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PROJECT SPECIFIC PLAN FOR AREA 1, PHASE II EXCAVATION MONITORING AND PRECERTIFICATION

SOIL AND DISPOSAL FACILITY PROJECT

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

JUNE 1999

U.S. DEPARTMENT OF ENERGY
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6-21-99
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Soil and Disposal Facility Project

6/21/99
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FERNALD ENVIRONMENTAL MONITORING PROJECT

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ISSUE AND REVISION SUMMARY

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Revision	Date	Description
0	5/26/99	Document signed and approved.
1	6/21/99	Revised to show changes in Data Quality Objectives, changes of Final Remediation Levels to 20ppm for inside of Sewage Treatment Plant, deleted reference to Gator usage, added physical samples, and changes to sampling number scheme.

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LIST OF ACRONYMS AND ABBREVIATIONS

A1PII	Area 1, Phase II
ASCOC	area-specific contaminant of concern
ASL	analytical support level
CDL	Certification Design Letter
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COC	constituent of concern
CU	certification unit
DQO	Data Quality Objective
ECDC	Engineering Control/Document Control
FACTS	Fernald Analytical Computerized Tracking System
FDF	Fluor Daniel Fernald
FEMP	Fernald Environmental Management Project
FRL	final remediation level
GIS	Graphical Information System
GPS	global positioning system
HPGe	high purity germanium
IRDP	Integrated Remedial Design Package
LAN	Local Area Network
mg/kg	milligrams per kilogram
NaI	sodium iodide
OSDF	On-Site Disposal Facility
PPE	personal protective equipment
ppm	parts per million
PSP	Project Specific Plan
QA/QC	Quality Assurance/Quality Control
RA	Remedial Action
RCTs	Radiological Control Technicians
RMS	Radiation Measurement Systems
RSS	Radiation Scanning System
RTIMP	Real-Time Instrumentation Measurement Program
RTRAK	Radiation Tracking System
RWP	Radiological Work Permit
SDFP	Soil and Disposal Facility Project
SCQ	Sitewide CERCLA Quality Assurance Project Plan
SED	Sitewide Environmental Database
SEP	Sitewide Excavation Plan
STP	Sewage Treatment Plant
SP-7	Soil Stockpile 7
V/FCN	Variance/Field Change Notice
WAC	Waste Acceptance Criteria
WAO	Waste Acceptance Organization
XRF	X-Ray Fluorescence

1.0 INTRODUCTION

This project specific plan (PSP) describes the excavation monitoring activities that will be performed during the Remedial Action (RA) of Area 1, Phase II (A1PII), which includes the Sewage Treatment Plant (STP) and adjacent areas. RA activities are outlined in the A1PII Integrated Remedial Design Package (IRDP) and the A1PII Supplemental Characterization Package. The data collected under this plan will be used to support two objectives: 1) to determine whether soil and soil-like material excavated from the area meets the waste acceptance criteria (WAC) for the On-Site Disposal Facility (OSDF), and 2) to precertify the remaining in-place soil to ensure concentrations of primary radiological constituents of concern (COCs) do not exceed Final Remediation Levels (FRLs). All data collection activities will conform to the requirements of the documents listed in Section 7.0.

1.1 PURPOSE

The primary purpose of this PSP is to describe data collection activities and the decision process required to excavate material known to be above OSDF WAC, to identify and remove any additional potential above-WAC material, and to precertify the post excavation native soils. As described in the A1PII STP Excavation Package technical specifications, the excavation contractor will excavate and remediate the STP, strip surface contamination outside the STP, excavate stabilized lead contaminated soil outside the STP, and remove stockpiled soils from A1PII.

The general excavation sequence will be removal of above-WAC material in 3 ± 1 foot lifts, and then deep excavations to design limits. WAC monitoring will supplement historical data and predesign investigation data to determine WAC attainment. WAC excavation monitoring will consist of visual monitoring, real-time *in situ* gamma spectrometry, and/or physical sampling, as applicable. Precertification monitoring will consist of visual monitoring (as applicable) and *in situ* gamma spectrometry. Precertification will be performed after excavation to design limits. The specific monitoring activities are discussed in Section 3.0.

1.2 SCOPE

The scope of this PSP includes the surveying, sampling and the real time *in situ* gamma spectrometry approaches for above-WAC soil identification and soil precertification, as applicable, for each of the following activities:

- Removal of STP above-WAC digester sludge
- Removal of STP above-WAC sludge cake
- STP deep excavations
- Removal of STP above-WAC technetium-99 material
- Stripping of A1PII surface contamination
- Removal of A1PII stockpiles and surface soils
- Excavation of A1PII Trap Range stabilized lead-contaminated soil
- Removal of A1PII special materials.

1.3 KEY PERSONNEL

Personnel responsible for conducting work in accordance with this PSP include team members from the Soil and Disposal Facility Project (SDFP), the Waste Acceptance Organization (WAO), Real-Time Instrumentation Measurement Program (RTIMP), Field Sampling, Surveying, Construction, Safety and Health, Radiological Control, and Quality Assurance (QA) personnel. Communications with the STP Excavation Contractor will be through Fluor Daniel Fernald (FDF) Construction personnel. Key project personnel are listed in Table 1-1.

TABLE 1-1
KEY PERSONNEL

TITLE	PRIMARY	ALTERNATE
DOE Contact	Robert Janke	Kathi Nickel
AIPII Area Project Manager	Tom Crawford	Jyh-Dong Chiou
Characterization Lead	Alex Duarte	Jenny Vance
RTIMP Manager	Joan White	Dave Allen
RTIMP Field Lead	Roger Knight	Brian McDaniel
Field Sampling Lead	Mike Frank	Tom Burhlage
Survey Lead	Jim Schwing	Jim Capannari
Laboratory Contact	Bill Westerman	Keith Tomlinson
Field Data Management Lead	Jenny Vance	Alex Duarte
Construction Contact	Rick McGuire	Chris Neumann
Safety and Health Contact	Lewis Wiedeman	Debra Grant
Radiological Control Contact	Corey Fabricante	Dan Stempfley
Quality Assurance Contact	Reinhard Friske	Ervin O'Bryan
WAO Contact	Christa Walls	Linda Barlow

2.0 AREA-SPECIFIC SAMPLING AND MONITORING

The RA activities in A1PII can be generally divided into activities performed inside and outside the STP area. The RA activities that will occur inside the STP are discussed in Sections 2.1 through 2.4. RA activities occurring within A1PII but outside of the STP area are discussed in Sections 2.5 through 2.7. Section 2.8 addresses the discovery of suspected above-WAC material encountered in A1PII during RA activities.

2.1 STP ABOVE-WAC DIGESTER SLUDGE

Figures 2-1A and 2-1B show a general excavation and monitoring sequence for the RA activities to be performed inside the STP area. The above-WAC digester sludge is located in the digester building, the west chamber of the primary settling basin, and in the sludge drying beds. As discussed in the A1PII Supplemental Characterization Package, the above-WAC digester sludge will be removed and stabilized in the STP by combining it with above-WAC, technetium-99 contaminated soil at a ratio of 2:1. It will then be hauled to Soil Stockpile 7 (SP-7). The filter fabric separating the digester sludge and the above-WAC sludge cake and material mixed with the above-WAC sludge cake will be removed, containerized, and transferred to the Special Materials Transfer Area. No physical sampling nor any real-time monitoring is planned for this activity. Once the above-WAC digester sludge has been removed, the interior walls of the digester and settling basin will be visually monitored to ensure all the digester sludge has been removed.

2.2 STP ABOVE-WAC SLUDGE CAKE

The above-WAC sludge cake and material contaminated with above-WAC sludge cake, including the geotextile and surrounding soil berm, will be removed and containerized after the above-WAC digester sludge is removed. The excavation limits for above-WAC sludge cake and associated material will be determined based on observation of visible residue or discoloration. If differences between the above-WAC sludge cake and associated materials is not readily discernable, the materials will be considered contaminated and subsequently removed and containerized. The north and east walls of the berm are constructed of clean soil and will not be containerized unless observation reveals visible residue or discoloration of the soil from above-WAC material. The exact limits of the berm, which will be classified as above-WAC, will also be determined based on visual observation. Once the above-WAC sludge cake, liner and berms are removed, the sludge drying beds will be physically sampled for technetium-99, total uranium, and volatiles and will undergo a real-time scan for total uranium WAC. This sampling will be completed before additional excavation to confirm that above-WAC technetium-99 contaminated material did not further contaminate the area, particularly in the sludge drying bed area. As shown in Figure 2-2, samples will be collected from six locations in the basin area of the sludge drying beds, and three locations previously covered by the north, south, and west walls of the berm, at 6-inch intervals through the first foot of native soil (approximately 5 feet). Once the sampling and analysis and real-time scanning are complete and the above-WAC material is confirmed removed, STP deep excavations will begin.

2.3 STP DEEP EXCAVATIONS

This excavation includes the removal of at-and below grade structures, removal of approximately two 3 ±1 foot lifts, then a deep excavation based on design depths. Visual monitoring for potential above-WAC material and debris will be performed on a continuing basis. Initially, the contractor will excavate two 3 ±1 foot lifts, with real-time scanning performed at the completion of each lift to ensure total uranium WAC compliance. After two lifts, the excavation will probably be inaccessible to real time tools and personnel for *in situ* precertification due to safety reasons. In this case, soil will be removed from the bottom of the excavation, brought to the surface and scanned or sampled for precertification. The FRL for uranium throughout most of the STP area is 82 mg/kg. However, if practical, excavation will continue to the 50 mg/kg level. In addition, a lower cleanup level of 20 mg/kg was established on the west side of the STP area in the vicinity of the trickling filters because of potential high leachability. Figure 2-3 outlines this lower FRL area.

2.4 EXCAVATION OF ABOVE-WAC TECHNETIUM-99 MATERIAL

The above-WAC excavation limits of technetium-99 locations within the STP boundary (outside the area of deep excavation) have been delineated by predesign sampling and analysis. The excavation boundary will be staked in the field and the excavation will be visually monitored. Field surveying will be performed to verify that the required 6-inch excavation has been performed. Once the above-WAC technetium-99 has been removed and the field survey complete, the soil will be scanned for total uranium WAC.

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2.5 A1PII SURFACE CONTAMINATION STRIPPING OUTSIDE THE STP

The surface soil adjacent to the STP will be stripped 6 inches to remove the above-FRL soil. Field surveying will be performed to verify that the required 6-inch excavation has been performed. Upon completion of the surface soil stripping, a precertification real-time scan will be performed in the excavation footprint.

2.6 A1PII STOCKPILES

The two existing A1PII below-WAC soil stockpiles, NAR-007 and OSD-007, are located in the A1PII excavation area. As discussed in the *Area 1 Stockpile Inventory and Waste Acceptance Criteria Attainment Report* (20700-RP-0001, July 1998), the two existing stockpiles (NAR-007 and OSD-007) have been adequately characterized, and the removal of these piles will not be performed in lifts or require excavation monitoring. When the stockpiles have been removed to grade, a WAC real-time scan will be performed on the original surface soil. The surface soil will then be excavated to a depth of 6 inches, and a precertification real-time scan performed. If characterization of any new stockpiles or the soils beneath them is necessary, it will be documented in a Variance/Field Change Notice (V/FCN).

2.7 A1PII TRAP RANGE STABILIZED LEAD-CONTAMINATED SOIL

Upon completion of the A1PII Trap Range lead stabilization, the treated soil will be excavated to design limits and placed in the OSDF. Since historical data show no above-WAC radiological soil in the area, the excavation will not require lifts or monitoring for above-WAC total uranium with real-time instrumentation. Once the lead-stabilized soil is removed, the area will be surveyed to ensure the excavation is complete; a precertification real-time scan will then be performed. If there is a concern that there may be lead present that could cause the area to fail certification, the field portable X-Ray Fluorescence (XRF) may be used. The use of the XRF would be documented in a variance.

