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Idaho Operations Office

Operable Unit 3-13, Group 3, Other Surface Soils Remediation Sets 1-3 (Phase I) Characterization Plan

September 2005

Idaho Cleanup Project

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Revision 1
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Operable Unit 3-13, Group 3
Other Surface Soils Remediation Sets 1-3 (Phase I)
Characterization Plan

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Prepared for the
U.S. Department of Energy
Idaho Operations Office

ABSTRACT

This Characterization Plan was developed for the Operable Unit 3-13, Group 3, Other Surface Soils, Remediation Sets 1-3 (Phase I) remediation activities for the Idaho Nuclear Technology and Engineering Center at the Idaho National Engineering and Environmental Laboratory. This plan, which supports the Group 3 Remedial Design/Remedial Action Work Plan, identifies the characterization data necessary to

1. Determine whether the sites require remediation

2. Determine whether waste can be disposed of at the INEEL CERCLA Disposal Facility landfill

3. Determine if waste that requires remediation and for which I-129 is suspected can be disposed of in the INEEL CERCLA Disposal Facility landfill.

It also establishes the procedures and requirements that will be used to perform characterization sampling and analysis, as well as minimize health and safety risks to persons performing the sampling activities at the 10 Group 3, Phase I release sites.

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ACRONYMS

AA	alternative action
ALS	alpha spectrometry
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
COC	contaminant of concern
COPC	contaminant of potential concern
CPP	Chemical Processing Plant
DAR	document action request
DOE	Department of Energy
DOT	Department of Transportation
DQO	data quality objective
DS	decision statement
EA	exposure area
EPA	Environmental Protection Agency
FFA/CO	Federal Facility Agreement and Consent Order
FSP	field sampling plan
FTL	field team leader
GFP	gas flow proportional
GMS	gamma spectrometry
HASP	health and safety plan
HDPE	high-density polyethylene
HPGe	high-purity germanium
ICDF	INEEL CERCLA Disposal Facility
ICP	Idaho Completion Project
IDEQ	Idaho Department of Environmental Quality

IEDMS	Integrated Environmental Data Management System
IH	industrial hygienist
INEEL	Idaho National Engineering and Environmental Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
LEPS	low-energy photon spectrometry
LSC	liquid scintillation counting
MDA	minimum detectable activities
MDL	method detection limits
MQO	measurement quality objective
OU	operable unit
PM	project manager
PSQ	principal study question
QA	quality assurance
QAPjP	quality assurance project plan
QC	quality control
RA	remedial action
RCRA	Resource Conservation and Recovery Act
RD/RA	remedial design/remedial action
RG	remediation goal
ROD	Record of Decision
SAM	Sample and Analysis Management
SAP	sampling and analysis plan
SC	sample custodian
SOW	statement of work
SVOC	semivolatile organic compound
TAL	target analyte list

TOS	task order statement of work
UCL	upper confidence limit
UTS	universal treatment standard
VOC	volatile organic compound
WAC	Waste Acceptance Criteria
WAG	waste area group

Operable Unit 3-13, Group 3, Other Surface Soils Remediation Sets 1-3 (Phase I) Characterization Plan

1. INTRODUCTION

This Characterization Plan was prepared for the Operable Unit (OU) 3-13, Group 3, Other Surface Soils, Remediation Sets 1-3 (Phase I) remediation activities for the Idaho Nuclear Technology and Engineering Center (INTEC) at the Idaho National Engineering and Environmental Laboratory (INEEL). This plan identifies the characterization data necessary for material profiling, remediation, and disposal decisions for 10 release sites (Group 3, Phase I sites, Remediation Sets 1, 2, and 3) consisting mainly of contaminated soils at INTEC.

This plan is a necessary component of the Remedial Design/Remedial Action (RD/RA) Work Plan (WP) (DOE-ID 2004a) developed for the OU 3-13, Group 3, remediation activities. Data quality objectives (DQOs) are outlined, and data collection, analysis, and management requirements are provided. Components of the project Health and Safety Plan (HASP) (INEEL 2004) are referenced (i.e., health and safety requirements, training, site control and security, and emergency response and notification).

This plan was developed using the U.S. Environmental Protection Agency (EPA) publication *Guidance for Conducting Remedial Investigations and Feasibility Studies under the Comprehensive Environmental Response, Compensation, and Liability Act* (EPA 1988) and meets the requirements of the Federal Facility Agreement and Consent Order (FFA/CO) (DOE-ID 1991).

1.1 Project Objectives

The objective of the characterization activities described in this plan is to verify that soil and debris in OU 3-13, Group 3, Phase I remediation sites exceeding the remediation goals (RGs) established in the OU 3-13 Record of Decision (ROD) (DOE-ID 1999) meet the Waste Acceptance Criteria (WAC) for disposal at the INEEL CERCLA Disposal Facility (ICDF). This plan describes the sampling necessary to

1. Determine whether the sites require remediation

2. Determine whether the wastes can be disposed of at the ICDF landfill

3. Determine if waste requiring remediation for which I-129 is suspected can be disposed of in the ICDF landfill.

This document is implemented with the current revision of the *Quality Assurance Project Plan for Waste Area Groups 1, 2, 3, 4, 5, 6, 7, 10, and Inactive Sites* (QAPjP) (DOE-ID 2002a). This document governs all work at the characterization sites performed by INEEL employees, subcontractors, and employees of other companies or U.S. Department of Energy (DOE) laboratories.

1.2 Site Description

Site description covers the INEEL Site, the relevant waste area group (WAG), and the WAG group with the three remediation sets.

