nitrile gloves, taking care to minimize the removal of any soil. If required, the Geoprobe® drill bit will be used to drill through any pavement and/or cement/rock subsurface. At the Field Sampling Lead's discretion, other sampling tools may be utilized (e.g. dual tube sampler) in accordance with environmental monitoring procedures. If Geoprobe® accessibility is not possible, the technicians will retrieve the samples using a hand-operated auger, core barrel sampler, or manual Macro-core® sampler according to procedure SMPL-01, *Solid Sampling*. The core-type samplers are equipped with a internal plastic liner with an approximate 2-inch diameter. If the boring or sample location needs to be moved more than 3 feet due to inaccessibility, a V/FCN will be generated and approved.

Each boring should be advanced to the estimated depth or until the lithology indicates the boring has advanced through flyash, fill and/or debris and reached native soil. The cores will be laid on clean plastic, divided into 12-inch depth increments, and analyzed or archived as specified. Upon collection of the sample material, each 12-inch interval will be labeled and scanned with a beta-gamma field frisker by the radiological technician. In addition to the beta-gamma frisk, an alpha frisk will be conducted on the cores from the A2P1-NWU-21 and A2P1-NWU-26 locations, and their respective boundary borings, due to elevated thorium and radium analytical results at these locations during the previous characterization investigations. The A2P1-NWU-21 location is at the former 055476 sample location which exhibited the highest isotopic thorium concentration as discussed in Section 1-2. The A2P1-NWU-26 location is at the former SS-25-012/SL-25-013/SL-25-014 RI/FS sample location which exhibited the highest isotopic radium concentration as discussed in Section 1-2. Four additional

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bounding borings, designated as A, B, C, and D, will be taken at locations A2P1-NWU-21 and A2P1-NWU-26 shown on Figure 2-1.

Sample intervals exhibiting greater than background counts for beta-gamma activity, and/or 20 disintegrations per minute (dpm) for alpha activity, will be submitted for analysis, including the intervals above and below to potentially bound the contamination. If no sample intervals in a core exhibit 20 dpm or greater alpha, or greater than background counts for beta-gamma activity, then the first 12-inch interval (surface soil) will be submitted for analysis with the exception of locations A2P1-NWU-8 through A2P1-NWU-15. A sample interval from this subset will only be submitted for analysis if elevated beta-gamma activity is detected (i.e. greater than background counts). All intervals not submitted for analysis can be discarded after the field frisking and visual classification is complete (expect for A2P1-NWU-21 and 26 and their respective bounding borings where all intervals will be archived). In addition, the 11-12 foot depth interval for A2P1-NWU-21 and the 0-1 foot depth interval for A2P1-NWU-26 will be submitted for analysis regardless of the field frisker reading.

The visual classification of the soil material (determined by a Geologist) along with the frisker readings will be recorded on the Visual Classification of Soils log. Sampling objectives are to collect contaminated soil only; therefore, gross fragments of construction rubble (e.g. bolts, nails, concrete, wood, metal) will be removed prior to performing the radiological frisks and placing each soil interval into a sample container. A description of the removed construction rubble will be recorded in the Visual Classification of Soils log.

All field measurements and sample collection information shall be recorded on the Sample Collection Log, the Field Activity Log and the Chain of Custody/Request for Analysis as required. All samples will be assigned a unique sample number which shall appear on the Chain of Custody/Request for Analysis and used to identify the sample during analysis, data entry, and data management.

2.2.2 Sampling Equipment Decontamination

Sampling equipment that comes in contact with the soil sample intervals will be decontaminated by Level II methods prior to transport to the field location, at each cutting shoe change (in the case of the Macro-core® sampler) and after sampling under this PSP is completed. If hand augers are used, a Level II decontaminated auger should be used for each one-foot soil interval. Probe rods and other equipment that does not contact the soil interval being collected does not require decontamination between sample boring locations. The decontaminated equipment can be dried with clean disposable wipes or air dried.

2.2.3 Borehole Abandonment

Each borehole will be plugged using bentonite pellets immediately after sampling is completed. Borehole collapse, expected to be minimal in the sampling area, does not pose a significant risk of contaminating deeper zones due to the immediate placement of pellets into the borehole following soil core collection. Any surface gravel or rock will be replaced with the equal thickness of a similar material. A Borehole Abandonment Log will be completed for each boring location.

2.3 REAL-TIME MEASUREMENTS

Real-time measurements will be taken in four areas within this investigation zone. These areas are based on the location of previous special material excavations, proximity to the IFP, and areas where RI/FS sampling indicated greater than FRL results. The area for real-time scanning is depicted in Figure 2-2. The real-time data will be used to assess the need for additional physical sample locations or adjust existing sample locations if necessary and to further investigate contamination levels greater than FRLs. Real-time surface measurements will be collected at Analytical Support Level (ASL A) and will require no data validation (refer to the SCQ for a definition of ASLs).

2.3.1 *In Situ* Gamma Spectroscopy Equipment Determination

The suspect areas will be characterized using *in situ* gamma spectrometry equipment [RMS systems which utilize a Sodium Iodide (NaI) detector system, and/or the high-purity germanium (HPGe) detector system], consistent with DQO SL-054 and the User's Manual. The real-time radiation tracking system (RTRAK) is utilized for larger flat areas that are readily accessible. The radiation scanning system (RSS) is utilized for smaller areas, gradual slopes or areas not accessible by the RTRAK. The HPGe is utilized for areas that are inaccessible to both the RTRAK or RSS. A walk-down of the area by representatives from Characterization and/or RTIMP may be required to determine the appropriate type of *in situ* gamma spectroscopy equipment needed. The decision to use any of these evaluation techniques will be made by the Characterization Lead or designee and RTIMP Field Lead or designee.

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2.3.2 RMS Data Acquisition

The RMS will be used to conduct a surface scan covering as close to 100 percent coverage as possible of the accessible area. The spectral acquisition time will be 4 seconds with data collected at a detector speed of 1 mile per hour as determined by the on-board GPS. The RTRAK or RSS passes will typically be in a back and forth pattern after two perimeter passes have been completed. Alternatively, a circular pattern may be more appropriate. The RTRAK overlapping passes are achieved by placing the innermost tire track in the former outermost tire track from the previous passes, achieving an approximate 0.4 m scanning overlap. Stakes or other markers may be used to keep the RSS on track. The RTRAK or RSS measurements will be accompanied by GPS northing and easting coordinates. GPS operations are described in Section 5.8 of the User's Manual. The RTRAK or RSS will use a 2 point running average (2 spectra average) to determine the trigger level of 1x the FRL for the following COCs: total uranium (1x FRL = 82 parts per million), thorium-232 (1x FRL = 1.5 pCi/g), radium-226 (1x FRL = 1.7 pCi/g). If RTRAK or RSS scans indicate measurement results greater than 1x FRL for total uranium, thorium-232, or radium-226, the location of the above-trigger level measurements may be further investigated with HPGe measurements or physical sampling. This determination will be at the discretion of the Characterization Lead or designee. If confirmation and/or delineation measurements are collected, the data will be collected at ASL B and 10 percent will be validated.

2.3.3 HPGe Data Acquisition

If the HPGe detectors are used to conduct a surface scan, the data acquisition parameters will be as follows: a detector height of 1 meter and a spectral acquisition time of 15 minutes. If more than one HPGe measurement is required, the center of the measurements should be located nominally 11 meters (approximately 36 feet) apart to achieve the 99.1 percent coverage. The HPGe trigger level for characterization with 1 meter detector heights is 1x the FRL for the following COCs: total uranium (1x FRL = 82 parts per million), thorium-232 (1x FRL = 1.5 pCi/g), radium-226 (1x FRL = 1.7 pCi/g). If the HPGe scans indicate measurement results greater than 1x FRL for total uranium, thorium-232 or radium-226, then the location of the above-trigger level measurements may be further investigated with physical sampling. This determination will be at the discretion of the Characterization Lead or designee.

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HPGe measurements will be accompanied by GPS northing and easting coordinates. One duplicate HPGe measurement will be collected for every 20 HPGe measurements performed. The duplicate will be collected immediately after the initial measurement at the same acquisition time and detector height.

2.3.4 Surface Moisture Measurements

Surface moisture measurements are used to correct *in situ* RTIMP equipment gamma spectroscopy measurement data in order to report data on a dry weight basis prior to mapping. Surface moisture measurements will be collected with an *in situ* moisture measurement instrument (*i.e.*, Troxler moisture gauge or Zeltex Infrared Moisture Meter) within 8 hours of the collection of the *in situ* RTIMP equipment gamma spectroscopy measurement data. Moisture measurements may be taken more frequently if ambient weather or soil moisture conditions change or are expected to change, including watering for dust control. Field conditions, such as weather, will be noted on the applicable electronic field worksheet.

In addition, at least one surface moisture measurement will be collected for each area that is approximately 0.5 acre (100 feet by 200 feet) in size or smaller. More than one moisture measurement can be collected for each area if the surface moisture appears visibly different over the area. If a large difference in measurements is noted by the RTIMP Lead or designee, the data will be re-evaluated. One surface moisture measurement will be collected at each HPGe measurement location.

If conditions prevent the use of a field moisture instrument, a default moisture value of 20 percent (which will overcorrect data in dry conditions and under correct in wet conditions) may be used or a soil moisture core can be collected to a depth of 4 inches and submitted to the on-site laboratory for moisture analysis only. Field moisture measurements and moisture-corrected data are discussed in detail in Sections 3.8 and 5.2 of the User's Manual.

2.4 BACKGROUND RADON MONITORING

Background radon monitoring will be utilized during the collection of real-time measurements to obtain background radon information from the time 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 background radon data will be used per Section 5.3 of the User's Manual to correct the radium-226 data.