2.8 A1PII SPECIAL MATERIAL

Special materials encountered during A1PII excavation will be individually assessed for WAC determination. If requested by the Characterization Lead or designee, a gamma measurement can be taken over the residual soil where special materials were located and removed during excavation, or where elevated (greater than 200 K disintegrations per minute) beta/gamma levels have been detected with field monitoring instruments. If alpha measurements are requested and the instrument readings are less than beta/gamma readings, the gamma measurements can be taken with either real-time scanning instruments or a high-purity germanium detector (HPGe), depending on how the special materials excavation footprint is configured. If beta/gamma field instrument readings are less than alpha readings, the gamma measurements must be taken with HPGe. Real-time instruments will be used as described in Section 3.3.1. HPGe deployment is described in Section 3.3.2. The size of the special material area may require a lower detector height to be used to allow the detector field of view to cover only the special material being measured. In this case, the data collection parameters and trigger levels discussed in Sections 3.3.3 and 3.3.4 will be used.

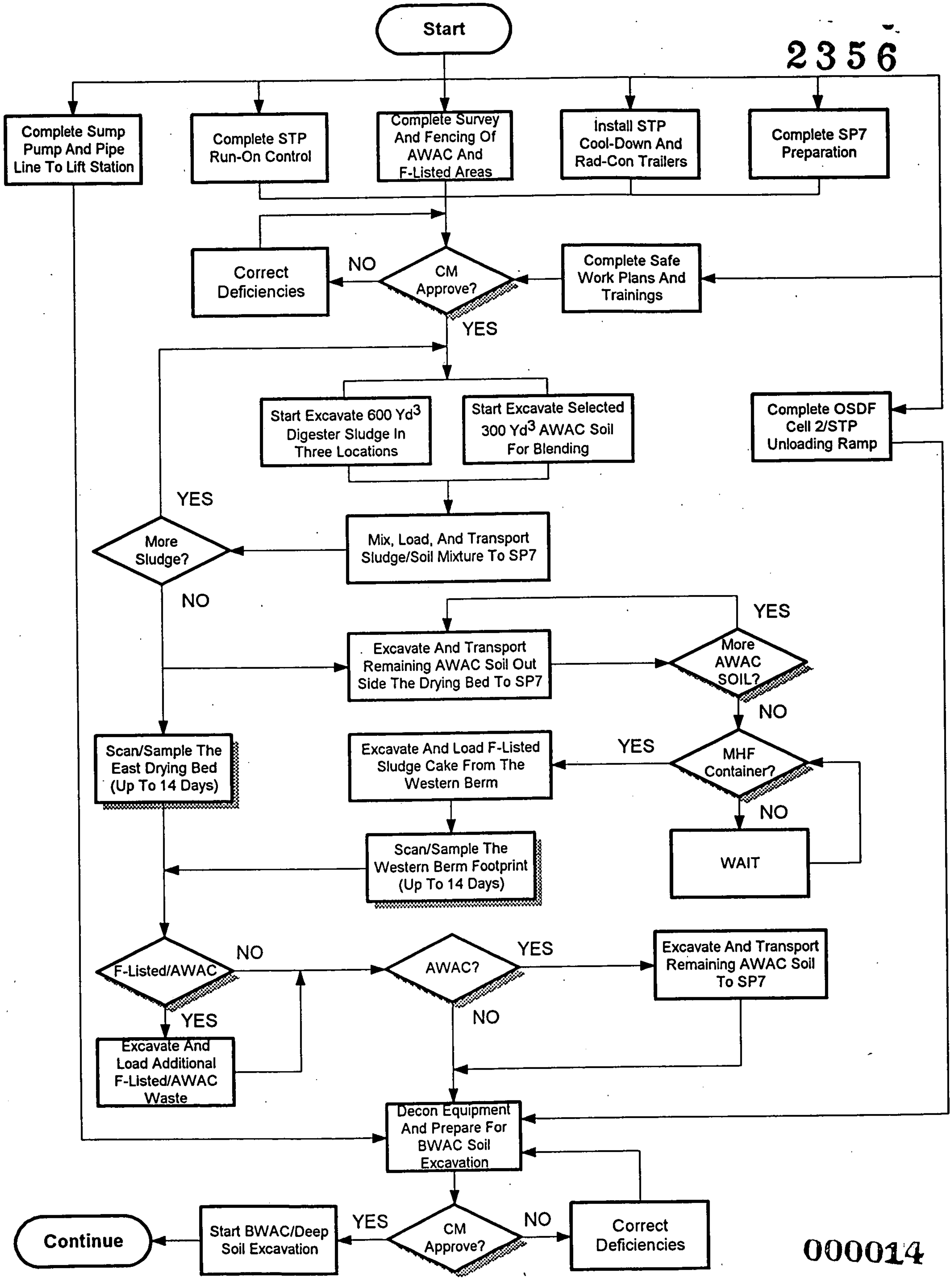


FIGURE 2-1A STP ABOVE-WAC MATERIAL EXCAVATION SEQUENCE

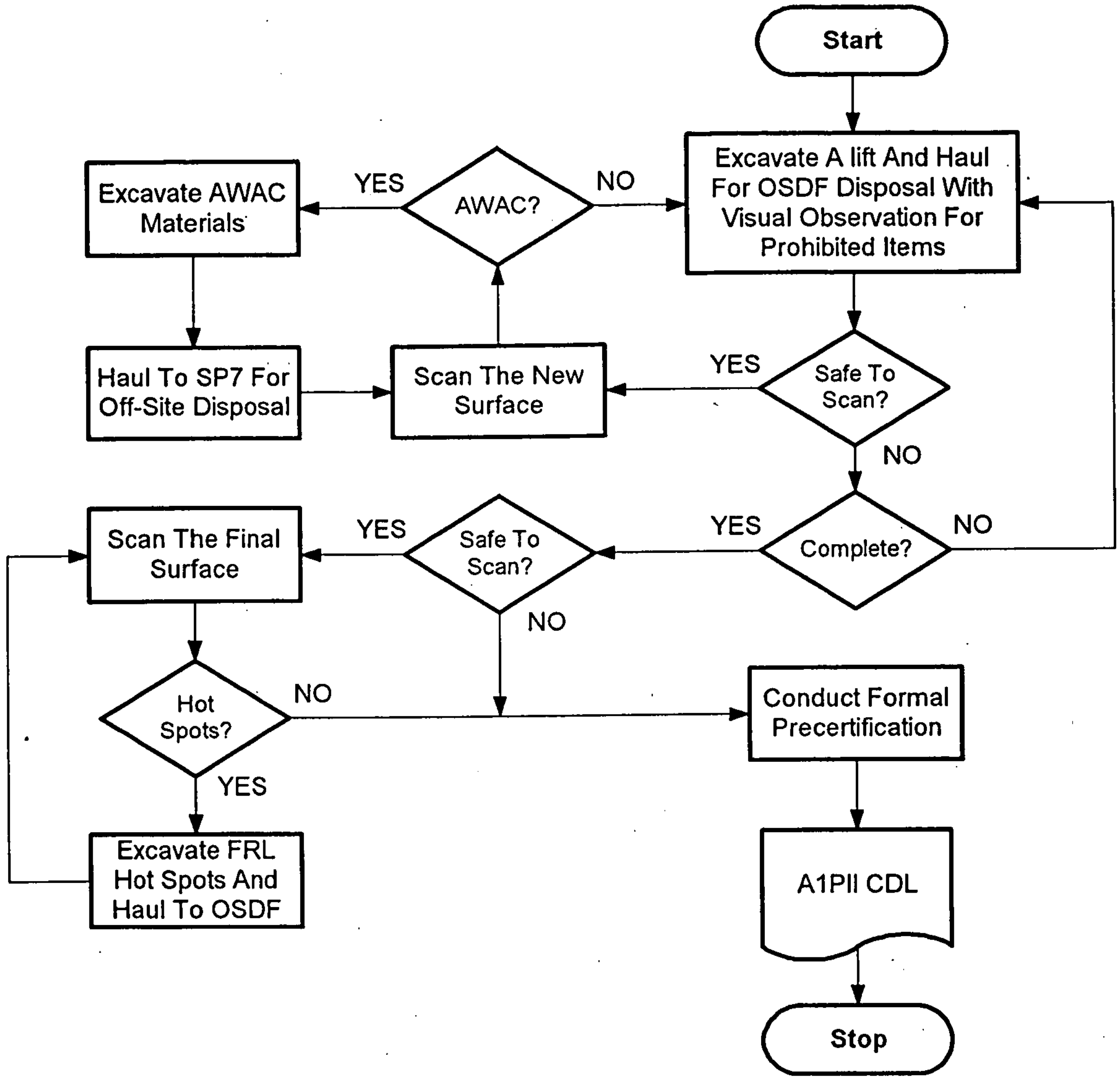
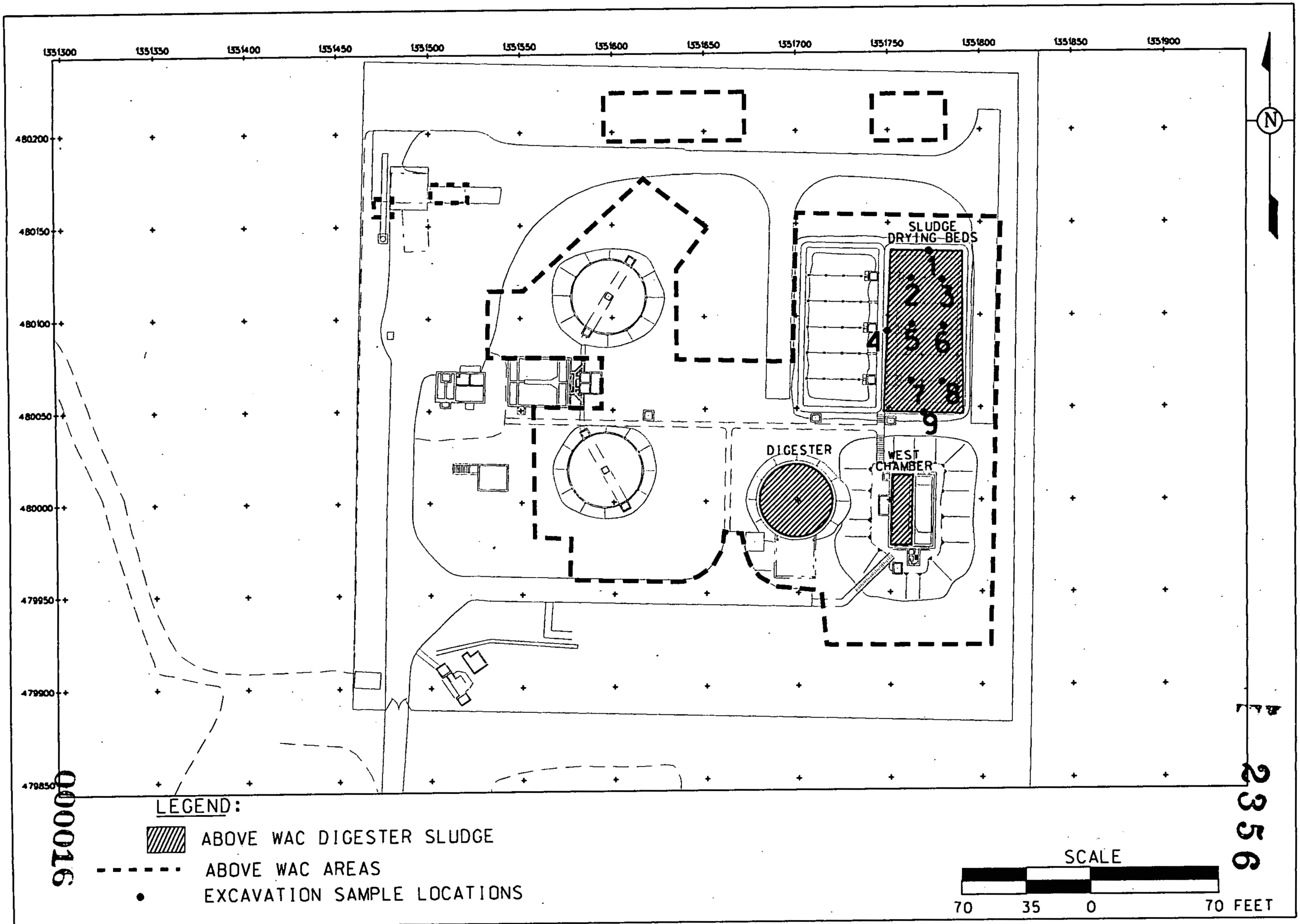