1.2.1 The Idaho National Engineering and Environmental Laboratory

The INEEL encompasses 2,305 km^2 (890 mi^2) and is located approximately 55 km (34 mi) west of Idaho Falls, Idaho (Figure 1-1). The United States Atomic Energy Commission, now the DOE, established the Nuclear Reactor Testing Station, now the INEEL, in 1949 as a site for building and testing nuclear facilities. At present, the INEEL supports the engineering and operations efforts of DOE and other federal agencies in areas of nuclear safety research, reactor development, reactor operations and training, nuclear defense materials production, waste management and technology development, and energy technology and conservation programs.

1.2.2 INTEC—Waste Area Group 3

The INTEC is located in the south central portion of the INEEL approximately 13 km (8 mi) north of the southern INEEL boundary and covers an area of 0.4 km^2 (0.15 mi^2). Operations commenced at INTEC in 1953. INTEC has historically been a uranium reprocessing facility for both defense projects and research while also acting as a storage facility for spent nuclear fuel. While reprocessing activities at INTEC were phased out in the 1990s, the facility continues to receive and store spent nuclear fuel and radioactive wastes for future disposition.

The INTEC is designated as WAG 3, which was subdivided into 13 OUs that were investigated for contaminant releases to the environment. Fifty-five contaminant release sites were identified within OU 3-13 requiring remedial action (RA) to mitigate risks to human health and the environment under a future residential use scenario. These sites were organized into seven groups that share common characteristics and contaminant sources. Group 3, Other Surface Soils, is further divided into Remediation Sets 1 through 7. Ten of the 55 release sites are included in Sets 1, 2, and 3. The characterization and remediation of Sets 1, 2, and 3 are to be completed as Phase I of the OU 3-13, Group 3, Other Surface Soils, remediation project. The remaining release sites will be addressed during the Phase II activities.

1.2.3 Operable Unit 3-13, Group 3, Other Surface Soils

Remediation Sets 1, 2, and 3 include 10 release sites (CPP-97, CPP-92, CPP-99, CPP-98, CPP-37B, CPP-37C, CPP-03, CPP-37A, CPP-67, and CPP-34A/B) consisting of tarp-covered soil stockpiles, boxed soil and debris, gravel pits with debris, in-place contaminated staging area soil, infiltration ponds, and disposal trenches (Figure 1-2). Soil and debris wastes are the result of onsite operations, and maintenance and upgrade projects (e.g., tank farm upgrade, CPP-603 cleanup, miscellaneous excavation projects).

Contaminants within OU 3-13, Group 3 include both chemical and radionuclide constituents. The OU 3-13 ROD identifies contaminants of concern (COCs) for Group 3 to include americium-241; cesium-137; europium-152 and -154; plutonium-238, -239, -240, and -241; strontium-90; and mercury (Hg) (DOE-ID 1999). The RGs are established in the ROD for each of these soil COCs and listed in Table 1-1.

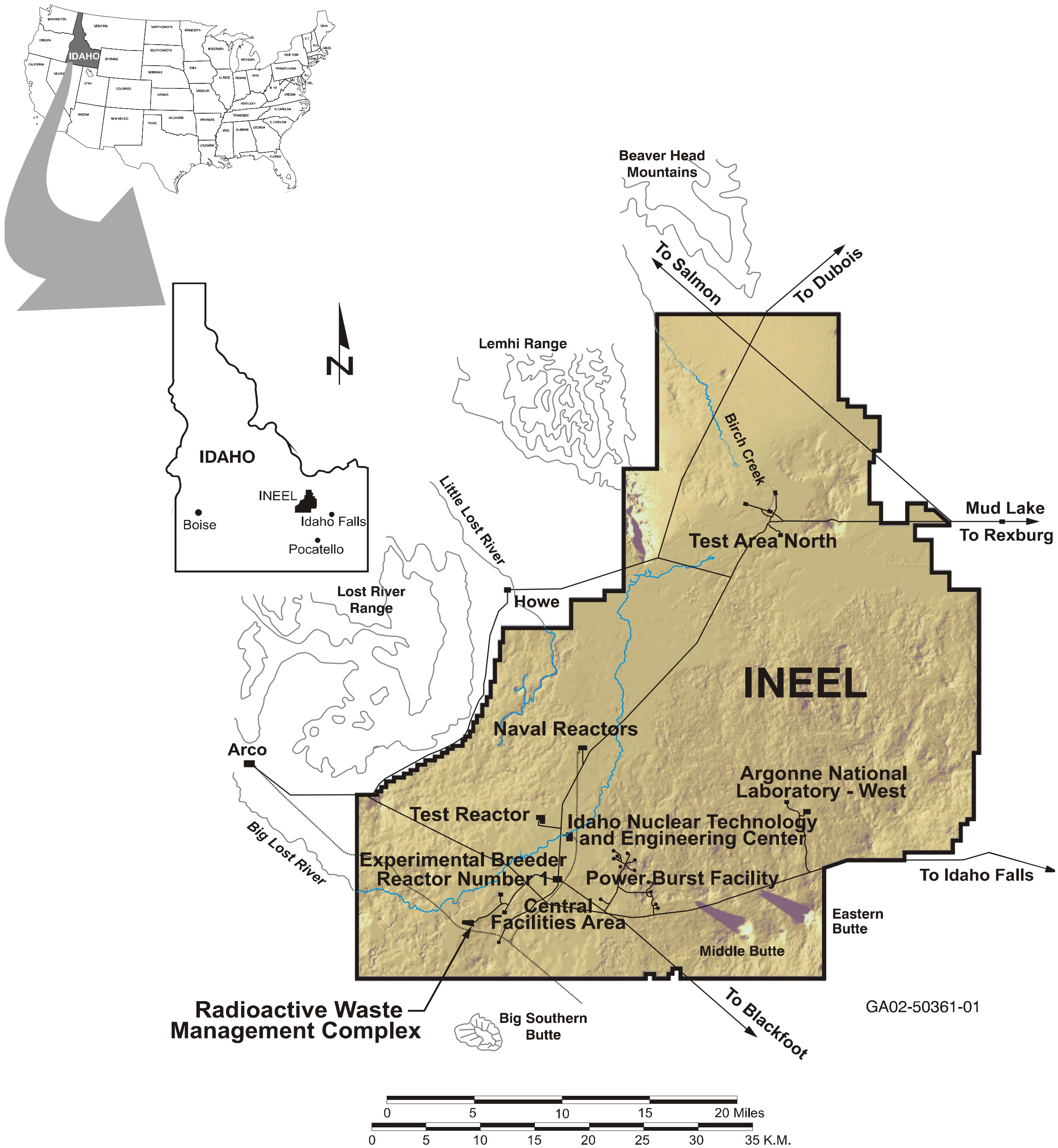


Figure 1-1. Location of the Idaho National Engineering and Environmental Laboratory.