2.5 REAL-TIME DATA MAPPING

As the measurements are acquired by the Survey and RTIMP Teams, the data will be electronically loaded into mapping software through manual file transfer or Ethernet. A set of maps and/or data summaries will be given to the Characterization Lead or designee. Maps will be generated indicating radionuclide concentrations at geographic locations (northing and easting). The maps will depict the following:

- COC Concentration Maps - total uranium, radium-226, thorium-232 (2 point running average) depicting 0.5X FRL, 1X FRL, 2X FRL, and 3X FRL concentrations. The total uranium concentration maps will also depict above-WAC concentrations, if present.

- HPGe Location Map - shows field of view circles that are color coded for COC concentrations and denotes identification number for each HPGe measurement, including a data summary printout for each HPGe measurement.

2.6 TRACKING/MANAGING DATA COLLECTION

All physical samples and real-time measurements will be assigned a unique alpha-numeric identification for data tracking purposes and will contain one or more of the following designators:

1. Area Designator: Denotes physical sampling area or real-time measurement area:
   A2P2-PT1 =Area 2, Phase II Part One
   A2P1-NWU = Area 2, Phase I - Non-Waste Unit

   Note: A numerical "2, 1" is used in place of the roman numerals "II, I" for data management purposes

2. Location Designator: Physical sample number designates the sequential numbering of physical samples. The first sample taken is 1 and any subsequent samples are numbered sequentially (2, 3, 4, etc.).
   OR
   Batch number designates the sequential numbering of batch runs that are unique to each of the RMS systems
   OR
   HPGe measurement number designates the sequential numbering of HPGe measurements. The first measurement taken is 1 and any subsequent measurements are numbered sequentially (2, 3, 4, etc.).

3. Depth Interval (if applicable) : Denotes depth interval in 12 inch increments, 1 (0 to 1 ft), 2 (1 - 2 ft), etc.

4. Measurement designator: G = HPGe gamma measurement and associated moisture measurement
   R = Lab analysis for radiological constituents
   V = Archived sample

5. Quality control designators (if necessary): D = duplicate measurement

Using these guidelines, the unique identification scheme for each measurement technique is as follows:

RMS Measurement Identification: use No. 1 and 2 designators above.

Example: A2P1-NWU-684 where: A2P1-NWU = Area 2, Phase I Non-Waste Unit
684 = RTRAK batch #684

HPGe Measurement Identification: use 1,2,4,5 (if appropriate)

Example: A2P1-NWU-3-G-D where: A2P1-NWU = Area 2 Phase I Non-Waste Unit
3 = Third HPGe measurement taken in this area
G = HPGe gamma measurement
D = duplicate

Physical Sample Identification:

Example: A2P2-PT1-4-2-R where: A2P2 = Area 2, Phase II Part One
4 = Fourth sample taken in this area
2 = 1 to 2 ft sample depth interval
R = Lab analysis for radiological constituents

Radon Monitoring Measurement Designation for Real-Time Measurements:

1. Prefix designating the area name: Denotes physical sampling area or real-time measurement area:
   A2P1-NWU = Area 2, Phase I - Non-Waste Unit

2. Monitoring activity: RADON = Radon monitoring

3. Detector Height: A = 1 meter
   B = 31 cm
   C = 15 cm

4. Sequential numbering of radon monitoring: 1, 2, 3, etc.

Example: A2P1-NWU-RADON-A-1 where:
A2P1-NWU = Area 2, Phase III Non-Waste Units
RADON = Radon monitoring
A = 1 meter
1 = first radon monitoring event

Table 2-1
A2PI-NWU/A2PII Part One Sample Identifications

Boring ID	Sample ID	Northing	Easting	Depth	TAL
A2P1-NWU-1	A2P1-NWU-1-X-Y	478409.94	1347359.79	4 ft	A
A2P1-NWU-2	A2P1-NWU-2-X-Y	478320.31	1347349.32	4 ft	A
A2P1-NWU-3	A2P1-NWU-3-X-Y	478289.48	1347439.40	4 ft	A
A2P1-NWU-4	A2P1-NWU-4-X-Y	478230.62	1347391.73	4 ft	A
A2P1-NWU-5	A2P1-NWU-5-X-Y	478123.59	1347363.25	5 ft	A
A2P1-NWU-6	A2P1-NWU-6-X-Y	477985.95	1347387.18	8 ft	A
A2P1-NWU-7	A2P1-NWU-7-X-Y	477799.84	1347398.40	6 ft	A
A2P1-NWU-8	A2P1-NWU-8-X-Y	477627.59	1347689.59	5 ft	A
A2P1-NWU-9	A2P1-NWU-9-X-Y	477571.96	1347837.30	5 ft	A
A2P1-NWU-10	A2P1-NWU-10-X-Y	477466.88	1347854.71	5 ft	A
A2P1-NWU-11	A2P1-NWU-11-X-Y	477327.68	1347755.84	5 ft	A
A2P1-NWU-12	A2P1-NWU-12-X-Y	477383.19	1347485.58	5 ft	A
A2P1-NWU-13	A2P1-NWU-13-X-Y	477355.69	1347581.54	5 ft	A
A2P1-NWU-14	A2P1-NWU-14-X-Y	477284.12	1347645.10	5 ft	A
A2P1-NWU-15	A2P1-NWU-15-X-Y	477170.16	1347728.57	5 ft	A
A2P1-NWU-16	A2P1-NWU-17-X-Y	477121.58	1347891.23	4 ft	A
A2P1-NWU-17	A2P1-NWU-17-X-Y	477035.01	1347971.50	4 ft	A
A2P1-NWU-18	A2P1-NWU-18-X-Y	477107.15	1348027.65	4 ft	A
A2P1-NWU-19	A2P1-NWU-19-X-Y	476971.83	1348108.70	4 ft	A
A2P1-NWU-20	A2P1-NWU-20-X-Y	477078.48	1348160.49	4 ft	A
A2P1-NWU-21	A2P1-NWU-21-X-Y	477005.48	1348151.09	16 ft	B
A2P1-NWU-21A	A2P1-NWU-21A-X-Y	477010.11	1348153.14	12 ft	B
A2P1-NWU-21B	A2P1-NWU-21B-X-Y	477004.17	1348155.86	12 ft	B
A2P1-NWU-21C	A2P1-NWU-21C-X-Y	477000.83	1348149.40	12 ft	B
A2P1-NWU-21D	A2P1-NWU-21D-X-Y	477007.09	1348146.36	12 ft	B
A2P1-NWU-22	A2P1-NWU-22-X-Y	476891.58	1348084.04	4 ft	A
A2P1-NWU-23	A2P1-NWU-23-X-Y	477178.44	1348182.59	4 ft	A
A2P1-NWU-24	A2P1-NWU-24-X-Y	476941.27	1348194.46	5 ft	A
A2P1-NWU-25	A2P1-NWU-25-X-Y	477120.61	1348319.08	4 ft	A
A2P1-NWU-26	A2P1-NWU-26-X-Y	477019.68	1348477.48	4 ft	C
A2P1-NWU-26A	A2P1-NWU-26A-X-Y	477024.65	1348478.82	4 ft	C
A2P1-NWU-26B	A2P1-NWU-26B-X-Y	477019.06	1348482.49	4 ft	C
A2P1-NWU-26C	A2P1-NWU-26C-X-Y	477014.78	1348476.81	4 ft	C
A2P1-NWU-26D	A2P1-NWU-26D-X-Y	477021.40	1348469.55	4 ft	C
A2P1-NWU-27	A2P1-NWU-27-X-Y	477021.57	1348558.16	4 ft	A
A2P1-NWU-28	A2P1-NWU-28-X-Y	477061.14	1348594.27	4 ft	A
A2P1-NWU-29	A2P1-NWU-29-X-Y	477137.59	1348497.38	4 ft	A
A2P1-NWU-30	A2P1-NWU-30-X-Y	477140.91	1348590.83	4 ft	A
A2P1-NWU-31	A2P1-NWU-31-X-Y	477201.58	1348634.94	4 ft	A
A2P1-NWU-32	A2P1-NWU-32-X-Y	477259.93	1348689.81	6 ft	A
A2P1-NWU-33	A2P1-NWU-33-X-Y	477348.51	1348681.56	6 ft	A
A2P1-NWU-34	A2P1-NWU-34-X-Y	477447.55	1348568.14	4 ft	A
A2P1-NWU-35	A2P1-NWU-35-X-Y	477527.82	1348432.50	6 ft	A
A2P1-NWU-36	A2P1-NWU-36-X-Y	478018.09	1348362.51	4 ft	A
A2P1-NWU-37	A2P1-NWU-37-X-Y	478081.40	1348184.37	4 ft	A
A2P2-PT1-1	A2P2-PT1-1	478135.01	1348020.84	4 ft	A
A2P2-PT1-2	A2P2-PT1-2	478182.73	1347860.45	4 ft	A
A2P2-PT1-3	A2P2-PT1-3	478243.30	1347697.15	4 ft	A

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Table 2-1
A2PI-NWU/A2PII Part One Sample Identifications

Boring ID	Sample ID	Northing	Easting	Depth	TAL
A2P2-PT1-4	A2P2-PT1-4	478339.37	1347548.62	4 ft	A
A2P2-PT1-5	A2P2-PT1-5	478227.27	1348105.17	4 ft	A
A2P2-PT1-6	A2P2-PT1-6	478300.78	1348133.11	4 ft	A
A2P2-PT1-7	A2P2-PT1-7	478301.30	1348258.62	4 ft	A