FIGURE 2-1B STP BELOW-WAC MATERIAL EXCAVATION SEQUENCE



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vt=5cj31=dgn=bmp=stp-1010.dgn
STATE PLANAR COORDINATE SYSTEM 1983

20-MAY-1999 FIGURE 2-2. PSP SAMPLE LOCATIONS

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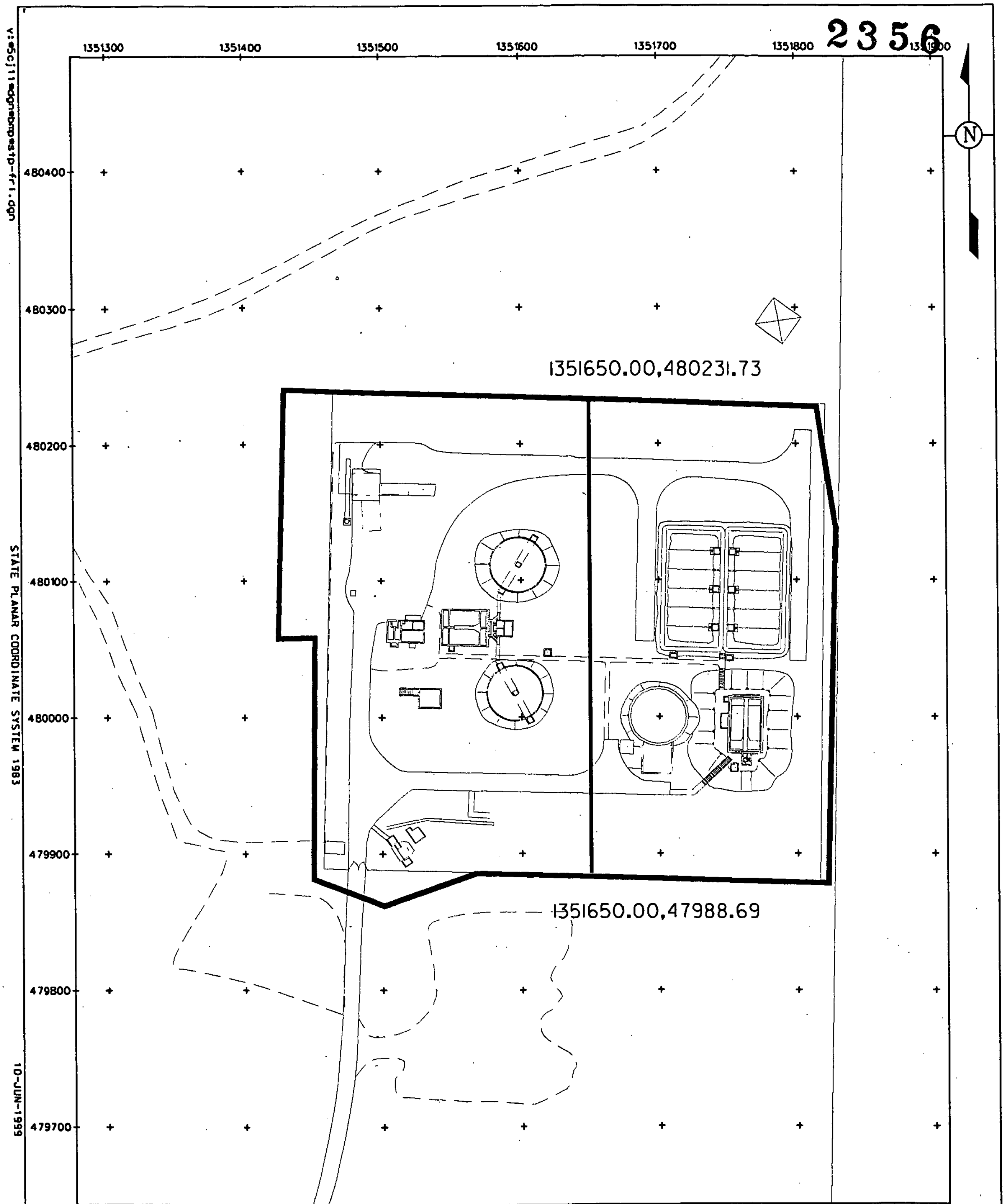

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LEGEND:

——— FEMP BOUNDARY

SCALE

100 50 0 100 FEET

FIGURE 2-3. STP AREA 20 mg/kg FRL

3.0 EXCAVATION MONITORING TECHNIQUES

A1PII excavation monitoring will be performed using the following techniques:

- Visual monitoring
- Field surveying
- Real-time radiological above-WAC identification and precertification monitoring
- Physical sampling.

3.1 VISUAL MONITORING

At a minimum, a FDF Construction and a WAO representative will visually monitor all excavation activities. This monitoring will detect special materials, prohibited items, and other situations. Visual inspection will be particularly significant for the following activities:

- During the removal of sludge cake contaminated material in the sludge drying beds. The exact limits of the berm material classified as above-WAC will be determined based on field observations. Material with visible residue or discoloration will be removed and containerized.

- During the excavation activities in the STP area, the contractor is required to clean residue from debris prior to transport of the OSDF. Visible residue on the debris (that cannot be removed) will prevent placement of the debris into the OSDF.

3.2 SURVEYING

Surveys will be performed to identify physical sample locations, to verify the required excavation depths have been attained, and to obtain vertical elevation (Z) coordinates for radiation measurements as needed. Horizontal positioning data for Radiation Measurement Systems (RMS) measurements are automatically collected by the on-board Global Positioning Systems (GPS) during the scan. Horizontal positioning data (northings and eastings) for HPGe measurements are collected by the gamma systems operators at the time of HPGe data collection. The operation of survey and positioning instruments will be conducted in accordance with surveying procedures identified in Section 7.0.

3.2.1 Excavation Lift Surveying

It is anticipated that two 3 ± 1 foot lifts will be performed in the STP area; however, additional lifts may be performed based on real time monitoring data (see Section 3.3). Field surveys will be performed before and after each lift to confirm that the proposed material has been excavated. FDF Construction personnel will inform the Characterization Lead when excavation of a lift area is complete. The Characterization Lead will then coordinate with the Surveying Lead to perform a topographic survey of the defined lift area and its boundary. Northing, easting, and elevation coordinate values will be determined using standard survey practices and positioning instruments (i.e., electronic total stations and GPS receivers). An average elevation will also be generated for the excavation lift area, with a minimum of four elevation points used. This average elevation will depict the horizontal plane of the lift area. Field locations (i.e., lift area boundaries, measurement locations, grid points, above-WAC delineation if necessary) will be marked, in a manner easily identifiable by all field personnel, using survey stakes, flags, and/or water-based paint. Survey information (coordinate data) will be downloaded at the completion of each survey (or at the end of each day) and transferred electronically to the Survey Lead. This information will be forwarded to the RTIMP and Characterization Leads as applicable.

3.2.2 Surface Contamination Stripping Surveying

The excavation contractor will perform pre-excavation and post-excavation surveys to verify that the appropriate amount of soil was removed from the area. This activity specifically applies to the 6-inch stripping areas outside of the STP and to the lead-stabilized excavation in the Trap Range. FDF may choose to verify some or all of the excavation contractor's survey measurements.

3.3 REAL-TIME RADIOLOGICAL MONITORING

When an excavation area or lift is complete and the area has been field surveyed, or is currently in the process of being field surveyed, the Characterization Lead will contact the RTIMP Lead and arrange for a real-time WAC or precertification scan. Figure 3-1 shows the general decision making process for real-time WAC scans.

A walk-down of the area by the Characterization Lead and/or the RTIMP Lead may be required to determine the type of *in situ* gamma spectroscopy equipment to use and if the excavation lift area is ready for *in situ* gamma spectroscopy. This walk-down will focus on ensuring area accessability for RTIMP equipment (reasonable grade and slopes, etc.), ensuring boundaries are marked or readily visible, ensuring that no excessive moisture is present, and ensuring the area is free of obstructions and construction equipment that might damage equipment or pose a safety risk to personnel.

The excavation lift area will be characterized for total uranium above-WAC material and/or precertified for radiological COCs discernable with *in situ* gamma spectrometry equipment (RMS and/or HPGe). Data acquisition will be consistent with Data Quality Objective (DQO) SL-054, *Real Time Precertification Monitoring,* or SL-055, *Real Time Excavation Monitoring for Total Uranium Waste Acceptance Criteria (WAC),* as applicable, Sections 2.0, 3.0, and 5.0 of the User's Manual, and the procedures identified in Section 7.0.

Excavation lift characterization for total uranium above-WAC material identification or precertification involves a detection phase to initially scan the excavation face of a lift, followed by confirmation and delineation phases, if necessary.

Confirming (and delineating) the extent of contamination with 31-cm and/or 15-cm HPGe measurements is at the discretion of the Characterization Lead. Conditions may arise which warrant a different decision process for confirming and/or delineating the extent of contamination (i.e., cost effectiveness, need for timely response, obvious discoloration in the soil, process residue, or other suspect above-WAC material which may require immediate excavation, photoionization detector monitoring, or physical sampling). The decision process for the unusual condition will be documented in applicable field logs and, if determined to be appropriate by the Characterization Lead, with a V/FCN.

The WAC and precertification FRL trigger levels needed for real time decision making are indicated in Table 3-1. (The lower FRL trigger levels for the STP trickling filters area as discussed in Section 2.3 and shown on Figure 2-3.)

3.3.1 WAC Detection Phase RMS Surface Scans

The RMS is either of two sodium iodide (NaI) detection systems: the Radiation Tracking System (RTRAK) or the Radiation Scanning System (RSS). They will be used to provide as close to 100 percent coverage as possible of the accessible excavation lift area. The spectral acquisition time will be 4 seconds, with data collected at a maximum detector speed of 1 mile per hour, as assisted by the on-board GPS. Two moisture measurements will be collected in each area measured by the RMS. The RMS passes will be made in a back and forth pattern, if possible, normally after two perimeter patterns have been completed. Alternatively, a circular pattern may be more appropriate. If the RTRAK is used, overlapping passes are achieved by placing the innermost RTRAK tires in the former outermost RTRAK tire track from the previous RTRAK pass, achieving an approximate 0.4-meter overlap. Stakes or other markers may be used to keep the RSS on track. The RMS measurements will be accompanied by horizontal positioning data. If elevation coordinates are requested, surveying personnel will obtain this measurement in accordance with Section 3.2.