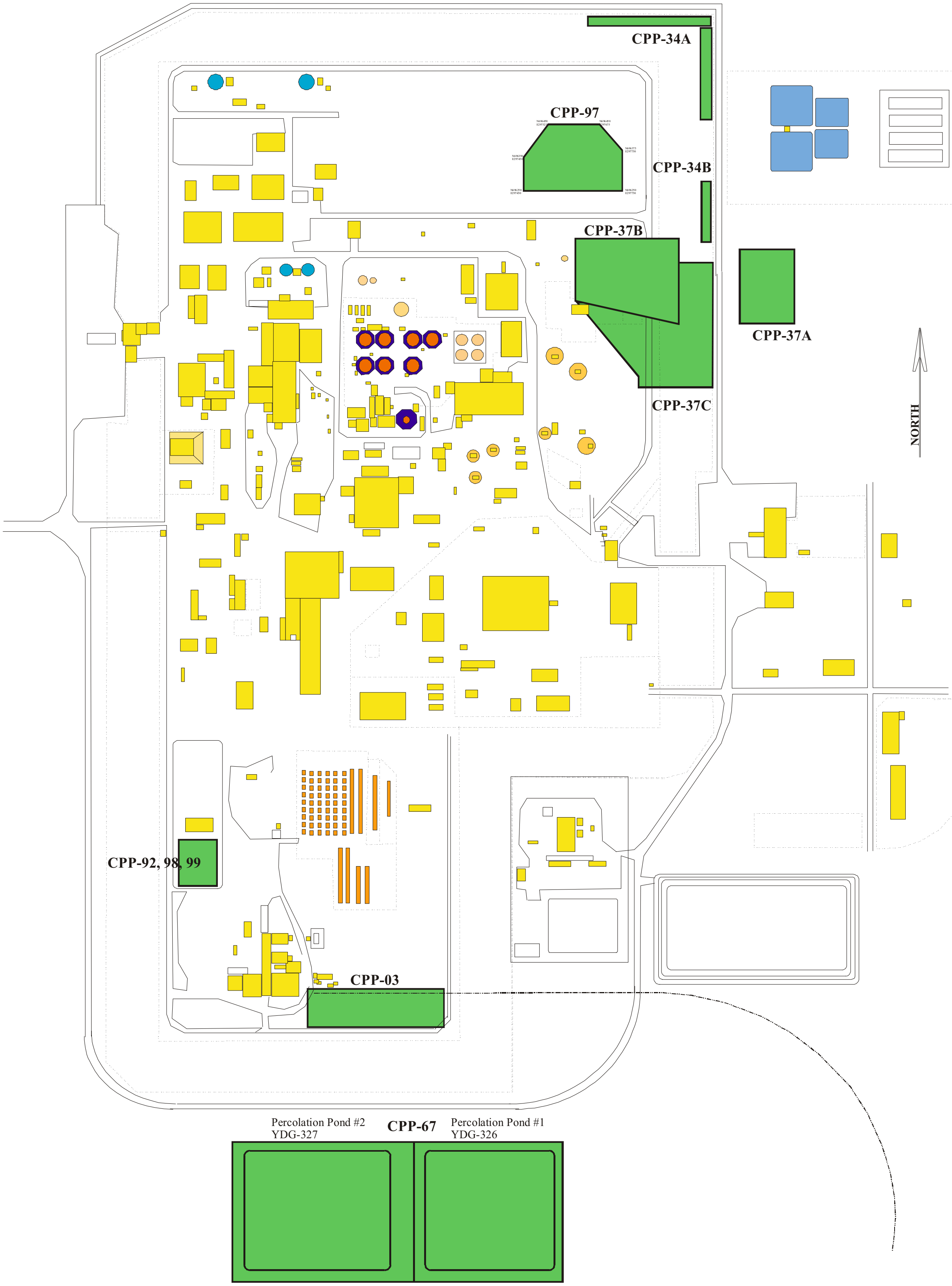


Figure 1-2. Operable Unit 3-13, Group 3, Other Surface Soils, Remediations Sets 1-3 (Phase I) sites.

Table 1-1. Operable Unit 3-13 soil remediation goals.

Contaminant of Concern	Soil Risk-Based RG[a] for Single COCs[b] (mg/kg or pCi/g)
Hg	23
Am-241	290
Cs-137	23
Eu-152	270
Eu-154	5,200
Pu-238	670
Pu-239/240	250
Pu-241	56,000
Sr-90	223

a. Source of risk-based soil remediation goals: Table 8-1 of the OU 3-13 Record of Decision (DOE-ID 1999).

b. If multiple contaminants are present, use a *sum of the fractions* to determine the combined COC remediation goal.

Site descriptions, waste types, COCs, waste stream constituents, and process knowledge summaries are provided in Table 1-2. In-depth site descriptions and discussion of process knowledge, and preliminary sampling and characterization efforts are contained in Section 3 of the RD/RA Work Plan (DOE-ID 2004a). This information is based on data from various INEEL documents including the *Comprehensive RI/FS for the Idaho Chemical Processing Plant OU 3-13 at the INEEL–Part A, RI/BRA Report (Final)* (DOE-ID 1997), the ROD (DOE-ID 1999), and *Operable Unit 3-13, Group 3, Other Surface Soils, Prioritization and Site Grouping Report* (DOE-ID 2002b).