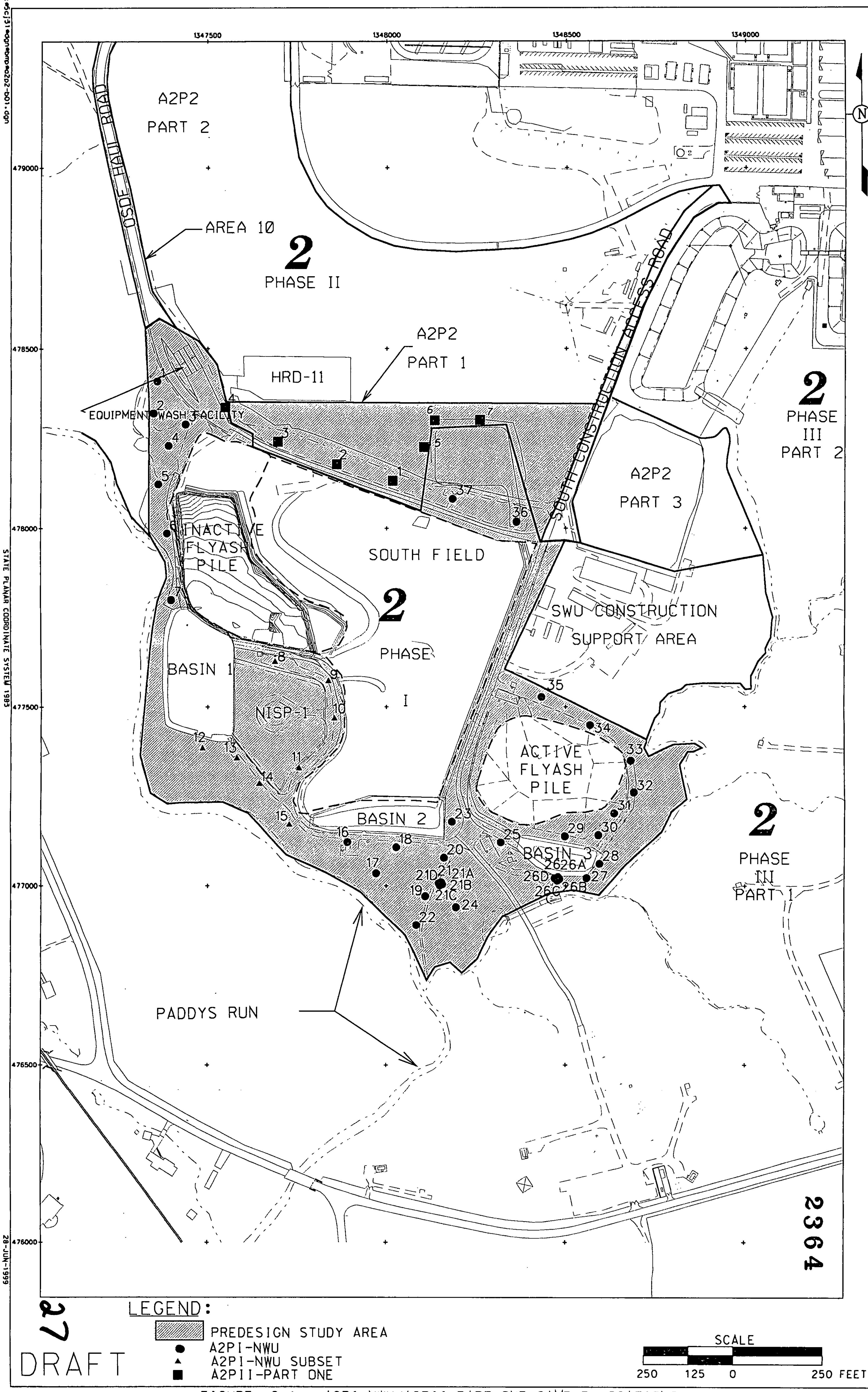

FIGURE 2-1. A2PI-NWU/A2PII-PART ONE SAMPLE LOCATIONS

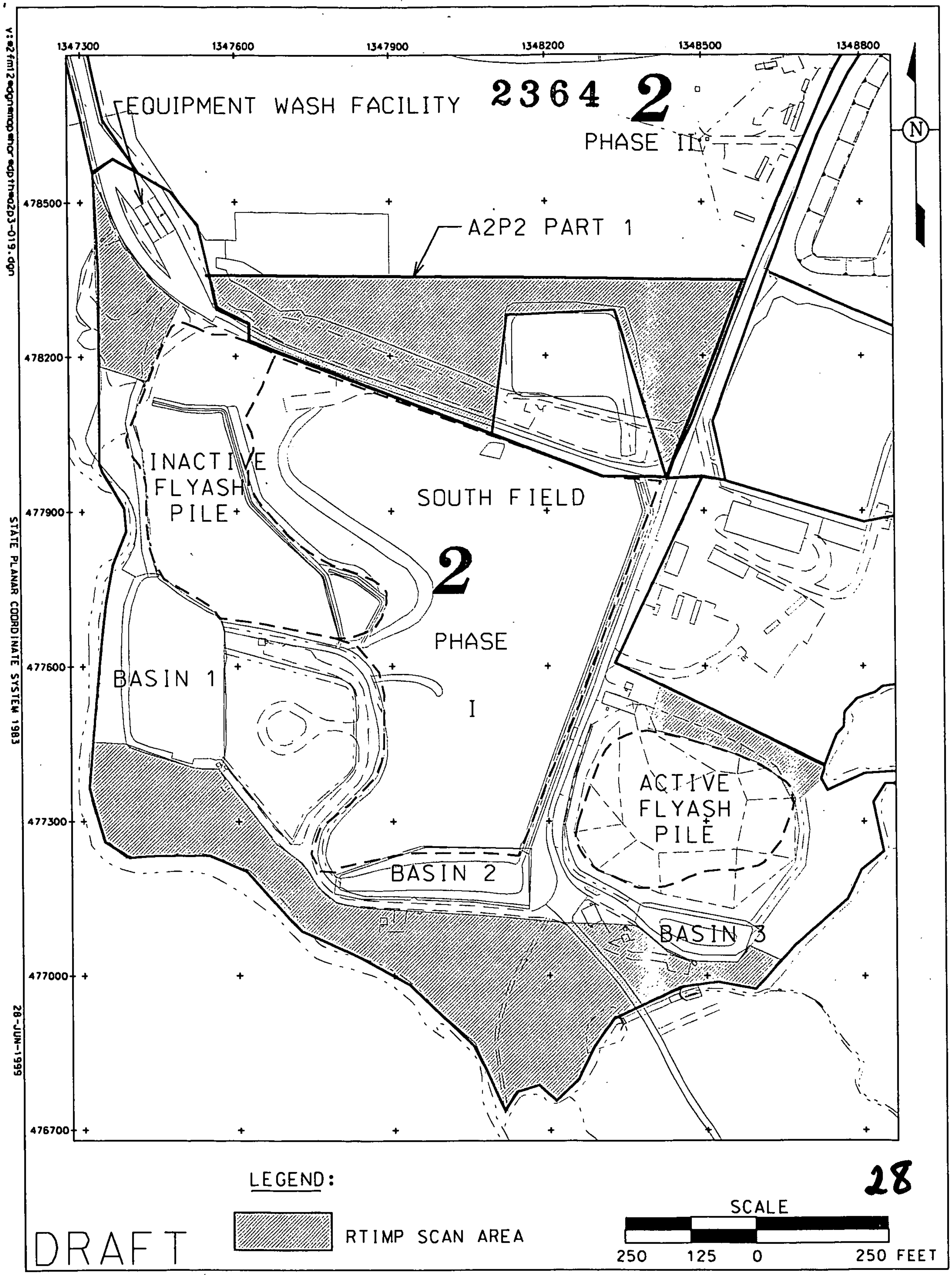

FIGURE 2-2. REAL-TIME SCAN MEASUREMENT AREA

3.0 PREDESIGN SAMPLE ANALYSIS

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All soil samples collected in A2PI-NWU and A2PII Part One (with the exception of A2P1-NWU-21, A2P1-NWU-26 and their bounding points A,B,C,D) and submitted to the FEMP on-site laboratory will be analyzed for total uranium analysis with the sampling and analytical requirements listed in Table 3-1.

The soil samples collected at point A2P1-NWU-21 and its bounding points (A,B,C,D) will be submitted to the FEMP on-site laboratory for analysis for total uranium, thorium-228 and thorium-232 with the sampling and analytical requirements listed in Table 3-2.

Soil samples collected at point A2P1-NWU-26 and its bounding points (A,B,C,D) will be submitted to the FEMP on-site laboratory for analysis for total uranium and radium-226 with the sampling and analytical requirements listed in Table 3-3.

The necessary volume of all samples collected will be prepared for the appropriate analytical method per requirements of the SCQ. The TALs are shown in Appendix B. Data validation requirements are listed in Table 3-4.

If the Area Project Manager (APM) decides to analyze samples subject to methods not described in the SCQ, the APM shall ensure that:

- A V/FCN includes references confirming that the new method is sufficient to support data needs
- Variations from the SCQ methodology are documented in the PSP, or
- The APM may request data validation for affected samples or communicate to the lab that Data Qualifier Codes of J and R be attached to detected and nondetected COCs, respectively.

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TABLE 3-1
SAMPLING AND ANALYTICAL REQUIREMENTS

Analyte	Method	Sample Matrix	Lab	ASL	Preserve	Holding Time	Sample Volume
Total uranium	ICP/MS	Solid	On-site	B	None	12 months	100 ml*

TABLE 3-2
SAMPLING AND ANALYTICAL REQUIREMENTS FOR A2P1-NWU-21 (A,B,C,D)

Analyte	Method	Sample Matrix	Lab	ASL	Preserve	Holding Time	Sample Volume
Total uranium, Thorium-228, Thorium-232	ICP/MS Alpha or Gamma Spectroscopy	Solid	On-site	B	None	12 months	300 ml*

TABLE 3-3
SAMPLING AND ANALYTICAL REQUIREMENTS FOR A2P1-NWU-26 (A,B,C,D)

Analyte	Method	Sample Matrix	Lab	ASL	Preserve	Holding Time	Sample Volume
Total uranium Radium-226	ICP/MS Alpha or Gamma Spectroscopy	Solid	On-site	B	None	12 months	300 ml*

* Sample container type is determined at the field team's discretion.