The RMS trigger level requiring potential confirmation and delineation for 31 cm RMS measurements is 721 parts per million (ppm) for total uranium (Section 3.4.1 of the User's Manual). If RMS single point measurements are less than or equal to 721 ppm total uranium, no confirmation or delineation with the HPGe is necessary. If single point measurements are greater than or equal to 721 ppm total uranium, confirmation and delineation measurements may be required.

3.3.2 <u>WAC Detection Phase HPGe Surface Scans</u>

The HPGe will be used for the initial scanning of an excavation lift area if the RMS is not used. If the HPGe is used without prior scanning by the RMS, a triangular grid (if practical) will be established over measurement areas to achieve approximately 99.1 percent coverage (see Section 4.10 and Figure 4.10-1 of the User's Manual). A detector height of 1 meter and a spectral acquisition time of 5 minutes will be used. 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. One moisture measurement will be collected for each HPGe measurement. One consecutive 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). HPGe measurements will be accompanied by GPS northing and easting coordinates and by the average elevation coordinate designated to represent each lift, if applicable. Elevation measurements can be obtained by the HPGe since the detector is stationary for a minimum of 5 minutes.

The HPGe trigger level requiring potential confirmation and delineation for 1 meter HPGe measurements is 400 ppm for total uranium. A trigger level of 400 ppm allows detection of total uranium WAC exceedances with a 1.5-meter radius (Section 3.4.1 of the User's Manual). If this initial HPGe scan indicates all data are below 400 ppm for total uranium, then no further confirmation or delineation with the HPGe is necessary. If the HPGe surface scan indicates locations greater than or equal to 400 ppm total uranium, then confirmation and delineation may be required.

3.3.3 Suspect Above-WAC Confirmation Phase Measurements

RMS scan locations exceeding the trigger level of 721 ppm total uranium, and HPGe scan locations exceeding 400 ppm total uranium, may require HPGe confirmation. This confirmation and delineation process is documented in Section 3.4 of the User's Manual. The circumscribed boundary of the suspect above-WAC location will be located and marked in the field using flags, stakes, and/or water-based paint. The location of the maximum activity will be identified in the field using a hand-held frisker or equivalent instrument.

HPGe detectors will be used for all confirmation measurements. Confirmation measurements will be made using detector heights of 15 cm and/or 31 cm, depending on the required field of view. The approximate circular field of view for the various HPGe detector heights are: 6-meter radius at a 1-meter detector height, 2.5 meter radius at a 31-cm detector height, and a 1-meter radius at a 15-cm detector height. The spectral acquisition time of 5 minutes will be used at the suspect above-WAC location to reliably determine above-WAC boundaries. One moisture measurement will be collected for each HPGe measurement. One consecutive duplicate measurement will be taken for each 20 HPGe measurements. Each HPGe measurement will be accompanied by GPS northing and easting coordinates and by an elevation coordinate, if requested.

The trigger level of confirming a hot spot is 928 ppm total uranium. If both confirmation measurements (15 cm and 31 cm) are below 928 ppm total uranium, then the potential hot spot is not confirmed and no delineation is required. If either confirmation measurement (15 cm or 31 cm) is equal to or exceeds the trigger level of 928 ppm, then the hot spot is confirmed and may be delineated with the HPGe.

Confirming (and delineating) the extent of contamination with 31-cm and/or 15-cm HPGe measurements is at the discretion of the Characterization Lead. Conditions may arise which warrant a different decision process for confirming and defining the extent of contamination (i.e., cost effectiveness, need for timely response, obvious discoloration in the soil, process residue, or other suspect above-WAC material which may require immediate excavation, photoionization detector monitoring, or physical sampling). The decision process for the unusual condition will be documented in applicable field logs and, if determined to be appropriate by the Characterization Lead, with a V/FCN.

3.3.4 Above-WAC Delineation Phase Measurements

HPGe detectors will be used for all delineation measurements. The boundary of confirmed above-WAC material will be delineated with the HPGe. The boundary of confirmed above-WAC material area will be delineated using a detector height of 15 cm with a spectral acquisition time of 5 minutes on a 2-meter triangular 90.1 percent coverage grid over the entire area indicated by the surface scan and confirmation measurements. One duplicate measurement will be taken for every 20 HPGe measurements. The excavation of the above-WAC area will be bounded by HPGe measurements that are lower than the HPGe WAC trigger level. The extent of the above-WAC area is identified when the measurements no longer equal to or greater than 928 ppm total uranium.

3.3.5 Precertification Detection Phase RMS Scans

RMS precertification detection phase scans will be conducted in the same manner as the RMS WAC detection phase surface scans identified in Section 3.3.2 with the addition of a radon monitor. The radon monitor, with a detector height of 31 cm, will be positioned in the proximity of the RMS run(s) to ensure the radon correction can be applied to the radium-226 data. Two moisture measurements will be taken for each acre to be scanned. The RMS measurements will be accompanied by GPS northing and easting coordinates and by an elevation coordinate, if requested. A hot spot is suspected for any resolvable COC if the RMS two-point moving average measurements are equal to or greater than 3xFRL within areas 10 meters or smaller, or equal to or greater than 2xFRL within an area greater than 10 meters in size (Section 3.3.5 of the User's Manual).

3.3.6 Precertification Detection Phase HPGe Scans

HPGe precertification detection phase scans will be conducted in the same manner as the WAC detection phase surface scans identified in Section 3.3.3 with the addition of a radon monitor and a count time of 15 minutes. The radon monitor, with a detector height of 1 meter, will be positioned near the HPGe measurements to ensure the radon correction can be applied to the radium-226 data. One moisture measurement will be collected for each HPGe measurement. One consecutive duplicate will be collected for every 20 HPGe measurements. The HPGe measurements will be accompanied by GPS northing and easting coordinates and by an elevation coordinate, if requested. An HPGe hot spot is suspected if the single measurement is equal to or greater than 2xFRL for any resolvable COC (Section 3.3.5 of the User's Manual). In addition, after the Certification Design Letter (CDL) has been written identifying the Certification Unit (CU) boundaries, a minimum of one HPGe measurement per CU will be collected at the highest RMS detection phase surface scan total activity measurement. The numbering system for these measurements will reflect the CU identification number. These measurements will be identified in a V/FCN.

3.3.7 Confirmation of Potential RMS or HPGe Precertification Above-FRL Hot Spots

Confirmation measurements will be obtained, if necessary, to confirm potential above-FRL hot spots identified during the RMS or HPGe surface scan. HPGe measurements will be made at the location of the maximum measurement at each potential hot spot where the RMS two-point average was greater than 3xFRL, or 2xFRL depending on the size of the potential hot spot. In accordance with guidelines established in Section 3.3.2 of the User's Manual, all confirmatory measurements for RMS identified hot spots will be obtained with the HPGe at both the 31-cm and 1-meter detector heights, with a radon monitor at both the 31-cm and 1-meter heights. The HPGe detector system acquisition time will be set to 15 minutes for both readings. If the potential hot spot was identified on an HPGe 1 meter surface scan, the hot spot will not be required to be confirmed and the delineation phase will proceed. One moisture measurement will be made at each HPGe location. One consecutive duplicate measurement will be collected for every 20 HPGe measurements. The HPGe location will be surveyed for northing and easting coordinates and with an elevation coordinate, if requested, and marked with a flag, stake and/or water-based paint. The HPGe hot spot is confirmed if either the 31-cm or 1-meter detector height measurements are equal to or greater than 2xFRL for any resolvable area-specific contaminant of concern (ASCOC) (Section 3.3.5 of the User's Manual).

3.3.8 Delineation of Precertification Above-FRL Hot Spots

To delineate confirmed above-FRL hot spots, HPGe measurements will be made to bound the area using a 15-cm detector height at an acquisition time of 15 minutes, with a radon monitor at 15 cm. One moisture measurement will be made at each HPGe location. One consecutive duplicate measurement will be taken for every 20 HPGe measurements. All HPGe measurement locations will be surveyed and marked with the measurement location. The boundary of the above-FRL location has been delineated when the concentrations of resolvable COCs are below the 2xFRL.

3.3.9 Surface Moisture Measurements

Surface moisture measurements are used to correct RMS and HPGe data to a dry weight basis prior to mapping. Moisture measurements will be collected with the Troxler moisture gauge or Zeltex Infrared Moisture Meter within 8 hours of the collection of the *in situ* gamma spectrometry measurement and before ambient weather conditions change. Field conditions such as weather will be noted on the applicable electronic worksheet. Field moisture measurements and moisture-corrected data are discussed in detail in Sections 3.8 and 5.2 of the User's Manual. When using the RMS for WAC or precertification measurements, two moisture measurements will be collected per acre. If the area is smaller than 1 acre, at least one surface moisture measurement will be collected for each excavation lift. More than one moisture measurement may be collected for each lift if the surface moisture of soil appears visibly different. If more than one moisture reading is obtained, the average of the readings will be used as the moisture measurement for the lift and to correct the real-time data. If a large difference in readings is noted by the RTIMP Lead, the data will be re-evaluated. When the HPGe is being used for WAC or precertification confirmation, delineation or special materials measurements, 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 may be used, or a soil moisture core will be collected to a depth of 4 inches and submitted to the on-site laboratory for moisture analysis only (Section 3.8 of the User's Manual). Moisture analysis turnaround time must meet the real-time/construction two-day turnaround schedule.

3.3.10 Safety and Health Measurements

If safety and health concerns are raised regarding elevated readings on hand-held radiological survey instruments, an HPGe gamma measurement can be taken over the area where the elevated readings are located. The intent of these measurements is to determine what isotopes are present (uranium versus thorium). If the RMS is deployed, the same parameters described in Section 3.3.1 will be used. If the HPGe is deployed, the most appropriate detector height for the applicable field of view with a spectral acquisition time of 5 minutes will be used. A radon monitor will not be used unless radium-226 is suspected. Each measurement location will be surveyed to obtain a northing and easting coordinate and

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an elevation coordinate, if requested. The data determined from this gamma measurement will be used only to assist in the evaluation of heath and safety requirements and is not required for WAC determination.

3.3.11 Radon Monitors

Radon monitors are used when RMS or HPGe precertification measurements are being made in the field to correct the precertification radium-226 measurements for radon-222 daughters emitted from the soil. A radon monitor may also be requested for S&H measurements if the suspected H&S concern is radium-226. Radon monitors are not used when RMS or HPGe WAC measurements are being made. A radon monitor will be set up in the vicinity of the area in which precertification measurements will be made. This monitor consists of a HPGe detector in a static location collecting continuous 15-minute measurements throughout the field data collection period. The radon monitor detector heights will be the same as the RMS or HPGe field data. If multiple detector heights are being used in the field, then multiple radon monitors are used at the corresponding detector heights. Radon corrections are applied in accordance with the guidance in Section 5.3 of the User's Manual.

3.3.12 Data Mapping

As the real-time 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 HPGe data summary printouts will be given to A1PII Characterization and WAO Leads so they can determine if additional scanning, confirmation, or delineation measurements are required. All *in situ* data will be moisture corrected before mapping. Maps can be generated to meet the specific needs of the Characterization and WAO Leads. Maps will be generated depicting any or all of the following:

WAC and Precertification Maps:

- WAC RMS Map - to be constructed using single spectra and will color coded to indicate locations above and below the trigger level; total activity maps may also be color coded to indicate general pattens of radiological constituents and will be constructed using single spectra. Batch numbers will be indicated on the map.
- WAC HPGe Map - to be color coded to show locations above and below HPGe WAC trigger level. The map will show the field of view and number for each HPGe

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measurement. A summary data printout for each HPGe measurement showing total uranium concentration will be included with the map.