1.3 Scope

The scope of this characterization activity is to determine if additional sampling is necessary at the Group 3 sites and to provide a compilation of analytical results necessary for establishing site boundaries and completing waste profiles for disposal at the ICDF. The scope includes all data collection activities, laboratory analyses, data quality, and data management and storage.

Characterization activities will also include I-129 analysis for those sites where I-129 is present. I-129 was identified as a required analysis in the *ICDF Complex Waste Verification Sampling and Analysis Plan* (SAP) (DOE-ID 2003). Because of its risk to groundwater, ICDF limits the mass of I-129 allowed to be disposed in its facility to 2.4 Ci. Therefore, I-129 mass will be quantified for the Group 3 sites suspected of having detectable I-129.

Table 1-2. Operable Unit 3-13, Group 3, Other Surface Soils (Phase I) sites.

Site	Description	Waste Type/ Description	COCs Exceeding Soil RGs[a]	Process Knowledge
Remediation Set 1				
CPP-97	Tank farm soil stockpile—two tarp-covered stockpiles and contaminated surface soil	Soil Pile 1—0-3 mR/hr Pile 2—3-50 mR/hr	Cs-137, Sr-90 No data for Eu-152 and Pu-241	Indicates source of the waste is from tank farm upgrade.
CPP-92	Boxed soil—653 boxes	Soil (primary), debris, and personal protective equipment	Cs-137, Sr-90 No data for Pu-241	Indicates source of waste is from tank farm upgrade and other excavations at INTEC.
CPP-99	Boxed soil—58 boxes	Soil, concrete, metal, wood, and other noncompactable debris	Cs-137, Sr-90[b]	Indicates source of waste is from tank farm upgrade and CPP-604 tunnel excavation.
CPP-98	Tank farm shoring boxes—119 boxes	Soil, wood, metal	Cs-137, Sr-90[b]	Indicates source of waste is from tank farm upgrade.
Remediation Set 2				
CPP-37B	Gravel pit and debris landfill inside INTEC fence—received sewage water pre-1982, construction debris post-1982	Soil (primary), minor debris, and personal protective equipment	No data for Eu-152, Eu-154, and Pu-241[c]	Indicates low volumes of water discharged to the pits, but believed to contain radionuclides, and may have also contained chemical waste; may have received radioactive steam from the High-Level Liquid Waste Tank Farm.
CPP-37C	Contamination southeast of CPP-37B—discovered during culvert excavation	Soil and rock (primary), concrete, plywood, plastic, pipe	No data for Eu-152, Eu-154, and Pu-241[d]	Indicates this site is not an extension of CPP-37B, but was used to dispose of construction debris.
Remediation Set 3				
CPP-03	Temporary storage area southeast of CPP-603	Soil	Cs-137 No data for Hg and Pu-241	Indicates this site was used to store old and abandoned radioactively contaminated equipment, as well as temporary storage for soil from WL-102 tank replacement project.

Site	Description	Waste Type/ Description	COCs Exceeding Soil RGs[a]	Process Knowledge
CPP-37A	Gravel pit outside INTEC fence	Soil (primary), personal protective equipment, debris, sampling equipment	None[e]	Indicates this site was used as a decontamination area for construction equipment, as a percolation pond for INTEC service wastewater, as well as INTEC stormwater runoff.
CPP-67	Percolation Ponds 1 and 2	Soil	SWP-1 - Cs-137, Hg No data for Eu-152, Eu-154, and Pu-241 SWP-2 – Cs-137 No data for Eu-152, Eu-154, and Pu-241	Indicates these received service wastewater containing trace amounts of radioactivity.
CPP-34A/B	Soil storage areas (disposal trenches) in northeast corner INTEC	Soil	Cs-137, Sr-90 No data for Eu-152, Eu-154, Pu-239, and Pu-241	Indicates this site was used to store soil from around the WL-102 tank excavation.

a. RGs obtained from OU 3-13 ROD (DOE-ID 1999).

b. Soil COCs exceeding RGs for Sites CPP-98 and CPP-99 are assumed to be representative of the expected COCs for CPP-97 and CPP-92.

c. All soil COCs except for Eu-152, Eu-154, and Pu-241 were analyzed during previous characterization efforts of CPP-37B and were found to be less than RGs; however, the OU 3-13 ROD states that because this site was previously used as a landfill, there is insufficient characterization to recommend no further action.

d. All soil COCs except for Eu-152, Eu-154, and Pu-241 were analyzed during previous characterization efforts of the excavated soil generated during the Tank Farm Interim Action and were found to be less than RGs.

e. An evaluation of data indicated no COCs exceed RGs, thus no remediation of this site is required as documented in the RD/RA Work Plan (DOE-ID 2004a).

COC = contaminant of concern

RD/RA = Remedial Design/Remedial Action

ROD = Record of Decision

SWP = Service Waste Pond

WP = Work Plan

2. PROJECT ORGANIZATION AND RESPONSIBILITIES

The project organization and responsibilities are identified and discussed in the HASP for the OU 3-13, Group 3, Other Surface Soils Remediation Sets 1-3 (Phase I) (INEEL 2004).

3. DATA QUALITY OBJECTIVES

The DQO process, which is used to qualitatively and quantitatively specify the objectives for the data collected, was designed as a specific planning tool to establish criteria for defensible decision-making and to facilitate the design of the data acquisition efforts. The DQO process is described in the U.S. Environmental Protection Agency (EPA) document *Data Quality Objective Process for Hazardous Waste Site Investigations* (EPA 2000). The DQO process includes seven steps, each of which has specific outputs. These steps are outlined in the following sections.