TABLE 3-4
DATA VALIDATION REQUIREMENTS

ASL Level	Percent Validated
ASL A	No data validation required
ASL B	10 percent data validation required

4.0 DISPOSITION OF WASTES

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During completion of physical sampling activities, field personnel may generate small amounts of soil, sediment, water, contact waste, or construction rubble that was segregated from soil samples (e.g. bolts, nails, concrete, metal). Management of these waste streams will be coordinated through the Project Waste Identification Document (PWID) process. Sample material, including archived predesign samples that are no longer needed, will be managed per PWID #467. Generation of decontamination waters will be minimized in the field. This water will be disposed of in a stormwater collection basin that discharges to the Advanced Wastewater Treatment facility after approval of the FEMP Wastewater Discharge Request. Contact waste generation will be minimized by limiting contact with sample media and by only using disposable materials which are necessary. This waste stream will be managed with radiological control point waste per PWID.

Archive soil samples will be disposed of following regulatory agency approval of the remedial action plan for the A2PI NWUs and A2PII Part One soil. This approval is expected to be received in the fourth quarter of 1999. The location for disposition of these soils will be determined be the WAO Lead or designee.

5.0 QUALITY ASSURANCE REQUIREMENTS

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Physical sampling and real-time data collection will be performed in accordance with the requirements in the latest revision of the SCQ and SCQ Addendum. The DQO for physical sampling under this plan is DQO SL-048, *Delineating the Extent of Constituents of Concern During Remediation Sampling*, Revision 5 and the DQOs for real-time characterization are DQO SL-054 and DQO SL-055 (Appendix A).

5.1 SURVEILLANCE

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

5.2 IMPLEMENTATION OF FIELD CHANGES

If field conditions require changes or variances, verbal approval must be obtained from the Characterization Lead, WAO Representative, and QA Representative before the changes can be implemented (electronic mail is acceptable as document approval). 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, WAO Representative, and the QA Representative within seven working days of granting verbal approval.

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6.0 SAFETY AND HEALTH

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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 by all personnel in the performance of their assigned duties.

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

7.0 DATA MANAGEMENT

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The RTIMP group will provide hard copy maps and/or summary reports to the Characterization Lead and Data Management Contact or designees. All Real-Time data collection will be collected and reported at a minimum ASL A and required no data validation. All physical samples and RTIMP confirmation/delineation measurements will be collected and reported at ASL B and will require 10 percent data validation. All electronically recorded field data will have the RMS or HPGe Data Verification Checklist (Section 5.4 of the Real Time User's 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 equipment 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 SED, the Data Management Contact 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 7-1), dated and signed.

Copies of field documentation shall be generated and provided to the Characterization Lead or Data Management Contact 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 should reference the PSP number and eventually be forwarded to ECDC to be placed in the project file.

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PSP/Project #:__________

Batch Numbers:__________

HPGe file Numbers:__________

REAL-TIME ELECTRONIC DATA QUALITY CONTROL CHECKLIST

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#	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__________

FIGURE 7-1

PSP/Project #:________________________

Batch Numbers:________________________

HPGe file Numbers:________________________

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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_________________________________

FIGURE 7-1

8.0 APPLICABLE DOCUMENTS, METHODS, AND STANDARDS

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Excavation characterization activities described in this plan shall follow the requirements outlined in the following documents, procedures, and standard methods (including the latest revision of each document):

- *Area 2, Phase I Integrated Remedial Design Package (IRDP)*, which includes the *Area 2, Phase I Southern Waste Units Implementation Plan for Operable Unit 2*, 2502-WP-0029, Revision 0, July 1998
- *Sitewide Excavation Plan*, 2500-WP-0028, Revision 0, July 1998
- *Waste Acceptance Criteria Attainment Plan for the On-Site Disposal Facility*, 20100-PL-0014, Revision 0, June 1998
- *Impacted Materials Placement Plan*, 20100-PL-0007, Revision 0, January 1998
- *User Guidelines, Measurement Strategies, and Operational Factors for Deployment of In-Situ Gamma Spectroscopy at the Fernald Site* (User's Manual), 20701-RP-0006, Draft Revision B, July 1998
- *Sitewide Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Quality (SCQ) Assurance Project Plan*, FD-1000, Revision 1, September 1998
- *In-Situ Gamma Spectroscopy Addendum to the Sitewide CERCLA Quality Assurance Project Plan*, Draft, August 1998
- *Real-Time Instrumentation Measurement Program Quality Assurance Plan*, 20300-PL-002, May 1998
- *Delineating the Extent of Constituents of Concern During Remediation Sampling*, Data Quality Objectives (DQO) SL-048, Revision 5, February 1999
- *Real Time Precertification Monitoring*, DQO SL-054, Revision 0, June 1999
- *Real Time Excavation Monitoring for Total Uranium Waste Acceptance Criteria (WAC)*, DQO SL-055, Revision 0, June 1999
- ADM-02 *Field Project Prerequisites*
- ADM-16 *In-Situ Gamma Spectrometry Quality Control Measurement*
- ADM-17 *In-Situ Gamma Spectrometry Data Verification*
- EQT-05 *Geodimeter® 4000 Surveying System*

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- EQT-22 *High Purity Germanium Detector In-Situ Efficiency Calibration*
- EQT-23 *High Purity Germanium Detectors*

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- EQT-32 *Troxler 3440 Series Surface Moisture/Density Gauge*
- EQT-33 *Real-Time Differential Global Positioning System Operation*
- EQT-39 *Zeltex Infrared Moisture Meter*
- EQT-41 *Radiation Measuring Systems*
- EW-1022 *On-Site Tracking and Manifesting of Bulk Excavated Material*
- SMPL-01 *Solids Sampling*

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APPENDIX A

DATA QUALITY OBJECTIVES SL-048, SL-054 AND SL-055

Control Number ________

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Fernald Environmental Management Project

Data Quality Objectives

Title: Delineating the Extent of Constituents of Concern During Remediation Sampling

Number: SL-048

Revision: 5

Effective Date: February 26, 1999

Contact Name: Eric Kroger

Approval: (signature on file) Date: 2/25/99
James E. Chambers
DQO Coordinator

Approval: (signature on file) Date: 2/26/99
J.D. Chiou
SCEP Project Director

Rev. #	0	1	2	3	4	5	6
Effective Date:	9/19/97	10/3/97	4/15/98	6/17/98	7/14/98	2/26/99	

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DATA QUALITY OBJECTIVES
Delineating the Extent of Constituents of Concern During Remediation Sampling

Members of Data Quality Objectives (DQO) Scoping Team

The members of the DQO team include a project lead, a project engineer, a field lead, a statistician, a lead chemist, a sampling supervisor, and a data management lead.

Conceptual Model of the Site

Media is considered contaminated if the concentration of a constituent of concern (COC) exceeds the final remediation levels (FRLs). The extent of specific media contamination was estimated and published in the Operable Unit 5 Feasibility Study (FS). These estimates were based on kriging analysis of available data for media collected during the Remedial Investigation (RI) effort and other FEMP environmental characterization studies. Maps outlining contaminated media boundaries were generated for the Operable Unit 5 FS by overlaying the results of the kriging analysis data with isoconcentration maps of the other constituents of concern (COCs), as presented in the Operable Unit 5 RI report, and further modified by spatial analysis of maps reflecting the most current media characterization data. A sequential remediation plan has been presented that subdivides the FEMP into seven construction areas. During the course of remediation, areas of specific media may require additional characterization so remediation can be carried out as thoroughly and efficiently as possible. As a result, additional sampling may be necessary to accurately delineate a volume of specific media as exceeding a target level, such as the FRL or the Waste Attainment Criterion (WAC). Each individual Project-Specific Plan (PSP) will identify and describe the particular media to be sampled. This DQO covers all physical sampling activities associated with Pre-design Investigations, precertification sampling, WAC attainment sampling or regulatory monitoring that is required during site remediation.

1.0 Statement of Problem

If the extent (depth and/or area) of the media COC contamination is unknown, then it must be defined with respect to the appropriate target level (FRL, WAC, or other specified media concentration).

2.0 Identify the Decision

Delineate the horizontal and/or vertical extent of media COC contamination in an area with respect to the appropriate target level.

3.0 Inputs That Affect the Decision

Informational Inputs - Historical data, process history knowledge, the modeled extent of COC contamination, and the origins of contamination will be required to establish a sampling plan to delineate the extent of COC contamination. The desired precision of the delineation must be weighed against the cost of collecting and analyzing additional samples in order to determine the optimal sampling density. The project-specific plan will identify the optimal sampling density.

Action Levels - COCs must be delineated with respect to a specific action level, such as FRLs and On-Site Disposal Facility (OSDF) WAC concentrations. Specific media FRLs are established in the OU2 and OU5 RODs, and the WAC concentrations are published in the OU5 ROD. Media COCs may also require delineation with respect to other action levels that act as remediation drivers, such as Benchmark Toxicity Values (BTVs).

4.0 The Boundaries of the Situation

Temporal Boundaries - Sampling must be completed within a time frame sufficient to meet the remediation schedule. Time frames must allow for the scheduling of sampling and analytical activities, the collection of samples, analysis of samples and the processing of analytical data when received.

Scale of Decision Making - The decision made based upon the data collected in this investigation will be the extent of COC contamination at or above the appropriate action level. This delineation will result in media contaminant concentration information being incorporated into engineering design, and the attainment of established remediation goals.

Parameters of Interest - The parameters of interest are the COCs that have been determined to require additional delineation before remediation design can be finalized with the optimal degree of accuracy.

5.0 Decision Rule

If existing data provide an unacceptable level of uncertainty in the COC delineation model, then additional sampling will take place to decrease the model uncertainty. When deciding what additional data is needed, the costs of additional sampling and analysis must be weighed against the benefit of reduced uncertainty in the delineation model, which will eventually be used for assigning excavation, or for other purposes.