- Precertification RMS maps - to be constructed for total uranium, radium-226 (corrected for radon and laboratory radium correction), and a thorium-232 using a 2-point running average of spectra and total counts using a single spectra.

- Precertification HPGe Maps- to be color coded to show locations at 1xFRL, 2xFRL, and 3xFRL for total uranium, radium-226 (corrected for radon and laboratory radium correction), and thorium-232. The map will show the field of view and number for each HPGe measurement. A summary data printout for each HPGe measurement showing total uranium concentration will be included with the map.

HPGe Special Material or Safety and Health Maps:

- Isotope specific maps, as requested
- Summary data printout for each HPGe measurement

3.3.13 Real-Time Data Numbering System

All RMS and HPGe measurements will be assigned a unique identification for data tracking purposes. There are three essential components in the numbering scheme regardless of which measurement technique is used:

- Excavation area
- Lift area within the excavation area
- Lift sequence in lift area.

These three components, combined with additional designators and differentiated by their location (northing, easting, and elevation) and time, will allow for unique identification.

All RMS and HPGe WAC and precertification measurements will contain some or all of the following designators.

1. Excavation area: Denotes major A1PII excavation area: Sewage Treatment Plant (A1P2STP), or Trap Range (A1P2TR), A1PII areas outside STP (A1P2)

2. Lift area: Denotes location of lift within the excavation area, if appropriate. For example, the initial surface scan of the STP will not require a lift designation. The STP lift areas are designated as follows:

I = Incinerator Area
S = Sludge Drying Bed Area
T = Trickle Filter Area
D = Digester Building and Surrounding Area

3.	Lift sequence:	Designates the lift sequence (if used) with the first completed lift starting as 1 and the following lift as 2, etc.
4.	Measurement Type	WAC = Waste Acceptance Criteria Measurements PC = Precertification Measurements S&H = Safety and Health SM = Special Materials RADON = Radon monitor measurements
5.	RMS Batch Number	Designates the sequential RMS batch number. (Batch numbers are not lift specific).
6.	HPGe Measurement Number (if applicable):	Designates the sequential numbering of HPGe measurements from a particular lift. The first measurement taken from a lift is 1 and any subsequent measurements are numbered sequentially (2, 3, 4, etc.).
7.	Measurement designator:	G = gamma measurements and associated moisture measurement
8.	Quality control designators (as necessary):	D = duplicate measurement

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

A) RMS WAC measurement identification use designators 1, 2, 3, 4, and 5.

Example: A1P2STP-I-2-WAC-348 where:

A1P2STP = Sewage Treatment Plant area
I = Incinerator area
2 = second lift in area I (approximately 4 - 8 feet deep)
WAC = WAC measurement
348 = batch number 348

B) HPGe WAC Measurement Identification use designators 1, 2, 3, 4, 6, 7 and possibly 8.

Example: A1P2STP-I-2-WAC-3-G-D where:

A1P2STP = Sewage Treatment Plant area
I = Incinerator area
2 = second lift in area I (approximately 4 - 8 feet deep)
WAC = WAC measurement
3 = third measurement in the active lift
G = gamma measurement
D = duplicate

C) RMS Precertification measurement identification use designators 1, 4, and 5.

Example: A1P2STP-PC-348 where:

A1P2STP = Sewage Treatment Plant area
PC = Precertification measurement
348 = batch number 348

D) HPGe Precertification Identification use designators 1, 4, 6, 7 and possibly 8.

Example: A1P2TR-PC-3-G-D where:

A1P2TR = Trap Range
PC = precertification measurement
3 = third measurement
G = gamma measurement
D = duplicate

E) Safety and Heath Measurement Identification use designators 1, 4, 6, 7 and possibly 8.

Example: A1P2STP-S&H-3-G-D where:

A1P2STP = Sewage Treatment Plant area
S&H = Safety and Health measurement
3 = third measurement
G = gamma measurement
D = duplicate

F) Special Material Measurement Identification use designators 1, 4, 6, 7 and possibly 8.

Example: A1P2STP-SM-3-G-D where:

A1P2STP = Sewage Treatment Plant area
SM = Special Materials
3 = third measurement
G = gamma measurement
D = duplicate

G) Radon Monitors use designators 1 and 4.

Example: A1P2-RADON-A-2 where:

A1P2 = A1P2 area (outside of STP and not in Trap Range)
RADON = Radon monitor
A = 100 cm detector height (B=31 cm, C=15 cm detector height)
2 = next sequential radon number

The maps generated from real-time monitoring of the excavation lift area will be attached to the Excavation Monitoring Form (Figure 3-2). This form contains relevant information pertaining to the data collection, Characterization Lead review of the data, and WAO acceptance of the characterization. The use of this form is referenced in Procedure EW-1022, *On-Site Tracking and Manifesting of Bulk Excavated Material*. The RTIMP, Characterization and WAO Leads will complete this form for each lift area. The original forms will be placed in the WAO project files. Significant or unusual daily events will be recorded in field logs or log books by the appropriate organization.

3.4 PHYSICAL SAMPLING

As discussed in Section 2.1, nine locations will be sampled in the sludge drying beds after the above-WAC digester sludge and sludge cake are removed.

Prior to sampling, the locations will be surveyed to determine the elevation and coordinates. The samples will be field located as shown in Figure 2-2. Samples will be collected in 6- inch intervals until native soil is reached at approximately 4 feet. A geologist will determine when the native clay soil is encountered. Two additional 6-inch intervals will be collected from the native soil strata. Samples will be collected by using a Geoprobe ® Model 5400 in accordance with Procedure EQT-06, *Geoprobe®*

Model 5400-Operation and Maintenance. At each sampling location, one or more pushes will be performed to a depth of approximately 36 inches each using the Macro-Core sampler with a plastic liner insert. The Geoprobe® drill bit will be used to drill through any pavement and/or cement/rock subsurface. Each sample will be divided into 6-inch sample increments. The samples will be submitted to the laboratory for analysis or archived as indicated in Appendix B.

If Geoprobe® access is impossible, the technicians will retrieve the samples using a hand-operated auger or core sampler (Geoprobe® Macro-Core by hand) in accordance with procedure SMPL-01, *Solids Sampling*. Samples will be collected using either a hand auger or a 1-inch or 2-inch butyrate liner with a split or solid barrel sampler (as soil conditions require) to collect a soil core to a depth of 48 inches.

A duplicate sample will be collected at sample location 5. This duplicate will be collected by making two adjacent pushes (side by side within a 6-inch radius).

All field measurements and sample collection information will be recorded on the Sample Collection Log and the Chain of Custody/Request for Analysis form as required. The sample locations, associated sample numbers, and field duplicates are listed in Appendix B.

Excess soil sample material will be containerized or disposed of according to direction from WAO. Boreholes will be backfilled with bentonite pellets and hydrated. Table 3-2 lists the sampling analytical requirements. A Borehole Abandonment Record form will be completed.

Sample identifiers for each sample are listed in Appendix B and Fernald Analytical Computerized Tracking System (FACTS) identification numbers will be assigned to each sample. Each sample has been assigned a unique sample identification number as follows:

A1P2-Excavation Area-Lift Area-Sample Location-Depth-Suite-QC

where:

A1P2 = Area 1, Phase II
Excavation Area = "STP" indicates the Sewage Treatment Plant
Lift Area = An "S" indicates the Sludge Drying Bed area.
Location = Location as shown on Figure 2-2

Depth = 0"-6" interval = 1
6"-12" interval = 2
12"-18" interval = 3
18"-24" interval = 4
24"-30" interval = 5
30"-36" interval = 6
36"-42" interval = 7
42"-48" interval = 8
48"-54" interval = 9
54"-60" interval = 10, etc. as needed

Suite = Analytical Suite. An "R" indicates Radionuclides, an "L" indicates Volatiles, and "V" indicates Archive.

QC = Quality Control Sample. A "D" indicates a duplicate sample. Trip Blank identifiers are included in Appendix B.

It is not foreseen that additional physical sampling will be required; however, if additional samples are collected, sample identification numbers will be identified in a V/FCN.

3.4.1 Analytical Requirements

Physical samples submitted for laboratory analysis will be sent to the on-site laboratory for technetium-99 and total uranium and to the off-site laboratory for volatiles. Samples will be analyzed and reported to ASL B, with the results reported on a dry weight basis. The highest allowable minimum detection limit for technetium-99 is 2.0 pCi/g, which is well below the WAC or FRL limit. The turnaround time is four days for technetium-99 and total uranium samples and seven days for volatile samples. Table 3-2 summarizes the sampling and analytical requirements.

TABLE 3-1
REAL-TIME MEASUREMENT WAC TRIGGER LEVELS AND RADIOLOGICAL ASCOC FRLs

RAD ASCOCs	1xFRL	2xFRL	3xFRL	WAC Trigger Levels
Total Uranium	82 ppm	164 ppm	246 ppm	RMS=721 ppm TU (at 31cm) HPGe=400 ppm TU (at 1 m) HPGe=928 ppm TU (at 31 and 15 cm)
Total Uranium (area defined in Figure 2-3)	20 ppm	40 ppm	60 ppm	RMS=721 ppm TU (at 31cm) HPGe=400 ppm TU (at 1 m) HPGe=928 ppm TU (at 31 and 15 cm)
Radium-226	1.7pCi/g	3.4 pCi/g	5.1pCi/g	Not applicable
Thorium-232	1.5 pCi/g	3.0 pCi/g	4.5 pCi/g	Not applicable

TABLE 3-2
SAMPLING AND ANALYTICAL REQUIREMENTS

Analyte	Sample Matrix	Sample Type	Preservative	Lab	ASL	Holding Time	Container
Tc-99, Total Uranium	Solid	Grab	None	On-site	B	6 Months	Capped plastic liner or 500-ml glass or plastic container
Volatiles	Solid	Grab	Cool, 4° C	Off-site	B	14 days	2 60-ml glass with teflon-lined lid
Volatiles	Water	Trip Blank	Cool, 4° C HCl to pH <2	Off-site	B	14 days	2 40-ml glass with teflon-lined septa