3.1 Problem Statement

The problem statement is intended to define the problem so that the focus of the sampling and analysis will be unambiguous. The problem statement for the Group 3 sites RA is three-fold. Sampling is required to

- Determine whether sites require remediation
- Determine whether the wastes can be disposed of at the ICDF landfill
- Determine if those wastes requiring remediation for which I-129 is suspected can be disposed of in the ICDF landfill.

3.2 Principal Study Questions and Decision Statements

This step in the DQO process identifies the decisions and actions that will be taken based on the data collected. Principal study questions (PSQs) and alternative actions (AAs) that could result from resolution of the PSQs are developed, and the PSQs and AAs are then combined into decision statements (DSs). The objective of this characterization activity is to answer the PSQs.

The first objective of the sampling specified in this plan is to determine if remediation is required for the sites. This objective is met by answering the following PSQ:

- PSQ1: Do the COCs exceed the RGs?

  The AAs to be taken, depending on the resolution to PSQ1, are as follows:

  - AA1.1: ***If*** the COCs do not exceed the RGs, ***then*** no remediation is required.
  - AA1.2: ***If*** the COCs exceed the RGs, ***then*** remediation is required.

  Combining PSQ1 and the associated AAs results in the following DS:

- DS1: Determine if the COCs do not exceed RGs or if remediation is required.

The second objective of the sampling specified in this plan is to determine whether the wastes can be disposed of in the ICDF landfill. This objective is met by answering the following PSQ:

- PSQ2: Can the waste, based on the waste profile, be disposed of in the ICDF landfill?

The AAs to be taken depending on the resolution to PSQ2 are as follows:

- AA2.1: ***If*** the waste can be disposed of, based on the RD/RA Work Plan, ***then*** no additional sampling by the project is required prior to disposal of the waste.

- AA2.2: ***If*** the waste cannot be disposed of based on an inadequate waste profile, ***then*** collect more samples in order to complete the waste profile prior to disposal of the waste.

Combining PSQ2 and the associated AAs results in the following DS:

- DS2: Determine if the waste can be disposed of in the landfill, based on the waste profile, or if additional sampling is required prior to disposal.

The third objective of the sampling specified in this plan is to determine if those wastes requiring remediation for which I-129 is suspected can be disposed of in the ICDF landfill. To meet this objective the following PSQ must be addressed:

- PSQ3: Do process knowledge or the I-129 sample results indicate that the waste for each site to be remediated and disposed of in the ICDF landfill meet the ICDF landfill WAC?

The AAs to be taken depending on the resolution to PSQ3 are as follows:

- AA3.1: For each of these sites, ***if*** process knowledge or sample results indicate that the waste with I-129 contamination meets the ICDF landfill WAC, ***then*** the waste may be disposed of in the landfill.

- AA3.2: For each of these sites, ***if*** process knowledge and sample results do not indicate that waste with I-129 contamination meets the ICDF landfill WAC, ***then*** the waste may not be disposed of in the landfill.

Combining PSQ3 and the associated AAs results in the following DS:

- DS3: Determine whether the waste with I-129 contamination meets the ICDF landfill WAC, or whether the waste cannot be disposed of in the ICDF landfill.

3.3 Decision Inputs

The purpose of this step is to identify informational inputs that will be required to resolve the DSs and to determine which inputs require measurements.

The following information is required to resolve the three DSs identified above:

- DS1—the identification and quantification of contaminants exceeding the soil COCs RG limits

- DS2—the identification and quantification of contaminants in the waste stream

- DS3—the volume of waste per site, the identification and quantification of I-129, and the ICDF landfill WAC.

This plan provides a comparison of existing analytical data from previous sampling events with the ICDF WAC requirements and the ROD RGs. In addition, it documents resulting areas where sufficient data do not exist to support the associated decisions. Table 3-1 identifies the data gaps for each site required to resolve the decision statements developed in Section 3.2. A detailed evaluation of the existing data gaps for each site relative to the ICDF WAC and the ROD RGs is presented in Sections 3 and 5 and the Appendix A tables of the RD/RA Work Plan (DOE-ID 2004a).

3.4 Study Boundaries

The primary objectives of this step are to identify the population of interest, define the spatial and temporal boundaries that apply to each DS, define the scale of decision-making, and identify practical constraints that must be considered in the sampling design. Implementing this step helps ensure that the sampling design will result in the collection of data that accurately reflect the true condition of the site under investigation.

The spatial boundaries are as identified in the Group 3, Phase I, RD/RA Work Plan (DOE-ID 2004a). If new information becomes available, these boundaries may be adjusted.

The temporal boundaries are the projected dates that the characterization activities for each site will be implemented, as identified in the RD/RA Work Plan. Results obtained from this sampling effort will be considered adequate to answer the PSQs developed in Section 3.2.

There are no practical constraints expected to be encountered that would interfere with the collection of adequate waste volumes for analyses. Any limitations on data quality and/or usability resulting from sample collection constraints will be discussed in the data quality assessment report.

3.5 Decision Rules

The objective of this step is to define parameters of interest that characterize the population, specify the action level, and integrate previous DQO outputs into a single statement that defines the conditions that would cause the decision-maker to choose among AAs. The decision rule typically takes the form of an "***If…then***" statement describing the action to take if one or more conditions are met.

The decision rule is specified in relation to a statistical parameter that characterizes the population of interest. The parameter of interest for the WAG 3, Group 3 waste samples will be the true mean concentration, as estimated by the 95% upper confidence limit (UCL) of the sample mean of the COCs. Therefore, the sample statistic of interest for the wastes will be the 95% UCL of the sample mean concentration for each COC exceeding the RGs.