6.0 Limits on Decision Errors

In order to be useful, data must be collected with sufficient areal and depth coverage, and at sufficient density to ensure an accurate delineation of COC concentrations. Analytical sensitivity and reproducibility must be sufficient to differentiate the COC concentrations below their respective target levels.

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Types of Decision Errors and Consequences

Decision Error 1 - This decision error occurs when the decision maker determines that the extent of media contaminated with COCs above action levels is not as extensive as it actually is. This error can result in a remediation design that fails to incorporate media contaminated with COC(s) above the action level(s). This could result in the re-mobilization of excavation equipment and delays in the remediation schedule. Also, this could result in media contaminated above action levels remaining after remediation is considered complete, posing a potential threat to human health and the environment.

Decision Error 2 - This decision error occurs when the decision maker determines that the extent of media contaminated above COC action levels is more extensive than it actually is. This error could result in more excavation than necessary, and this excess volume of materials being transferred to the OSDF, or an off-site disposal facility if contamination levels exceed the OSDF WAC.

True State of Nature for the Decision Errors - The true state of nature for Decision Error 1 is that the maximum extent of contamination above the FRL is more extensive than was determined. The true state of nature for Decision Error 2 is that the maximum extent of contamination above the FRL is not as extensive as was determined. Decision Error 1 is the more severe error.

7.0 Optimizing Design for Useable Data

7.1 Sample Collection

A sampling and analytical testing program will delineate the extent of COC contamination in a given area with respect to the action level of interest. Existing data, process knowledge, modeled concentration data, and the origins of contamination will be considered when determining the lateral and vertical extent of sample collection. The cost of collecting and analyzing additional samples will be weighed against the benefit of reduced uncertainty in the delineation model. This will determine the sampling density. Individual PSPs will identify the locations and depths to be sampled, the sampling density necessary to obtain the desired accuracy of the delineation, and if samples will be analyzed by the on-site or off-site laboratory. The PSP will also identify the sampling increments to be selectively analyzed for concentrations of the COC(s) of interest, along with field work requirements. Analytical requirements will be listed in the PSP. The chosen analytical methodologies are able to achieve a detection limit capable of resolving the COC action level. Sampling of groundwater monitoring wells may require different purge requirements than those stated in the SCQ (i.e., dry well definitions or small purge volumes). In order to accommodate sampling of wells that go dry prior to completing the purge of the necessary well volume, attempts to sample the monitoring wells will be made 24 hours after purging the well dry. If, after the 24 hour period, the well does not yield the required volume, the analytes will be collected in the order stated in the applicable PSP until the well goes dry. Any remaining analytes will not be collected. In some instances, after the 24 hour wait the well may not yield any water. For these cases, the well will be considered dry and will not be sampled.

7.2 COC Delineation

The media COC delineation will use all data collected under the PSP, and if deemed appropriate by the Project Lead, may also include existing data obtained from physical samples, and if applicable, information obtained through real-time screening. The delineation may be accomplished through modeling (e.g. kriging) of the COC concentration data with a confidence limit specific to project needs that will reduce the potential for Decision Error 1. A very conservative approach to delineation may also be utilized where the boundaries of the contaminated media are extended to the first known vertical and horizontal sample locations that reveal concentrations below the desired action level.

7.3 QC Considerations

Laboratory work will follow the requirements specified in the SCQ. If analysis is to be carried out by an off-site laboratory, it will be a Fluor Daniel Fernald approved full service laboratory. Laboratory quality control measures include a media prep blank, a laboratory control sample (LCS), matrix duplicates and matrix spike. Typical Field QC samples are not required for ASL B analysis. However the PSPs may specify appropriate field QC samples for the media type with respect to the ASL in accordance with the SCQ, such as field blanks, trip blanks, and container blanks. All field QC samples will be analyzed at the associated field sample ASL. Data will be validated per project requirements, which must meet the requirements specified in the SCQ. Project-specific validation requirements will be listed in the PSP.

Per the Sitewide Excavation Plan, the following ASL and data validation requirements apply to all **soil and soil field QC samples** collected in association with this DQO:

- If samples are analyzed for Pre-design Investigations and/or Precertification, 100% of the data will be analyzed per ASL B requirements. For each laboratory used for a project, 90% of the data will require only a Certificate of Analysis, the other 10% will require the Certificate of Analysis and all associated QA/QC results, and will be validated to ASL B. Per Appendix H of the SEP, the minimum detection level (MDL) for these analyses will be established at approximately 10% of the action level (the action level for precertification is the

FRL; the action level for pre-design investigations can be several different action levels, including the FRL, the WAC, RCRA levels, ALARA levels, etc.). If this MDL is different from the SCQ-specified MDL, the ASL will default to ASL E, though other analytical requirements will remain as specified for ASL B.

- If samples are analyzed for WAC Attainment and/or RCRA Characteristic Areas Delineation, 100% of the data will be analyzed and reported to ASL B with 10% validated. The ASL B package will include a Certificate of Analysis along with all associated QA/QC results. Total uranium analyses using a higher detection limit than is required for ASL B (10 mg/kg) may be appropriate for WAC attainment purposes since the WAC limit for total uranium is 1,030 mg/kg. In this case, an ASL E designation will apply to the analysis and reporting to be performed under the following conditions:

  - all of the ASL B laboratory QA/QC methods and reporting criteria will apply with the exception of the total uranium detection limit

  - the detection limit will be ≤10% of the WAC limit (e.g., ≤103 mg/kg for total uranium).

- If delineation data are also to be used for certification, the data must meet the data quality objectives specified in the Certification DQO (SL-043).

- Validation will include field validation of field packages for ASL B or ASL D data.

All data will undergo an evaluation by the Project Team, including a comparison for consistency with historical data. Deviations from QC considerations resulting from evaluating inputs to the decision from Section 3, must be justified in the PSP such that the objectives of the decision rule in Section 5 are met.

7.4 Independent Assessment

Independent assessment shall be performed by the FEMP QA organization by conducting surveillances. Surveillances will be planned and documented in accordance with Section 12.3 of the SCQ.

7.5 Data Management

Upon receipt from the laboratory, all results will be entered into the SED as qualified data using standard data entry protocol. The required ASL B, D or E data will undergo analytical validation by the FEMP validation team, as required (see Section 7.3). The Project Manager will be responsible to determine data usability as it pertains to supporting the DQO decision of determining delineation of media

COC's.

7.6 Applicable Procedures

Sample collection will be described in the PSP with a listing of applicable procedures. Typical related plans and procedures are the following:

- Sitewide Excavation Plan (SEP)
- Sitewide CERCLA Quality Assurance Project Plan (SCQ).
- SMPL-01, *Solids Sampling*
- SMPL-02, *Liquids and Sludge Sampling*
- SMPL-21, *Collection of Field Quality Control Samples*
- EQT-06, *Geoprobe® Model 5400 Operation and Maintenance*
- EQT-23, *Operation of High Purity Germanium Detectors*
- EQT-30, *Operation of Radiation Tracking Vehicle Sodium Iodide Detection System*

Data Quality Objectives
Delineating the Extent of Constituents of Concern During Remediation Sampling

1A. Task/Description: Delineating the extent of contamination above the FRLs

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

RI [ ] FS [ ] RD [X] RA [ ] R_vA [ ] OTHER [ ]

1.C. DQO No.: SL-048, Rev. 5 DQO Reference No.: ____________

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

Air [ ] Biological [ ] Groundwater [X] Sediment [X] Soil [X]

Waste [X] Wastewater [ ] Surface water [ ] Other (specify) _____

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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 [X] C [ ] D [X] E [X]

Risk Assessment
A [ ] B [ ] C [ ] D [ ] E [ ]

Evaluation of Alternatives
A [ ] B [ ] C [ ] D [ ] E [ ]

Engineering Design
A [ ] B [X] C [ ] D [X] E [X]

Monitoring during remediation
A [X] B [X] C [ ] D [X] E [X]

Other
A [ ] B [ ] C [ ] D [ ] E [ ]

4.A. Drivers: Remedial Action Work Plans, Applicable or Relevant and Appropriate Requirements (ARARs) and the OU2 and/or OU5 Record of Decision (ROD).

4.B. Objective: Delineate the extent of media contaminated with a COC (or COCs) with respect to the action level(s) of interest.

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5. Site Information (Description):

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 [X] *
   Temperature [X] *
   Specific Conductance [X] *
   Dissolved Oxygen [X] *
   Technetium-99 [X] *

2. Uranium [X] *
   Full Radiological [X] *
   Metals [X] *
   Cyanide [ ]
   Silica [ ]

3. BTX [ ]
   TPH [ ]
   Oil/Grease [ ]

4. Cations [ ]
   Anions [ ]
   TOC [ ]
   TCLP [X] *
   CEC [ ]

5. VOA [X] *
   BNA [X] *
   Pesticides [X] *
   PCB [X] *
   COD [ ]

6. Other (specify)

*If constituent is identified for delineation in the individual PSP.

6.B. Equipment Selection and SCQ Reference:

Equipment Selection	Refer to SCQ Section
ASL A	SCQ Section:
ASL B X	SCQ Section: App. G Tables G-1&G-3
ASL C	SCQ Section:
ASL D X	SCQ Section: App. G Tables G-1&G-3
ASL E X (See sect. 7.3, pg. 6)	SCQ Section: App. G Tables G-1&G-3

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

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

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

DQO Number: SL-048, Rev. 5

7.B. Sample Work Plan Reference: This DQO is being written prior to the PSPs.