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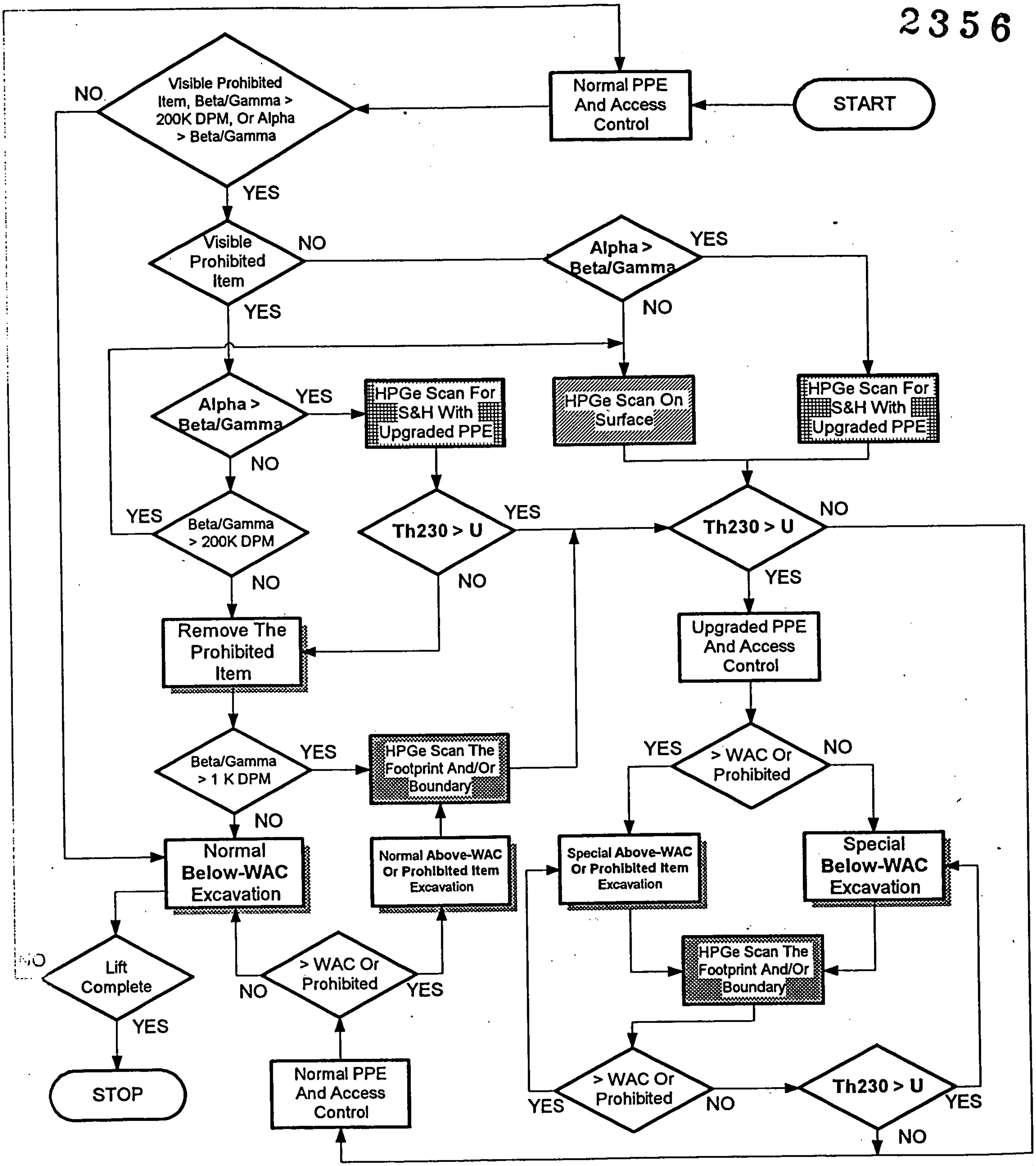

FIGURE 3-1 GENERAL DECISION MAKING PROCESS FOR REAL-TIME SCAN UNDER SPECIAL CONDITIONS BETWEEN EXCAVATION LIFTS

EXCAVATION MONITORING FORM

1. Area Description:____________________ Area ID (Lift Area / SM / EWF):________________
Comments:____ PWID #:____________

2. Section 1 - Data Collection
Equipment Used ☐ RTRAK ☐ RSS ☐ HPGe Unit No: __________

Calibration Acceptable ☐ Yes Date: ______________
Note: If not in calibration, do not use equipment until calibration is acceptable

3. RTRAK / RSS	**4.** HPGe
Map attached? ☐ Yes ☐ No	Data Report attached? ☐ Yes ☐ No
List of Batch #s: Coverage in accordance with PSP? ☐ Yes ☐ No If "No": ☐ Equipment Malfunction ☐ Rough Terrain ☐ Weather ☐ Standing Water ☐ Other:__________ Data Verification Checklist attached? ☐ Yes ☐ No	List of Data Points: Data Verification Checklist attached? ☐ Yes ☐ No

5. This signature indicates the data generated for this area by this equipment on this day is correct and valid within the confines of equipment performance and as defined in PSP #: __________

______________________________ (Signature) ______________________ (Signature Date)

6. Section 2 - Characterization
Review real-time data
Sufficient real-time coverage? ☐ Yes ☐ No

Further action required: ____

All data points < total uranium WAC? ☐ Yes ☐ No
If no, define > WAC area(s) and extent with HPGe if applicable (see attached real-time map) as defined in PSP.

The signature indicates this area has been characterized using the real-time data generated in Section 1 above and in accordance with PSP listed in Box 5.

______________________________ (Signature) ______________________ (Signature Date)

7. Section 3 - WAO
Review attached documentation ☐ Yes MTL Designation ______________

This signature indicates this area can be excavated and dispositioned in accordance with the characterization provided in Section 2 above. ☐ Yes ☐ No and Reason:______________________________

______________________________ (Signature) ______________________ (Signature Date)

Assigned Data Group for HPGe from WAO System Controls: __________

FS-F-5195
REV.1: 08/28/98

Instructions for form completion are provided

FIGURE 3-2 Excavation Monitoring Form
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Instructions for the Excavation Monitoring Form:

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Box 1	Enter the Area Description (excavation area), Area ID [Lift Area / Special Material (SM) / Equipment Wash Facility (EWF)], Comments (if additional clarification is required) and PWID No.
Box 2	Check all the equipment used and enter the identification number for the HPGe detector used. If equipment is not in calibration, do not use until calibration is acceptable. Check yes if the calibration is acceptable and enter the date the calibration was performed. If more than one unit is used, a separate sheet for each unit number must be used.
Box 3	Check yes or no if a RTRAK map is attached. List the Batch Numbers associated with the referenced lift ID. Check yes or no if coverage is in accordance with the PSP. If the answer is no, give the reason that coverage was not in accordance with the PSP. If 'Other' is chosen as the reason, add a description of the reason. Check yes or no if the data verification checklist is attached. If the data verification checklist is not attached, explain why.
Box 4	Check yes or no if an HPGe data report is attached. List all the data points associated with the identified lift. Check yes or no if the data verification checklist is attached. If the data verification checklist is not attached, explain why.
Box 5	Enter the appropriate PSP number. Sign and date.
Box 6	Check yes or no if the real-time coverage is in accordance with applicable PSP. If the coverage is not as specified in the PSP, identify any further action required. Check yes if all the data points are less than Total Uranium WAC, if not check no. If data points are not all below WAC, define areas above-WAC and extent by filling out a separate form and attaching applicable map(s). Sign and date.
Box 7	Check yes if reviewed attached documentation. Enter Material Tracking Location (MTL) designator. Check yes if area can be excavated or no and explain why not. Sign and date. Fill in assigned (unique IIMS data group designator) data group for HPGe from WAO Systems Control.

NOTE:
Box 1 will be completed by the SCEP representative and/or WAO representative.
Boxes 2-5 will be completed by the RTIMP representative.
Box 6 will be completed by the SCEP representative.
Box 7 will be completed by the WAO representative.

FIGURE 3-2 Excavation Monitoring Form
Page 2 of 2

4.0 QUALITY ASSURANCE REQUIREMENTS

Real-time data and physical sample collection will be performed in accordance with the requirements in the latest revision of the Sitewide CERCLA Quality Assurance Project Plan (SCQ) and SCQ Addendum. If methodology is required that is not described in the SCQ or is different from SCQ requirements, a variance will be issued which confirms the methodology basis and resulting data will reflect project needs. The appropriate data qualifier codes will be established for data validation. The DQOs applicable to this PSP are SL-048, *Delineating the Extent of Constituents of Concern During Remediation Sampling*, SL-054, *Real Time Precertification Monitoring*, and SL-055, *Real Time Excavation Monitoring for Total Uranium Waste Acceptance Criteria*. Copies of these DQOs are included in Appendix A of this PSP.

4.1 SURVEILLANCE

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

4.2 IMPLEMENTATION OF FIELD CHANGES

If field conditions require changes or variances, verbal approval must be obtained from the Characterization, RTIMP or Field Sampling Lead, as appropriate, and the QA Representative before changes can be implemented (electronic mail is acceptable to document approval). Changes to the PSP will be noted in the applicable field logs and on a V/FCN. QA must receive the completed V/FCN, with the signatures of the Project Manager, Characterization Lead, WAO, and the QA Representative within seven working days of granting verbal approval. Changes involving real time data collection must receive the signature of the RTIMP Lead. Changes involving sample collection must receive the signature of the Field Sampling Lead.

4.3 DATA ASLs

Physical samples and real-time measurements collected under this PSP will be collected according to the following Analytical Support Levels (ASLs):

- Physical samples from the Sludge Drying Beds will be collected to ASL B and will require Data Validation.
- Real-time RMS and HPGe measurements collected for WAC determination will be collected to ASL A and will not require Data Validation.
- Real-time RMS measurements collected for precertification will be collected to ASL A and will not require validation.
- Real-time HPGe measurements collected for precertification will be collected to ASL A and will not require Data Validation.

5.0 SAFETY AND HEALTH

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

All work performed on this project will be performed in accordance to applicable Environmental Monitoring project procedures, RM-0020, *Radiological Control Requirements Manual*, RM-0021, *Safety Performance Requirements Manual,* FDF work permit, radiological work permit (RWP), 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 personnel performing measurements related to this project will be briefed on the Contractor Safe Work Plan for the A1PII specific work area and the briefing will be documented. Personnel who do not receive a briefing on these requirements will not participate in the execution of excavation activities related to the completion of assigned project responsibilities.

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

6.0 DATA MANAGEMENT

A data collection process will be implemented during the PSP to properly manage data collected from both real-time scanning and physical sampling for technetium-99, total uranium and volatiles.

6.1 REAL TIME RADIOLOGICAL MONITORING DATA

The RTIMP group will provide hard copy maps and data sheets to the Characterization Lead and Data Management Contact. All electronically recorded data will be verified by RTIMP after each data collection event, and documented by using the Checklist for Verification Checklists in accordance with ADM-17, *In-Situ Gamma Spectrometry Data Management.* Other 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 will be downloaded to the Local Area Network (LAN) using the Ethernet connection. The Characterization Lead will be informed by the RTIMP Lead when RMS or HPGe measurements do not meet data quality control checklist criteria. The Characterization Lead will determine whether additional or replacement RMS or HPGe data is to be collected.

Once the electronic data has been placed on the LAN, the Data Management Contact will perform an evaluation prior to placement into the Sitewide Environmental Database (SED). The evaluation will involve a comparison check between the electronic data, hard copy maps and summary reports for accuracy and completeness. The Data Management Contact will complete the Excavation Monitoring Real-Time Electronic Data Quality Control Checklist (Appendix D). After the data have been placed in the SED, the data will also be placed on the SDFP Web Site.

The original completed Excavation Monitoring Form, the real-time map(s), and HPGe summary data (if applicable) will be forwarded to WAO for placement in the WAO project files. Copies of other field documentation may be generated and provided to the Characterization Lead or Data Management Contact upon request. RTIMP will manage the real-time hard copy information according to the appropriate real-time operating procedure or ADM-17, *In-situ Gamma Spectrometry Data Management,* as applicable. Survey locations for physical samples and real time measurements are attached to the measurement in either hard copy of electronic format, any additions survey information will be retained by the Survey Lead. Project records will be forwarded to the Engineering/Construction Document Control (ECDC) group according to site procedures for records management.

6.2 PHYSICAL SAMPLING DATA

As specified in Section 5.1 of the SCQ, sampling teams will describe daily activities on the Field Activity Log (FAL) in sufficient detail so that the sampling team may reconstruct a particular situation without reliance on memory. Chain of Custody/Request for Analysis forms, Sample Collection Logs, and Borehole Abandonment Records will be completed according to instructions specified in Appendix B of the SCQ and applicable procedures.

Field documentation, such as the FAL, SCL, and Borehole Abandonment Record, will undergo an internal QA/QC review by sample technicians. A second review will be performed by FEMP QA personnel. Copies will then be generated and delivered to data entry personnel for input into the SED.