The decision rules originating from the sampling objectives are as follows:

- ***If*** the mean concentration for a contaminant at a site exceeds an RG or the sum of the fractions exceeds the combined COC RG, ***then*** remediation of that site will be required.
- ***If*** the mean concentration for a contaminant at a site does not exceed an RG or the sum of the fractions does not exceed the combined COC RG, ***then*** remediation of that site is ***not*** required.

Table 3-1. Data requirements for the Operable Unit 3-13, Group 3 soil sites.

	Decision Statement 1—Determine if Remediation is Required		Decision Statement 2—Waste Profile		Decision Statement 3—I-129 Mass	
Site	Data Gap	Additional Samples Required	Data Gap	Additional Samples Required	Data Gap	Additional Samples Required
CPP-97	None – Remediation is required – Soils COCs are greater than ROD RGs.	None.[a]	Organics, inorganics, and radionuclides.	Six samples. The piles will be sampled at random locations on the soil pile at the east, west, and south face of each pile for a total of six samples.	No characterization data available.	Three samples (smaller stockpile). Samples will be collected during DQO-2 sampling.
CPP-92	None – Remediation is required – Soils COCs are greater than ROD RGs.	None.[a]	Organics, inorganics, and radionuclides.	The boxed soil will be segregated for sampling purposes into three levels as stated in the text. The sampling approach will include randomly selecting approximately 5% of the boxes from each level to be sampled, except for Level 3 in which samples will be collected from all the boxes. Samples will then be collected from the boxes and randomly composited in groups of two for Levels 1 and 2 and in groups of three (all Level 3 boxes) for Level 3: Level 1 – 24 boxes – 12 samples Level 2 – 6 boxes – 3 samples Level 3 – 3 boxes – 1 sample.	I-129 was detected in one sample (from CPP-89).	59 samples Three biased samples will be collected from the >50-mR/hr level and the remaining 56 samples will be randomly collected from CPP-92 and CPP-99.
CPP-98	None – Remediation is required – Soils COCs are greater than ROD RGs.	None.[a]	No characterization data available.[b]	To be combined with CPP-92.	No characterization data available.[b]	To be combined with CPP-92.
CPP-99	None – Remediation is required – Soils COCs are greater than ROD RGs.	None.[a]	No characterization data available.[b]	To be combined with CPP-92.	No characterization data available.[b]	To be combined with CPP-92.
CPP-37B	All soil/GW COCs[c]/Tc-99	6 sample locations 8 sample depths ==> 48 samples.	None.	None.	None.	None[d]I-129 will be analyzed under DQO#1.
CPP-37C	All soil/GW COCs[c]/Tc-99	11 sample locations 5 sample depths ==> 55 samples.	None.	None.	None.	None[d]–I-129 will be analyzed under DQO#1.
CPP-37A	Eu-152, Eu-154, Pu-241	None – Scaling, as described in the ICDF Design Inventory (EDF-ER-264), will be performed to estimate concentrations. The scaling results will be included in the RD/RA Work Plan (DOE-ID 2004a).	None.[d]	None.[d]	None.[d]	None.[d]

Table 3-1. (continued).

	Decision Statement 1—Determine if Remediation is Required		Decision Statement 2—Waste Profile		Decision Statement 3—I-129 Mass	
Site	Data Gap	Additional Samples Required	Data Gap	Additional Samples Required	Data Gap	Additional Samples Required
CPP-03	Hg, Pu-241	None.[a]	None – Sufficient data are available to complete a waste profile.	None.	No characterization data available.	Verification sampling will be performed as described in Section 3.7.3.
CPP-67 Pond #1	Eu-152, Eu-154, Pu-241	None.[a]	None – Sufficient data are available to complete a waste profile.	None.	Ten I-129 samples were collected and analyzed from various depths at five sample locations, but not detected.	Verification sampling will be performed as described in Section 3.7.3 based on half of the detection limit of the existing I-129 data.
CPP-67 Pond #2	Eu-152, Eu-154, Pu-241	None.[a]	None – Sufficient data are available to complete a waste profile.	None.	Ten samples were collected and analyzed for I-129 with detectable concentrations of I-129.	Verification sampling will be performed as described in Section 3.7.3.
CPP-34A/B	Eu-152, Eu-154, P-239, Pu-241	None.[a]	None – Sufficient data are available to complete a waste profile.	None.	Twenty samples were collected and analyzed for I-129 with nondetectable concentrations.	Verification sampling will be performed as described in Section 3.7.3.

a. No additional sampling is required because RGs have been exceeded using Cs-137 as the indicator of contamination and remediation is required.

b. Data gaps for Sites CPP-98 and CPP-99 are assumed to be representative of the expected data gaps for CPP-97 and CPP-92.

c. Although characterization was previously performed for Site CPP-37B, the OU 3-13 ROD states that because the pit was used as a landfill, previous characterization is considered insufficient to recommend no further action. Therefore, characterization sampling will be performed for all soil and groundwater COCs.

d. No remediation is planned for Sites CPP-37A, CPP-37B, and CPP-37C; therefore, no characterization for waste profiling of I-129 is planned. If remediation is required based on characterization efforts, then sufficient samples should be available to complete the waste profile.

e. Limited characterization was performed at Site CPP-37C; however, the extent of contamination at this site was not determined. Characterization sampling will be performed for all soil and groundwater COCs.

COC = contaminant of concern

RD/RA = Remedial Design/Remedial Action

RG = remediation goal

ROD = Record of Decision

And

- ***If*** existing data confirm that the waste may be disposed of in the ICDF landfill, as evidenced by the completion of the waste profile, ***then*** no additional data are required prior to disposal of the waste.

- ***If*** existing data do not confirm that the waste may be disposed of in the ICDF landfill, as evidenced by the lack of a waste profile, ***then*** additional data are required to complete the waste profile prior to disposal of the waste.

- And

- ***If*** process knowledge or sample results indicate that the waste with I-129 contamination meets the ICDF landfill WAC, ***then*** the waste may be disposed of in the landfill.