Background samples: OU5 RI

7.C. Sample Collection Reference:

Sample Collection Reference: SMPL-01, SMPL-02, EQT-06

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

8.A. Field Quality Control Samples:

Trip Blanks	[X]*	Container Blanks	[X]++
Field Blanks	[X]+	Duplicate Samples	[X]***
Equipment Rinsate Samples	[X]***	Split Samples	[X]**
Preservative Blanks	[ ]	Performance Evaluation Samples	[ ]
Other (specify)			

- * For volatile organics only
- ** Split samples will be collected where required by EPA or OEPA.
- *** If specified in PSP.
- \+ Collected at the discretion of the Project Manager (if warranted by field conditions)
- \+ + One per Area and Phase Area per container type (i.e. stainless steel core liner/plastic core liner/Geoprobe tube).

8.B. Laboratory Quality Control Samples:

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

Other (specify) Per SCQ

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

Control Number 2364

Fernald Environmental Management Project

Data Quality Objectives

Title: Real Time Precertification Monitoring

Number: SL-054

Revision: 0

Effective Date: 6/03/99

Contact Name: Joan White

Approval: [signature] Date: 6/3/99
James Chambers
DQO Coordinator

Approval: Joan H. White Date: 6/3/99
Joan White
Real-Time Instrumentation Measurement
Program Manager

Rev. #	0						
Effective Date:	6/03/99						

Data Quality Objectives
Real Time Precertification 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 low enough to pass certification. Finally, certification physical sampling is performed to verify that clean up goals (i.e., Final Remediation Levels, [FRLs]) have been achieved, and therefore, remediation is complete in that portion of the FEMP.

This DQO describes the real-time in-situ gamma spectrometry methods used during precertification. Any physical soil samples collected during precertification will be collected under a separate DQO. Real-time precertification measurements involves field surveys of the surface soil using mobile and stationary gamma-discernable real-time equipment. Real-time precertification measurements take place within a soil remediation area when the expected concentrations of primary radiological constituents of concern (COCs) are expected to be below the respective final remediation levels (FRLs). This may occur over an excavated surface or on an unexcavated surface where no above-FRL contamination is anticipated.

Precertification 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, precertification measurements are conducted in two separate activities:

- Precertification Phase I includes a mobile sodium iodide (NaI) detector scan of as much of the area as accessible. 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 Precertification 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 3x FRL in single measurements using the HPGe detectors.

- Precertification Phase II includes stationary HPGe detector measurements to verify the highest values obtained by the mobile NaI detector. It also 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 3x FRL. Target parameters for Precertification Phase II are all resolvable radiological ASCOCs.

Available Resources

Time: Precertification 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 soil certification 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. Precertification 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 Precertification Phase I will determine Phase II HPGe measurement number and location, which, if necessary, will determine physical sample number and location. Certification and regrading of the site to meet final land use commitments is dependent on successful completion of this work.

Instrumentation: Real-time monitoring includes 2 mobile sodium iodide (NaI) systems referred to as the Radiation Measurement Systems (RMS). They are the RTRAK (mounted on a tractor) and the RSS (mounted on a small pushcart). In addition, the 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 resolvable radiological Area Specific Contaminants of Concern (ASCOCs) in a rapid and non-intrusive manner.

2.0 Identify the Decision

Decision

Precertification real-time measurements support two decisions:

Decision 1: Precertification Phase I measurements will be the basis of a decision for the location(s) and number of Precertification Phase II HPGe measurements to collect within an area potentially exceeding 3x FRL, and for Phase II measurements to confirm the highest mobile NaI systems total activity locations.

Decision 2: Precertification Phase II measurements will be the basis of a decision to either:

1) excavate residual contaminated soil, conduct additional real-time measurements, or conduct physical sampling to evaluate potential residual contamination. The decision to excavate would be made if residual contamination could possibly cause certification failure; or,
2) make the assumption that an area is likely to pass certification, and therefore, is ready for certification to begin.

Possible Results of Decision 1

The location and number of Phase II HPGe measurements to be obtained will be established based on Precertification Phase I NaI and HPGe measurements, and the target level specified in the PSP. Two-point averaging of the Phase I NaI measurements, and/or single HPGe measurements will determine ASCOC concentrations or activities with regard to 3x FRL, and this data will be mapped for review. This data will also be considered when establishing Certification Units (CUs).

If the area potentially exceeding 3x FRL exhibits a visible contamination boundary, the Project may determine that Phase II measurements may not need to be collected. In this event, the area of interest may be excavated, and Phase II HPGe measurements will be obtained on the newly excavated surface to ensure the area is now below 3x FRL.

Possible Results of Decision 2

Possible results are as follows:
1) The Phase II HPGe results for all gamma discernable target parameters indicate that the CU is likely to pass certification for widespread contamination and the hot-spot criteria. If this is the case, the area of interest is ready for certification.
2) The Phase II HPGe results for all gamma discernable target parameters indicate that the CU is not likely to pass certification for widespread contamination and/or the hot-spot criteria. If this is the case, additional real-time measurements and/or physical samples may be collected to delineate the contaminated soil for remedial excavation.

3.0 Identify Inputs That Affect the Decision

Required Informational Input

An area will not be subjected to precertification if above-FRL contamination is known to be present. Real-time precertification measurements will be used to estimate the surface soil contamination and the variation in surface soil contamination in areas scheduled for certification. In addition, physical samples may be collected and/or a review of existing physical sample data, process knowledge, or visible observation may be performed.

Sources of Informational Input

Precertification measurements for 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 precertify for 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-be exceeded 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

Precertification 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 Precertification Phase II by strategically placed stationary HPGe measurements. Analysis and data management for Precertification Phase I data will be conducted at ASL A. Precertification 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. 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, and the SEP.

The Precertification 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 Precertification 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.C of this DQO.

Surface physical samples may be collected to verify HPGe measurements and to precertify for non-gamma resolvable ASCOCs. If physical sampling is needed, it will be identified in precertification 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 precertification scanning is closely associated with the excavation schedule. Precertification real-time scanning must be conducted after 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 Precertification 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 Precertification Phase II, parameters of interest are all HPGe-discernable radiological ASCOCs.

Precertification Target Levels

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

Decision Rules

Following Precertification Phase I, any Phase I NaI 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 precertification Phase II, if HPGe results indicate a CU could fail certification, 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 confirmed completed by the HPGe, the area will be considered ready for certification. Certification readiness means there i is no indication of wide-spread contamination, or localized contamination (i.e., hot-spot).

6.0 Establish Constraints on the Uncertainty of the Decision

Range of Parameter Limits

The range of soil concentrations anticipated will be from background (natural concentrations) to greater than the maximum subsurface value indicated in the RI database. It is anticipated that the concentrations will be below the FRL prior to the onset of precertification sampling.

Types of Decision Errors and Consequences

Decision Error 1: This decision error occurs when the decision maker decides an area is ready for certification when the average soil concentration in an area is above the FRL, or the soil contains ASCOC concentrations above two-times the FRL (the hot-spot criteria). 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 precertification 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 (i.e., concentrations above two-times the FRL). 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, precertification scanning consists of two separate activities. Refer to Section 1.0 of this DQO for a general overview of Precertification Phase I and Precertification Phase II activities.

Real-time measurements are generated by two methods: 1) the mobile sodium iodide (NaI) detection systems (RTRAK or RSS) 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, as specified in the PSP. 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 computer corrected for moisture by the Lab View software.

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 speeds and count times specified in the PSP, and are consistent with the Real-time User's Manual. The 0.4 meter overlap option is used, as discussed in Section 4.3.1 of the Real-time User's Manual, unless directed differently in the PSP. If the total uranium FRL is 20 ppm or lower, the NaI systems should not be used for precertification; the HPGe system should be used.

The mobile NaI systems are electronically coupled with Satloc global positioning system (GPS) rover and base unit to record each reading 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 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 Precertification Phase II HPGe measurements, if required.

In-Situ HPGe Detectors

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

- During Precertification 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 and count times are specified in the PSP and are consistent with the most current version of the Real-Time User's Manual.

- During Precertification Phase II, the HPGe detector is used at strategic locations established thorough the Precertification 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 quantify radiological COC levels, which in turn provide information concerning the ability to pass certification.

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 Precertification 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 the more stringent Soil Characterization and Excavation Project requirements.

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Data Quality Objectives
Real Time Precertification Measurements

1A. Task/Description: Precertification real-time measurements.
1B. Project Phase: (Put an X in the appropriate selection.)

RI ☐ FS ☐ RD ☐ RA ☒ R$_v$A ☐ OTHER ☐

1.C. DQO No.: SL-054, Rev. 0 DQO Reference No.: Current Sampling DQO

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

Air ☐ Biological ☐ Groundwater ☐ Sediment ☒ Soil ☒

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

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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 Requiremnts (ARARs), Operable Unit 5 Record of Decision (ROD), the Real-Time User's Manual, the Sitewide Excavation Plan and the Pre-certification Project-Specific Plan (PSP).

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

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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. Pre-certification will be necessary for areas of the site with soils that are scheduled for certification.

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 ☐
- Temperature ☐
- Spec.Conductance ☐
- Dissolved Oxygen ☐
- Technitium-99 ☐

2.
- Uranium ☒*
- Full Rad. ☒*
- Metals ☐
- Cyanide ☐
- Silica ☐

3.
- BTX ☐
- TPH ☐
- Oil/Grease ☐

4.
- Cations ☐
- Anions ☐
- TOC ☐
- TCLP ☐
- CEC ☐
- COD ☐

5.
- VOA ☐
- ABN ☐
- Pesticides ☐
- PCB ☐

6. Other (specify)
- Percent Moisture

* If specified in the PSP

6.B. Equipment Selection and SCQ Reference:

Equipment Selection	Refer to SCQ Section
ASL A Mobile NaI, HPGe (Precert. Phase I) and HPGe (Precert. Phase II)*	SCQ Section: Not Applicable
ASL B HPGe (Precertification Phase II)*	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 precertification 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 Gamm Spectrometry Quality Control*
-User Guidelines, Measurement Strategies, and Operational Factors for Deployment of In-Situ Gamma Spectrometry at the Fernald Site, 20701-RP-0006

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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) ____________________
* If specified in the PSP.