Electronically recorded data from the land survey unit will be downloaded to disks as soon as schedules permit. Technicians will review the data for completeness and accuracy and then download it onto the FEMP LAN. Once on the LAN, the SDFP Data Management Contact will evaluate the data and then send it to the loader, where it will be loaded onto the Oracle system and an error log will be generated. The data will then be made available to users through both the Graphical Information System (GIS) and Microsoft (MS) Access Software.

Analytical data from the on-site and off-site laboratories will be reported in preliminary form to the Characterization Lead by the Laboratory Contact when the data are available in the FACTS databases. After the data are validated for each sample release, the data for that release will be reported to the Characterization Lead in the final data report format. Qualified data will be entered into the SED.

7.0 APPLICABLE DOCUMENTS, METHODS, AND STANDARDS

Excavation characterization activities described in this plan shall follow the requirements outlined in the following documents, procedures, and standard methods:

- Sitewide Excavation Plan (SEP), 2500-WP-0028, Revision 0, July 1998
- Waste Acceptance Criteria Attainment Plan for the On-Site Disposal Facility, 20100-PL-0014, Revision 0, May 1998
- Impacted Materials Placement Plan, 20100-PL-0007, Revision 0, January 1998
- Area 1, Phase II IRDP, 20710-PL-0002, Revision D, September 1998
- Area 1, Phase II Supplemental Characterization Package 20710-PL-0005, Revision C, September 1998
- Sitewide CERCLA Quality Assurance Project Plan (SCQ), FD-1000, Revision 1, September 1998
- *In-Situ* Gamma Spectroscopy Addendum to the Sitewide CERCLA Quality Assurance Project Plan, Draft, FD-1000, August 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, September 1998
- RTRAK Applicability Study, 20701-RP-0003, Revision 2, January 1999
- Area 1 Stockpile Inventory and Waste Acceptance Criteria Attainment Report, 20701-RP-0001, Draft Revision B, July 1998
- ADM-16 *In Situ* Gamma Spectrometry Quality Control Measurement
- ADM-17 *In Situ* Gamma Spectrometry Data Management
- ADM-18 Gammavision Software for *In-Situ* Gamma Spectrometry
- ADM-19 *In Situ* Gamma Spectrometry Field Prerequisites
- EQT-06 Geoprobe ® Model 5400-Operation and Maintenance

- EQT-09 Spectrace 9000 Field Portable X-Ray Fluorescence Spectrometer
- EQT-22 High Purity Germanium Detector In-Situ Efficiency Calibration
- EQT-23 High Purity Germanium Detectors
- EQT-32 Troxler 3440 Series Surface Moisture/Density Gauge
- EQT-33 Real-Time Differential Global Positioning System Operation
- EQT-39 Zeltex Infrared Moisture Meter
- EQT-40 Satloc Real-time Differential Global Positioning System
- EQT-41 Radiation Measuring Systems
- 20300-PL-002 Real-Time Instrumentation Measurement Quality Assurance Plan
- 34-00-005 *In-situ* Gamma Spectrometry Data Validation (Draft)
- EW-1022 On-Site Tracking and Manifesting of Bulk Excavated Material
- SMPL-01 Solids Sampling
- DQO SL-048 Delineating the Extent of Constituents of Concern During Remediation Sampling
- DQO SL-054 Real Time Precertification Monitoring
- DQO SL-055 Real Time Excavation Monitoring for Total Uranium Waste Acceptance Criteria (WAC)

APPENDIX A

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

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Control Number ________

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	

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.

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 ☒ RA ☐ R$_v$A ☐ 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 ☒ 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
A ☒ B ☒ C ☐ D ☒ E ☒

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 [ ]

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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 2356

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.

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

* 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 2356

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: ______________________ Date: 6/8/99
James E. Chambers
DQO Coordinator

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

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

DATA QUALITY OBJECTIVES
Excavation Monitoring for Total Uranium Waste Acceptance Criteria (WAC)

<u>Members of Data Quality Objectives (DQO) Scoping Team</u>
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.

<u>Conceptual Model of the Site</u>
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 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.

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.

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 [X] 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 [X]

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 [X] 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	NaI and HPGe	SCQ Section:	Appendix H
ASL B		SCQ Section:	
ASL C		SCQ Section:	
ASL D		SCQ Section:	
ASL E		SCQ Section:	

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

Biased [ ] Composite [ ] Environmental [ ] Grab [ ] Grid [ ]
Intrusive [ ] Non-Intrusive [X] 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

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

8.A. Field Quality Control Samples:

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

*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 Spike [ ]
Other (specify) Per method
Matrix Duplicate/Replicate [ ]
Surrogate Spikes [ ]

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

APPENDIX B

SAMPLE IDENTIFIERS AND LOCATIONS

APPENDIX B
SAMPLE IDENTIFIERS AND LOCATIONS

Location	Sample ID	Northing	Easting	Depth (inches)	TAL or Archive
1	A1P2-STP-S-1-1-R	480135.00	1351772.19	0-6	A
1	A1P2-STP-S-1-1-L	480135.00	1351772.19	0-6	B
1	A1P2-STP-S-1-2-R	480135.00	1351772.19	6-12	A
1	A1P2-STP-S-1-2-L	480135.00	1351772.19	6-12	B
1	A1P2-STP-S-1-3-R	480135.00	1351772.19	12-18	A
1	A1P2-STP-S-1-3-L	480135.00	1351772.19	12-18	B
1	A1P2-STP-S-1-4-V	480135.00	1351772.19	18-24	Archive
1	A1P2-STP-S-1-5-R	480135.00	1351772.19	24-30	A
1	A1P2-STP-S-1-5-L	480135.00	1351772.19	24-30	B
1	A1P2-STP-S-1-6-V	480135.00	1351772.19	30-36	Archive
1	A1P2-STP-S-1-7-R	480135.00	1351772.19	36-42	A
1	A1P2-STP-S-1-7-L	480135.00	1351772.19	36-42	B
1	A1P2-STP-S-1-8-V	480135.00	1351772.19	42-48	Archive
1	A1P2-STP-S-1-9-R	480135.00	1351772.19	48-54 Native soil	A
1	A1P2-STP-S-1-9-L	480135.00	1351772.19	48-54 Native soil	B
1	A1P2-STP-S-1-10-V	480135.00	1351772.19	54-60 Native soil	Archive
2	A1P2-STP-S-2-1-R	480120.20	1351762.47	0-6	A
2	A1P2-STP-S-2-1-L	480120.20	1351762.47	0-6	B
2	A1P2-STP-S-2-2-R	480120.20	1351762.47	6-12	A
2	A1P2-STP-S-2-2-L	480120.20	1351762.47	6-12	B
2	A1P2-STP-S-2-3-R	480120.20	1351762.47	12-18	A
2	A1P2-STP-S-2-3-L	480120.20	1351762.47	12-18	B

APPENDIX B
SAMPLE IDENTIFIERS AND LOCATIONS
(Continued)

Location	Sample ID	Northing	Easting	Depth (inches)	TAL or Archive
2	A1P2-STP-S-2-4-V	480120.20	1351762.47	18-24	Archive
2	A1P2-STP-S-2-5-R	480120.20	1351762.47	24-30	A
2	A1P2-STP-S-2-5-L	480120.20	1351762.47	24-30	B
2	A1P2-STP-S-2-6-V	480120.20	1351762.47	30-36	Archive
2	A1P2-STP-S-2-7-R	480120.20	1351762.47	36-42	A
2	A1P2-STP-S-2-7-L	480120.20	1351762.47	36-42	B
2	A1P2-STP-S-2-8-V	480120.20	1351762.47	42-48	Archive
2	A1P2-STP-S-2-9-R	480120.20	1351762.47	48-54 Native Soil	A
2	A1P2-STP-S-2-9-L	480120.20	1351762.47	48-54 Native Soil	B
2	A1P2-STP-S-2-10-V	480120.20	1351762.47	54-60 Native Soil	Archive
3	A1P2-STP-S-3-1-R	480119.54	1351779.25	0-6	A
3	A1P2-STP-S-3-1-L	480119.54	1351779.25	0-6	B
3	A1P2-STP-S-3-2-R	480119.54	1351779.25	6-12	A
3	A1P2-STP-S-3-2-L	480119.54	1351779.25	6-12	B
3	A1P2-STP-S-3-3-R	480119.54	1351779.25	12-18	A
3	A1P2-STP-S-3-3-L	480119.54	1351779.25	12-18	B
3	A1P2-STP-S-3-4-V	480119.54	1351779.25	18-24	Archive
3	A1P2-STP-S-3-5-R	480119.54	1351779.25	24-30	A
3	A1P2-STP-S-3-5-L	480119.54	1351779.25	24-30	B
3	A1P2-STP-S-3-6-V	480119.54	1351779.25	30-36	Archive
3	A1P2-STP-S-3-7-R	480119.54	1351779.25	36-42	A
3	A1P2-STP-S-3-7-L	480119.54	1351779.25	36-42	B

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APPENDIX B
SAMPLE IDENTIFIERS AND LOCATIONS
(Continued)

Location	Sample ID	Northing	Easting	Depth (inches)	TAL or Archive
3	A1P2-STP-S-3-8-V	480119.54	1351779.25	42-48	Archive
3	A1P2-STP-S-3-9-R	480119.54	1351779.25	48-54 Native Soil	A
3	A1P2-STP-S-3-9-L	480119.54	1351779.25	48-54 Native Soil	B
3	A1P2-STP-S-3-10-V	480119.54	1351779.25	54-60 Native Soil	Archive
4	A1P2-STP-S-4-1-R	480091.71	1351749.44	0-6	A
4	A1P2-STP-S-4-1-L	480091.71	1351749.44	0-6	B
4	A1P2-STP-S-4-2-R	480091.71	1351749.44	6-12	A
4	A1P2-STP-S-4-2-L	480091.71	1351749.44	6-12	B
4	A1P2-STP-S-4-3-R	480091.71	1351749.44	12-18	A
4	A1P2-STP-S-4-3-L	480091.71	1351749.44	12-18	B
4	A1P2-STP-S-4-4-V	480091.71	1351749.44	18-24	Archive
4	A1P2-STP-S-4-5-R	480091.71	1351749.44	24-32	A
4	A1P2-STP-S-4-5-L	480091.71	1351749.44	24-32	B
4	A1P2-STP-S-4-6-V	480091.71	1351749.44	32-38	Archive
4	A1P2-STP-S-4-7-R	480091.71	1351749.44	38-42	A
4	A1P2-STP-S-4-7-L	480091.71	1351749.44	38-42	B
4	A1P2-STP-S-4-8-V	480091.71	1351749.44	42-48	Archive
4	A1P2-STP-S-4-9-R	480091.71	1351749.44	48-54 Native soil	A
4	A1P2-STP-S-4-9-L	480091.71	1351749.44	48-54 Native soil	B
4	A1P2-STP-S-4-10-V	480091.71	1351749.44	54-60 Native soil	Archive
5	A1P2-STP-S-5-1-R	480095.29	1351762.92	0-6	A

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APPENDIX B
SAMPLE IDENTIFIERS AND LOCATIONS
(Continued)