- ***If*** process knowledge and sample results do not indicate that the waste with I-129 contamination meets the ICDF landfill WAC, ***then*** the waste may not be disposed of in the landfill.

3.6 Decision Error Limits

Since analytical data can only estimate the true condition of the site under investigation, and, since data are intrinsically variable, decisions based on measurement data could potentially be in error. For this reason, the primary objective of this step is to determine which DSs, if any, require a statistically based sample design.

Possible decision errors that can occur for the decisions associated with the three sampling objectives at the WAG 3, Group 3 sites include

1. Determining that the site does not require remediation, when, in fact, COCs exceed the RGs for a site

2. Disposal of waste in the ICDF landfill, when, in fact, the waste profile does not confirm the waste may be disposed of there

3. Determining that the I-129-bearing waste can be disposed of in the landfill, when, in fact, the waste exceeds the ICDF landfill WAC.

The possibility of decision error cannot be eliminated but it can be minimized, which is accomplished by controlling the total sampling activity errors. Methods for controlling errors include collecting a large number of samples (to control sampling design error), analyzing individual samples several times, or using more precise analytical methods (to control measurement error). The chosen method for reducing decision errors depends on where the greatest component of total error exists in the data set and the ease in reducing the error contributed by those data components. The amount of effort expended on controlling decision error is directly proportional to the consequences of making an error.

3.7 Design Optimization

The objective of this step is to identify the best sampling and analysis design that satisfies the previous DQO steps. The activities required to optimize the design include

- Review the outputs of the DQO steps and existing environmental data

- Develop general data collection design alternatives

- Formulate a mathematical expression needed to solve the design problem for each data collection design alternative

- Select the optimal number of samples to satisfy the DQOs for each data collection design alternative

- Select the most resource-effective data collection design that satisfies all the DQOs.

A review of the existing environmental data was performed for each site and data gaps were identified. These results, discussed in detail in the RD/RA Work Plan (DOE-ID 2004a), form the basis for the sampling designs presented in the following sections. The sampling design for each Phase I site is discussed relative to the three decision statements developed in Section 3.2. The specific data required to resolve each decision statement are identified in Table 3-1.

3.7.1 Decision Statement 1

Decision Statement 1 is as follows: Determine if remediation at the site is necessary. For those sites with at least one soil COC 95% UCL for the true mean concentration greater than RGs, remediation is required (Sites CPP-97, -92, -98, -99, -03, -67, and –34). The 95% UCL will be calculated assuming the data follow a normal distribution. This assumption will be tested using the Shapiro-Wilk test. Data will be transformed if necessary. If log-transformed data are normal, then the 95% UCL from the transformed data will be compared to the log-transformed RG. The 95% UCL will be calculated as follows in Equation (3-1):

$$\bar{x} + t_{0.95,n-1}\sqrt{\frac{s^2}{n}} \tag{3-1}$$

where

$\bar{x}$ = the sample mean

$t_{0.95,n-1}$ = the 95th percentile of the t distribution with $n-1$ degrees of freedom

s^2 = the sample variance

n = the number of sample results.

If a site(s) has not been sufficiently characterized to determine whether soil COC 95% UCLs are greater than RGs, then additional characterization is necessary to determine whether remediation is required. Sites CPP-37B and –37C will require additional characterization. The approach for characterization of these sites will be performed in three phases:

- The first phase will be a geophysical survey (ground-penetrating radar system) of the two sites to determine the boundaries of the sites, extent of debris, and potentially confirm the pit edges (based upon material density variations). Analysis of this nonphysical survey information will provide information regarding the debris pit boundaries, provide the relative concentration of debris disposal areas, and guide the selection of sample locations and test pits/trenches.

- The second phase will consist of taking samples, analyzing for COCs, and determining 95% UCLs. The number of sample results required will be determined by assuring that the 95% UCLs are below the RGs. The following formula will be used, substituting best estimates of mean and variance, and, if none are available, using EPA (2001) guidance:

$$n = \left\{ \frac{1.645^2 \times s^2}{\left(\bar{x} - RG\right)^2} + \frac{1.645^2}{2} \right\} \uparrow \qquad (3\text{-}2)$$

  where the components are as defined above, and the arrow indicates the number of samples will be rounded up to the next integer. The number of sample locations will be determined by dividing the required number of results by the appropriate number of depths to be sampled. The sample locations will be determined by dividing the site into equal-sized grids to allow for the proper number of sample locations with one sample per grid-block. Then, biased sample locations will be selected and samples will be collected from various depths (37B: 2, 5, 10, 15, 20, 25, 30 and 35 ft) (37C: 2, 5, 10, 15, and 20) based upon previous sampling depths, historical photos of the waste areas, and historical survey data of waste depths. The locations will be biased to avoid boring into debris or previous sample locations, and yet retain representativeness over the site.

- The third phase will consist of excavating test pits/trenches to extract buried debris for radiological field screening and visual inspection to determine waste types by physical configuration (piping, concrete, soil, building debris, etc.). There will be a maximum of three test pits in each of the CPP-37B and CPP-37C areas. The test pits will be excavated to a maximum depth of 10 ft per the ROD risk-driven depth determination. The screening data will be evaluated to determine the disposition of the debris (e.g., leave in place or excavate and dispose at ICDF). Field-screening using high-purity germanium detectors will be used during the test pit operation for real-time characterization onsite to minimize sampling costs and provide faster results.

3.7.1.1 CPP-97. Previous sampling activities at CPP-97 focused primarily on radiation measurements of the two soil piles themselves and gamma spectrometry measurements of the surrounding surface area to define the site boundary. Radiological surveys have defined the lateral extent of Cs-137 contamination at this site and indicate that concentrations exceed the RGs for Cs-137 and Sr-90. No additional sampling is required because Cs-137 is used as the indicator to determine if remediation is required.