8.B. Laboratory Quality Control Samples:

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

Other (specify) ____________________

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

Control Number 2364

Fernald Environmental Management Project

Data Quality Objectives

Title: Real-Time Excavation Monitoring For Total Uranium Waste Acceptance Criteria (WAC)

Number: SL-055

Revision: 0

Final Draft: 6/8/99

Contact Name: Joan White

Approval: [signature] Date: 6/8/99
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Approval: [signature] Date: 6/8/99
Joan White
Real-Time Instrumentation Measurement
Program Manager

Rev. #	0						
Effective Date:	6/8/99						

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DATA QUALITY OBJECTIVES

Excavation Monitoring for Total Uranium Waste Acceptance Criteria (WAC)

Members of Data Quality Objectives (DQO) Scoping Team

The members of the scoping team included individuals with expertise in QA, analytical methods, field construction, statistics, laboratory analytical techniques, waste management, waste acceptance, data management, and excavation monitoring.

Conceptual Model of the Site

Fernald Environmental Management Project (FEMP) remediation includes the construction of an on-site disposal facility (OSDF) to be used for the safe permanent disposal of materials at or above the site final remediation levels (FRLs), but below the waste acceptance criteria (WAC) for constituents of concern (WAC COCs). The WAC concentrations for several constituents, including total uranium, were developed using fate and transport modeling, and were established to prevent a breakthrough of unacceptable levels of contamination (greater than a specified Maximum Contaminant Level to the underlying Great Miami Aquifer) over a 1000-year period of OSDF performance. The WAC for total uranium and other area-specific WAC COCs as referenced in the Operable Unit 5 (OU5) and Operable Unit 2 (OU2) Records Of Decision (RODs), the Waste Acceptance Plan for the On-Site Disposal Facility (WAC Plan), and the OSDF Impacted Materials Placement Plan (IMPP), must be achieved for all soil and soil-like materials that have been identified for disposal in the OSDF.

The extent of soil contamination requiring remediation was estimated and published in both the Operable Unit 5 and Operable Unit 2 Feasibility Studies (FS). These estimates were based on modeling analysis of available uranium data from soil samples collected during the Remedial Investigation (RI) efforts and from other environmental studies conducted at the FEMP. Maps outlining boundaries of soil contamination were generated for both the Operable Unit 5 and Operable Unit 2 FS documents by overlaying the results of the modeling analysis of uranium data with isoconcentration maps of other COCs. The soil contamination maps were further modified by conducting spatial analysis on the most current soil characterization data.

A sequential remediation plan has been presented which subdivides the FEMP into ten (10) independent remediation areas. Extensive historical sampling has demonstrated that in each of these 10 areas potentially above-WAC concentrations

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may not be present, may be limited to one WAC COC, or consist of a subset of WAC COCs. According to the Sitewide Excavation Plan (SEP) only WAC COCs with a demonstrated or likely presence in an area will be evaluated during remedial design and implementation. This DQO will be used to define the WAC decision-making process using excavation monitoring instrumentation in areas where soil and soil-like material is being excavated and total uranium is a WAC COC.

1.0 Statement of Problem

Adequate information must be available to demonstrate excavated soils or soil-like material is acceptable or unacceptable for disposal in the OSDF, based on the total uranium WAC.

Available Resources

Time: WAC decision-making information of sufficient quality must be made available to the Project Manager (or designee), characterization representative, and Waste Acceptance Operations representative (decision makers) prior to excavation and disposition of soil and soil-like materials.

Project Constraints: WAC decision-making information must be collected and assimilated with existing manpower and instrumentation to support the remediation schedule. Successful remediation of applicable areas, including excavation and placement of soil and soil-like material in the OSDF, is dependent on the performance of this work.

Summary of the Problem

Excavated soil or soil-like material must be classified as either of the following:

1. Having concentrations of total uranium at or above the WAC, and therefore, unacceptable for disposal in the OSDF, or

2. Having concentrations of total uranium below the WAC, and therefore, acceptable for disposal in the OSDF.

2.0 Identify the Decision

Decision

The WAC decision-making process will result in the classification of defined soil or soil-like material volumes as either meeting or exceeding the 1,030 ppm total uranium WAC.

Possible Results

1. A defined volume of soil or soil-like material has a concentration of total uranium at or above the WAC. This material is classified as unacceptable for placement in the OSDF, and will be identified, excavated, and segregated pending off-site disposition.

2. A defined volume of soil or soil-like material has a concentration of total uranium below the total uranium WAC. This soil is classified as acceptable for placement in the OSDF and is transported directly from the excavation to the OSDF for placement.

3.0 Identify Inputs That Affect the Decision

Required Information

The total uranium WAC published in the Waste Acceptance Criteria Attainment Plan for the OSDF, historical data, pre-design investigation data, and in-situ gamma spectrometry information collected prior to and during excavation are required to determine whether a specified volume of soil or soil-like material meets or exceeds the total uranium WAC.

Source of Informational Input

The list of sitewide OSDF WAC COCs identified in the OU2 and OU5 RODs and the WAC Plan will be referenced. Historical area specific data from the Sitewide Environmental Database (SED) will also be retrieved and evaluated for both radiological and chemical WAC constituents. This information will be utilized to determine area specific WAC COCs.

Non-invasive real-time excavation monitoring in areas where total uranium is a WAC concern will involve measurements collected with mobile and/or stationary in-situ gamma spectrometry equipment. These measurements will be collected from the surface of each excavation lift prior to excavation. Information compiled from this real-time monitoring will be assimilated and reviewed by decision makers to classify lifts or sections of lifts as either acceptable or unacceptable for placement in the OSDF. These measurements may also be collected on soils exposed after the removal of suspect above WAC material to verify its removal.

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Action Levels

To ensure no above WAC soil or soil-like material is sent to the OSDF, threshold values (trigger levels) have been set for NaI and HPGe Phase 1 and II measurements. These values are significantly lower than the 1030 ppm total uranium OSDF not-to-exceed (NTE) level. The WAC Phase I (detection phase) threshold value is 721 ppm total uranium for NaI instruments (31 cm detector height), and 400 ppm total uranium for the HPGe (1 meter detector height). The WAC Phase II (confirmation and delineation phase) threshold value is 928 ppm total uranium for the HPGe (31 cm and 15 cm detector heights).

Methods of Data Collection

WAC Phase 1 measurements will be collected to obtain as close to complete coverage of the areas of concern as possible using either the NaI Radiation Measurement Systems (RMS) or HPGe equipment to identify potential above WAC total uranium locations. WAC Phase II measurements will be collected with strategically placed HPGe equipment to confirm and delineate Phase I potential above WAC measurements, as needed. The project may decide not to collect Phase II measurements if the potential above WAC area boundary is discernable by visual observation (such as presence of process residue or other OSDF prohibited items, discoloration of soil or soil-like material, or other information).

The project will use the real-time WAC Phase I and Phase II data as ASL A, and will perform no data validation (however the data will be collected with ASL B quality control criteria, for real-time project internal quality control. All measurements will be performed in compliance with operating procedures identified in Section 7.5 of this DQO, the Real-Time User's Manual, and the SEP.

4.0 The Boundaries of the Situation

Spatial Boundaries

Domain of the Decision: The boundaries where excavation monitoring for total uranium will be used is limited to soils and/or soil-like material in remediation areas where total uranium is a WAC COC, excavation is planned, and material is designated for disposition in the OSDF.

Population of Soils:

Includes all at-and below-grade soil and soil-like material impacted with total uranium potentially exceeding the WAC and planned for disposition in the OSDF.

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Scale of Decision Making

Areas designated for excavation will be evaluated as to whether the soil or soil-like material is below or above the OSDF WAC for total uranium. Excavation monitoring will be conducted on each excavation lift. Based on the information obtained as a result of reviewing and modeling existing data coupled with newly acquired excavation monitoring information, a decision will be made whether an individual excavation lift, or portion of a lift, meets or exceeds the OSDF WAC for total uranium.

Temporal Boundaries

Time Constraint: Real-time excavation monitoring information must be acquired and processed in time for review and use in decision making prior to excavation and disposition of excavated material. The scheduling of WAC excavation monitoring is directly tied to the excavation schedule. WAC excavation monitoring will be performed and a disposition decision made prior to excavation of each designated lift. Acquired information must be processed and reviewed by the project decision-makers prior to disposition of the lift being monitored. Time limits to complete measurements are specified in the excavation subcontracts.

Practical Considerations: Weather, moisture, field conditions, and unforseen events affect the ability to perform excavation monitoring and meet the schedule. To maintain safe working conditions, excavation and construction activities will comply with all FEMP and project specific health and safety protocols..

5.0 Develop a Logic Statement

Parameter(s) of Interest

The parameter of interest is the concentration of total uranium in soil or soil-like material designated for disposition in the OSDF.

Waste Acceptance Criteria Concentration

The OSDF WAC concentration is 1,030 ppm for total uranium in soil and soil-like materials. This concentration is considered a NTE level for OSDF WAC attainment, and no real-time measurement data point, as defined by the instrument-specific threshold values, can meet or exceed this level in material destined for the OSDF.

Decision Rules

If excavation monitoring results are below the total uranium WAC for a specified volume of soil or soil like material, then that soil is considered acceptable for final disposition in the OSDF. If monitoring results reveal concentrations at or above the total uranium WAC, as indicated by exceeding the instrument-specific threshold level, then the unacceptable soil will be delineated, removed, and segregated pending off-site disposal.

6.0 Limits on Decision Errors

Range of Parameter Limits

The area-specific total uranium soil concentrations anticipated in excavation areas will range from background levels (naturally-occurring soil concentrations) to concentrations greater than the total uranium WAC levels.