Location	Sample ID	Northing	Easting	Depth (inches)	TAL or Archive
5	A1P2-STP-S-5-1-L	480095.29	1351762.92	0-6	B
5	A1P2-STP-S-5-2-R	480095.29	1351762.92	6-12	A
5	A1P2-STP-S-5-2-L	480095.29	1351762.92	6-12	B
5	A1P2-STP-S-5-3-R	480095.29	1351762.92	12-18	A
5	A1P2-STP-S-5-3-L	480095.29	1351762.92	12-18	B
5	A1P2-STP-S-5-4-V	480095.29	1351762.92	18-24	Archive
5	A1P2-STP-S-5-5-R	480095.29	1351762.92	24-30	A
5	A1P2-STP-S-5-5-L	480095.29	1351762.92	24-30	B
5	A1P2-STP-S-5-6-V	480095.29	1351762.92	30-36	Archive
5	A1P2-STP-S-5-7-R	480095.29	1351762.92	36-42	A
5	A1P2-STP-S-5-7-L	480095.29	1351762.92	36-42	B
5	A1P2-STP-S-5-8-V	480095.29	1351762.92	42-48	Archive
5	A1P2-STP-S-5-9-R	480095.29	1351762.92	48-54 Native soil	A
5	A1P2-STP-S-5-9-L	480095.29	1351762.92	48-54 Native soil	B
5	A1P2-STP-S-5-10-V	480095.29	1351762.92	54-60 Native soil	Archive
5	A1P2-STP-S-5-1-R-D	480095.29	1351762.92	0-6	A
5	A1P2-STP-S-5-1-L-D	480095.29	1351762.92	0-6	B
5	A1P2-STP-S-5-2-R-D	480095.29	1351762.92	6-12	A
5	A1P2-STP-S-5-2-L-D	480095.29	1351762.92	6-12	B
5	A1P2-STP-S-5-3-R-D	480095.29	1351762.92	12-18	A
5	A1P2-STP-S-5-3-L-D	480095.29	1351762.92	12-18	B
5	A1P2-STP-S-5-4-V-D	480095.29	1351762.92	18-24	Archive

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APPENDIX B
SAMPLE IDENTIFIERS AND LOCATIONS
(Continued)

Location	Sample ID	Northing	Easting	Depth (inches)	TAL or Archive
5	A1P2-STP-S-5-5-R-D	480095.29	1351762.92	24-30	A
5	A1P2-STP-S-5-5-L-D	480095.29	1351762.92	24-30	B
5	A1P2-STP-S-5-6-V-D	480095.29	1351762.92	30-36	Archive
5	A1P2-STP-S-5-7-R-D	480095.29	1351762.92	36-42	A
5	A1P2-STP-S-5-7-L-D	480095.29	1351762.92	36-42	B
5	A1P2-STP-S-5-8-V-D	480095.29	1351762.92	42-48	Archive
5	A1P2-STP-S-5-9-R-D	480095.29	1351762.92	48-54 Native soil	A
5	A1P2-STP-S-5-9-L-D	480095.29	1351762.92	48-54 Native soil	B
5	A1P2-STP-S-5-10-V-D	480095.29	1351762.92	54-60 Native soil	Archive
6	A1P2-STP-S-6-1-R	480094.18	1351780.11	0-6	A
6	A1P2-STP-S-6-1-L	480094.18	1351780.11	0-6	B
6	A1P2-STP-S-6-2-R	480094.18	1351780.11	6-12	A
6	A1P2-STP-S-6-2-L	480094.18	1351780.11	6-12	B
6	A1P2-STP-S-6-3-R	480094.18	1351780.11	12-18	A
6	A1P2-STP-S-6-3-L	480094.18	1351780.11	12-18	B
6	A1P2-STP-S-6-4-V	480094.18	1351780.11	18-24	Archive
6	A1P2-STP-S-6-5-R	480094.18	1351780.11	24-30	A
6	A1P2-STP-S-6-5-L	480094.18	1351780.11	24-30	B
6	A1P2-STP-S-6-6-V	480094.18	1351780.11	30-36	Archive
6	A1P2-STP-S-6-7-R	480094.18	1351780.11	36-42	A
6	A1P2-STP-S-6-7-L	480094.18	1351780.11	36-42	B
6	A1P2-STP-S-6-8-V	480094.18	1351780.11	42-48	Archive

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APPENDIX B
SAMPLE IDENTIFIERS AND LOCATIONS
(Continued)

Location	Sample ID	Northing	Easting	Depth (inches)	TAL or Archive
6	A1P2-STP-S-6-9-R	480094.18	1351780.11	48-54 Native soil	A
6	A1P2-STP-S-6-9-L	480094.18	1351780.11	48-54 Native soil	B
6	A1P2-STP-S-6-10-V	480094.18	1351780.11	54-60 Native soil	Archive
7	A1P2-STP-S-7-1-R	480064.74	1351762.47	0-6	A
7	A1P2-STP-S-7-1-L	480064.74	1351762.47	0-6	B
7	A1P2-STP-S-7-2-R	480064.74	1351762.47	6-12	A
7	A1P2-STP-S-7-2-L	480064.74	1351762.47	6-12	B
7	A1P2-STP-S-7-3-R	480064.74	1351762.47	12-18	A
7	A1P2-STP-S-7-3-L	480064.74	1351762.47	12-18	B
7	A1P2-STP-S-7-4-V	480064.74	1351762.47	18-24	Archive
7	A1P2-STP-S-7-5-R	480064.74	1351762.47	24-30	A
7	A1P2-STP-S-7-5-L	480064.74	1351762.47	24-30	B
7	A1P2-STP-S-7-6-V	480064.74	1351762.47	30-36	Archive
7	A1P2-STP-S-7-7-R	480064.74	1351762.47	36-42	A
7	A1P2-STP-S-7-7-L	480064.74	1351762.47	36-42	B
7	A1P2-STP-S-7-8-V	480064.74	1351762.47	42-48	Archive
7	A1P2-STP-S-7-9-R	480064.74	1351762.47	48-54 Native soil	A
7	A1P2-STP-S-7-9-L	480064.74	1351762.47	48-54 Native soil	B
7	A1P2-STP-S-7-10-V	480064.74	1351762.47	54-60 Native soil	Archive
8	A1P2-STP-S-8-1-R	480064.08	1351779.25	0-6	A
8	A1P2-STP-S-8-1-L	480064.08	1351779.25	0-6	B

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APPENDIX B
SAMPLE IDENTIFIERS AND LOCATIONS
(Continued)

Location	Sample ID	Northing	Easting	Depth (inches)	TAL or Archive
8	A1P2-STP-S-8-2-R	480064.08	1351779.25	6-12	A
8	A1P2-STP-S-8-2-L	480064.08	1351779.25	6-12	B
8	A1P2-STP-S-8-3-R	480064.08	1351779.25	12-18	A
8	A1P2-STP-S-8-3-L	480064.08	1351779.25	12-18	B
8	A1P2-STP-S-8-4-V	480064.08	1351779.25	18-24	Archive
8	A1P2-STP-S-8-5-R	480064.08	1351779.25	24-30	A
8	A1P2-STP-S-8-5-L	480064.08	1351779.25	24-30	B
8	A1P2-STP-S-8-6-V	480064.08	1351779.25	30-36	Archive
8	A1P2-STP-S-8-7-R	480064.08	1351779.25	36-42	A
8	A1P2-STP-S-8-7-L	480064.08	1351779.25	36-42	B
8	A1P2-STP-S-8-8-V	480064.08	1351779.25	42-48	Archive
8	A1P2-STP-S-8-9-R	480064.08	1351779.25	48-54 Native soil	A
8	A1P2-STP-S-8-9-L	480064.08	1351779.25	48-54 Native soil	B
8	A1P2-STP-S-8-10-V	480064.08	1351779.25	54-60 Native soil	Archive
9	A1P2-STP-S-9-1-R	480047.53	1351768.88	0-6	A
9	A1P2-STP-S-9-1-L	480047.53	1351768.88	0-6	B
9	A1P2-STP-S-9-2-R	480047.53	1351768.88	6-12	A
9	A1P2-STP-S-9-2-L	480047.53	1351768.88	6-12	B
9	A1P2-STP-S-9-3-R	480047.53	1351768.88	12-18	A
9	A1P2-STP-S-9-3-L	480047.53	1351768.88	12-18	B
9	A1P2-STP-S-9-4-V	480047.53	1351768.88	18-24	Archive
9	A1P2-STP-S-9-5-R	480047.53	1351768.88	24-30	A

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APPENDIX B
SAMPLE IDENTIFIERS AND LOCATIONS
(Continued)

Location	Sample ID	Northing	Easting	Depth (inches)	TAL or Archive
9	A1P2-STP-S-9-5-L	480047.53	1351768.88	24-30	B
9	A1P2-STP-S-9-6-V	480047.53	1351768.88	30-36	Archive
9	A1P2-STP-S-9-7-R	480047.53	1351768.88	36-42	A
9	A1P2-STP-S-9-7-L	480047.53	1351768.88	36-42	B
9	A1P2-STP-S-9-8-V	480047.53	1351768.88	42-48	Archive
9	A1P2-STP-S-9-9-R	480047.53	1351768.88	48-54 Native soil	A
9	A1P2-STP-S-9-9-L	480047.53	1351768.88	48-54 Native soil	B
9	A1P2-STP-S-9-10-V	480047.53	1351768.88	54-60 Native soil	Archive
NA	A1P2-STP-S-TB1	NA	NA	NA	B
NA	A1P2-STP-S-TB2	NA	NA	NA	B
NA	A1P2-STP-S-TB3	NA	NA	NA	B

Note: Depths listed are approximate. If collection of samples deeper than four feet is necessary to reach native soil, these samples will be collected as an archive sample. Once the native soil layer is reached, the top 6-inch interval of native soil is to be collected for analysis and the second 6-inch interval is to be collected for archive. The appropriate depth identifier should be used for all samples.

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APPENDIX C

TARGET ANALYTE LISTS (TALs)

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APPENDIX C
TARGET ANALYTE LISTS

TAL 20710-PSP-0007 A
(On-site Laboratory, ASL B)

Total Uranium by ICP/MS
Technetium-99 by Gas Proportional Counting Method

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TAL 20710-PSP-0007 B
(Off-Site Laboratory, ASL B)

GC/MS Volatile Organic Compounds
1,1,1-Trichloroethane
1,1,2-Trichloroethane
1,1,2,2-Tetrachloroethane
1,1-Dichloroethane
1,1-Dichloroethene
1,2-Dichloroethane
1,2-Dichloroethene (total)
1,2-Dichloropropane
2-Butanone
2-Hexanone
4-methyl-2-pentanone
Acetone
Benzene
Bromodichloromethane
Bromoform
Bromomethane
Carbon Disulfide
Carbon Tetrachloride
Chlorobenzene
Chloroethane
Chloroform
Chloromethane
cis-1,3-Dichloropropene
Dibromochloromethane
Ethylbenzene
Methylene Chloride
Styrene
Tetrachloroethene

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TAL 20710-PSP-0007 B
(Off-Site Laboratory, ASL B)
(continued)

GC/MS Volatile Organic Compounds
Toluene
trans-1,3-Dichloropropene
Trichloroethene
Vinyl chloride
Xylenes, total

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APPENDIX D

EXCAVATION MONITORING REAL-TIME ELECTRONIC DATA QUALITY CONTROL CHECKLIST

PSP/Project #:__________

Batch Numbers:__________

HPGe file Numbers:__________

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EXCAVATION MONITORING REAL-TIME ELECTRONIC DATA QUALITY CONTROL CHECKLIST

#	ITEM TO BE CHECKED	✔ or No	Modification/Correction with explanation	Date Corrected
1	Receive the Characterization Request form, Excavation Monitoring Form (EMF), 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 EMF 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 EMF, the LAN, and the SED in both the worksheet files and the results/data files			
6	Check that the EMF, 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__________

APPENDIX D

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 EMF 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 EMF listing all the files. This Checklist can be used to ensure all the files were received in the SED.

Sign and Date______________________