Types of Decision Errors and Consequences

Decision Error 1: This decision error occurs when the decision makers decide a specified volume of soil or soil-like material is below the WAC for total uranium, when in fact the uranium concentration in that soil is at or above the WAC. This error would result in soil or soil like material with concentrations above the WAC for total uranium being placed into the OSDF. Since the WAC is a NTE level, this error is unacceptable.

Decision Error 2: This decision error occurs when a volume of soil or soil-like material is identified as above WAC, excavated, and sent for off-site disposition when the material is actually below the WAC for total uranium. This error would result in added costs due to the unnecessary segregation and off-site disposition of material that is acceptable for disposal in the OSDF.

True State of Nature for the Decision Errors

The true state of nature for Decision Error 1 is that the actual concentration of total uranium in a volume of soil or soil-like material is greater than the WAC. The true state of nature for Decision Error 2 is that the actual concentration of total uranium in a volume of soil or soil-like material is below the WAC. Decision Error 1 is the more severe error.

7.0 Design for Obtaining Quality Data

7.1 WAC Attainment Excavation Monitoring

WAC attainment will be based on real-time excavation monitoring using the NaI and

HPGe measurement systems. Phase I (detection phase) measurements are collected with the NaI systems using a spectral acquisition time of 4 seconds, at a detector speed of 1 mile per hour (mph), and a detector height of 31 cm. These parameters achieve the required sensitivity, and are the best compromise of practical considerations such as detector speed and time in the field. In the NaI systems, the presence of thorium contamination can cause interferences which could affect total uranium concentration calculations. Uranium results associated with thorium values greater than 500 net counts per second will be reevaluated. The threshold value (trigger level) for Phase I NaI measurements is 721 ppm for total uranium (70% of the 1,030 ppm WAC concentration for soil, arrived at by agreement with the USEPA). Phase I measurements can also be collected with the HPGe systems using a spectral acquisition time of 5 minutes, and a detector height of 1 meter (the threshold value is lower than the NaI threshold value because of the larger field of view at the HPGe 1 meter detector height). (For more information reference the *RTRAK Applicability Study, 20701-RP-0003, Revision 1, May 1998).*

At the discretion of the characterization lead, Phase II confirmation and delineation measurements may be collected using the HPGe systems with a spectral acquisition time of 5 minutes at both the 31 cm and 15 cm detector heights. The HPGe detector will be placed directly over the zone of maximum activity identified by the Phase I measurements. The threshold value (trigger level) for Phase II measurements is 928 ppm for total uranium at either detector height. Lower (more conservative) threshold values may be defined in the PSP. (For more information reference the *User Guidelines, Measurement Strategies, and Operational Factors for Deployment of In-Situ Gamma Spectrometry at the Fernald Site, 20701-RP-0006, Revision A, May 8, 1998.)*

In the event the monitoring data exceeds the trigger levels (see above), the entire vertical thickness (3 ± 1 foot) of the areal extent of above-WAC material will be removed and segregated pending off-site disposal.

7.2 Interpretation of Results

The results obtained from real-time monitoring for purposes of WAC attainment will be compared to the published OSDF WAC concentration for total uranium. If results are equal to or greater than the WAC concentration (as defined by exceeding the specific threshold value level), the decision makers may take one of the following actions:

- Determine that the entire unit volume or "lift" subjected to excavation monitoring is at or above WAC and requires segregation pending off-site disposal.

- Based on adequacy of existing information (including visual inspection), excavate and segregate the portion of the lift material that is at or above WAC pending off-site disposition.

- Perform additional real-time monitoring to more accurately delineate the areal extent of above-WAC contamination. Using this information, define the extent of removal efforts to be conducted.

7.3 QC Considerations

The following data management requirements will be met prior to evaluation of acquired WAC attainment information:

1) An excavation monitoring form will be completed and reviewed in the field.

2) WAC data and decision-making information will be assigned to respective soil profiles, so characterization and tracking information can be maintained and retrieved.

3) The mobile sodium iodide systems will generate ASL level A data, with no data validation. The HPGe detectors are capable of providing either ASL level A or B data, however for WAC determination only ASL A data will be generated.

4) When using the HPGe detectors, duplicate measurements will be taken at a frequency of one in twenty measurements or one per excavation lift, whichever is greater.

7.4 Independent Assessment

Independent assessment shall be performed by the FEMP QA organization by conducting surveillances. Surveillances shall be planned and documented in accordance with Section 12.3 of the SCQ.

7.5 Applicable Procedures

Real-time monitoring performed under the PSP shall follow the requirements outlined within the following procedures:

- ADM-16, In-Situ Gamma Spectrometry Quality Control Measurements
- EQT-22, High Purity Germanium Detector In-Situ Efficiency Calibration
- EQT-23, Operation of ADCAM Series Analyzers with Gamma Sensitive Detectors
- EQT-32, Troxler 3440 Series Surface Moisture/Density Gauge

- EQT-33, Real Time Differential Global Positioning System
- EQT-39, Zeltex Infrared Moisture Meter
- EQT-40, Satloc Real-time Differential Global PositioningSystem
- EQT-41, Radiation Measurement Systems
- 20300-PL-002, Real Time Instrumentation Measurement Program Quality Assurance Plan
- EW-1022, On-Site Tracking and Manifesting of Bulk Impacted Material

7.6 References

- Sitewide CERCLA Quality Assurance Project Plan (SCQ), May 1995, FD-1000
- Sitewide Excavation Plan, July 1998, 2500-WP-0028, Revision 0
- Waste Acceptance Criteria Attainment Plan for the On-Site Disposal Facility, June 1998, 20100-PL-0014, Revision 0
- Impacted Materials Placement Plan for the On-Site Disposal Facility, January 1998, 20100-PL-007, Revision 0
- Area 2, Phase 1 Southern Waste Units Implementation Plan for Operational Unit 2, July 1998, 2502-WP-0029, Revision 0
- RTRAK Applicability Study, May 1998, 20701-RP-0003, Revision 1
- User Guidelines, Measurement Strategies, and Operational Factors for Deployment of In-Situ Gamma Spectrometry at the Fernald Site, July 1998, 20701-RP-0006 Revision B

Data Quality Objectives
Excavation Monitoring for Total Uranium Waste Acceptance Criteria (WAC)

1A. Task/Description: Waste Acceptance Criteria Monitoring

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

RI ☐ FS ☐ RD ☐ RA ☒ R_vA ☐ OTHER

1.C. DQO No.: SL-055 DQO Reference No.: N/A

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

Air ☐ Biological ☐ Groundwater ☐ Sediment ☐

Soil and Soil Like Material ☒

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

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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 Waste Acceptance Evaluation
A ☒ B ☐ C ☐ D ☐ E ☐

4.A. Drivers: Specific construction work plans, Applicable or Relevant and Appropriate Requirements (ARARs) and Operable Unit 2 and Operable Unit 5 Records of Decision (ROD).

4.B. Objective: To provide data for identification of soils and soil-like materials for compliance with Waste Acceptance Criteria.

5. Site Information (Description):

The RODs specify that FEMP soils will be below the WAC for disposal in the OSDF. WAC determination will be necessary for site soils and soil like material that is scheduled for excavation and potential OSDF disposition.

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 ☐
   - Temperature ☐
   - Specific Conductance ☐
   - Dissolved Oxygen ☐
   - Technetium-99 ☐
2. Uranium ☒
   - Full Radiological ☐
   - Metals ☐
   - Cyanide ☐
   - Silica ☐
3. BTX ☐
   - TPH ☐
   - Oil/Grease ☐
4. Cations ☐
   - Anions ☐
   - TOC ☐
   - TCLP ☐
   - CEC ☐
   - COD ☐
5. VOA ☐
   - BNA ☐
   - Pesticides ☐
   - PCB ☐
6. Other (specify) ☒
   - Moisture

6.B. Equipment Selection and SCQ Reference:

ASL A Nal and HPGe SCQ Section: Appendix H

ASL B ______ SCQ Section: ______

ASL C ______ SCQ Section: ______

ASL D ______ SCQ Section: ______

ASL E ______ SCQ Section: ______

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

Biased ☐ Composite ☐ Environmental ☐ Grab ☐ Grid ☐
Intrusive ☐ Non-Intrusive ☒ Phased ☐ Source ☐

DQO Number: SL-055

7.B. Sample Work Plan Reference: The DQO is being established prior to completion of the PSP.

Background samples: SED

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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 Measurements ☒*
Equipment Rinsate Samples ☐ Split Samples ☐
Preservative Blanks ☐ Performance Evaluation Samples ☐
Other (specify) ____________

*For the HPGe detectors, duplicate measurements will be made every 1 in 20 or one per lift, whichever is greater.

8.B. Laboratory Quality Control Samples:
Method Blank ☐ Matrix Duplicate/Replicate ☐
Matrix Spike ☐ Surrogate Spikes ☐
Other (specify) Per method

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

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APPENDIX B

PREDESIGN SAMPLING
TARGET ANALTYES LIST

APPENDIX B
PREDESIGN SAMPLING TARGET ANALYTE LISTS

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TAL A
ICP/MS Method
(ASL B)

Analyte	Method	FRL limit	MDC
Total Uranium	ICP/MS	82 ppm	8 ppm

TAL B
ICP/MS and Alpha or Gamma Spectroscopy Method
(ASL B)

Analyte	Method	FRL limit	MDC
Total Uranium	ICP/MS	82 ppm	8 ppm
Thorium-228	Alpha or Gamma Spectroscopy	1.7 pCi/g	.17 pCi/g
Thorium-232	Alpha or Gamma Spectroscopy	1.5 pCi/g	.15 pCi/g

TAL C
ICP/MS and Alpha or Gamma Spectroscopy Method
(ASL B)

Analyte	Method	FRL limit	MDC
Total Uranium	ICP/MS	82 ppm	8 ppm
Radium-226	Alpha or Gamma Spectroscopy	1.7 pCi/g	.17 pCi/g