3.7.1.2 CPP-92. Existing data indicate that contaminant concentrations associated with this boxed waste exceed the RGs for Cs-137 and Sr-90. Because all of the containers are slated for remediation, additional sampling is not needed to determine if remediation is required.

3.7.1.3 CPP-98. Process knowledge indicates that the source of the CPP-98 boxed waste is from the tank farm. No analytical data are available for this site specifically. However, data are available for the corresponding contaminated soils excavated as part of the same projects (CPP-97 and CPP-92), which are assumed to be representative data for this site. Because all of the containers contain debris, additional sampling is not needed to determine if remediation is required.

3.7.1.4 CPP-99. Process knowledge indicates that the source of the CPP-99 boxed waste is from the tank farm. No analytical data are available for this site specifically. However, data are available for the corresponding contaminated soils excavated as part of the same projects (CPP-97 and CPP-92), which are assumed to be representative data for this site. Because all of the containers are slated for remediation, additional sampling is not needed to determine if remediation is required.

3.7.1.5 CPP-37B. The physical boundaries of this site are well defined based on previous site investigations and some chemical and radiological data are available. However, the OU 3-13 ROD states that since the pit was previously used as a landfill, the existing characterization data are insufficient. Therefore, additional characterization is necessary to determine if remediation is required.

3.7.1.6 CPP-37C. This site, established in 2002, was insufficiently characterized to determine the nature and extent of contamination. Therefore, additional characterization is needed to determine if remediation is required.

3.7.1.7 CPP-03. The source of the waste at Site CPP-03 is associated with the releases from the tank farm and Waste Calcining Facility condensate. Existing data are limited to radionuclides only and indicate that the waste exceeds the RG for Cs-137. No additional sampling is required because Cs-137 is used as the indicator to determine that remediation is required.

3.7.1.8 CPP-37A. Previous characterization sampling and process knowledge indicated that RGs were not exceeded for the soil COCs. As described in the RD/RA Work Plan (DOE-ID 2004a), remediation is not required at this site.

3.7.1.9 CPP-67. The existing data for this site indicate that the RGs for Cs-137 and mercury are exceeded in Pond 1, and the RG for Cs-137 is exceeded in Pond 2. No additional sampling is required because Cs-137 is used as the indicator to determine that remediation is required at this site.

3.7.1.10 CPP-34A/B. The existing data indicate that the RGs for Cs-137 and Sr-90 were exceeded at this site. Although, there is no data for Eu-152, Eu-154, Pu-239, and Pu-241 (Table 3-1), no additional sampling is required because Cs-137 is used as the indicator to determine that remediation is required at this site.

3.7.2 Decision Statement 2

Decision Statement 2 is as follows: Determine if the waste can be disposed of in the landfill or if additional sampling is required to complete a waste profile prior to disposal in the landfill.

For these soils, if inadequate data exist to prepare a waste profile, additional characterization will be required. These requirements are presented for each site individually.

3.7.2.1 CPP-97. Because Cs-137 and Sr-90 concentrations in the stockpiled soils exceed their respective RGs, this site will be remediated. However, the existing data are insufficient to complete a waste profile for the resulting waste stream. Therefore, additional organic, inorganic, and radiological data are required.

3.7.2.2 CPP-92. Because existing data indicate Cs-137 and Sr-90 concentrations in the boxed waste exceed RGs, this site will be remediated. However, these data are insufficient to complete a waste profile for the resulting waste stream. Therefore, additional organic, inorganic, and radiological data are required.

3.7.2.3 CPP-98. As described in Section 3.7.1.3, waste associated with Site CPP-98 corresponds with Sites CPP-97 and CPP-92 soils, and the soil data for these sites are assumed to be representative of debris waste in CPP-98. Because this waste stream is debris only, sampling for profiling purposes will not be performed.

3.7.2.4 CPP-99. As described in Section 3.7.1.4, boxed waste associated with this site corresponds with Sites CPP-97 and CPP-92 soils, but the data are insufficient to complete a waste profile for the resulting CPP-99 waste stream. Organic, inorganic, and radiological data are required.

3.7.2.5 CPP-37B. As described in the RD/RA Work Plan (DOE-ID 2004a), no remediation is planned for this site. Therefore, a waste profile is not required for disposal at the ICDF. If characterization sampling identifies exceedences of RGs, the RD/RA Work Plan will be revised accordingly.

3.7.2.6 CPP-37C. As described in the RD/RA Work Plan, no remediation is planned for this site. Therefore, a waste profile is not required for disposal at the ICDF. If characterization sampling identifies exceedences of RGs, the RD/RA Work Plan will be revised accordingly.

3.7.2.7 CPP-03. Because the Cs-137 RG is exceeded for this site, remediation is required. Existing data are sufficient to complete a waste profile.

3.7.2.8 CPP-37A. As described in the RD/RA Work Plan, no remediation is planned for this site. Therefore, a waste profile is not required for disposal at the ICDF.

3.7.2.9 CPP-67. The RGs for Hg and Cs-137 are exceeded in Pond 1, and remediation is required. Remediation is also required for Pond 2, as the RG for Cs-137 is exceeded. Existing data for both ponds are sufficient to complete a waste profile.

3.7.2.10 CPP-34A/B. Because the RGs for Cs-137 and Sr-90 are exceeded, remediation of this site is required. Existing data are sufficient to complete a waste profile.

3.7.3 Decision Statement 3

Decision Statement 3 is as follows: Determine whether the I-129-bearing waste meets the ICDF landfill WAC, or whether the waste cannot be disposed of in the ICDF landfill.

Characterization of I-129 for Group 3 soils that are to be excavated may require a two-stage approach: first, initial characterization, and, second, verification. Initial characterization first involves determining if I-129 is suspected at the site, based on process knowledge. If process knowledge indicates no I-129, then no further action is necessary (i.e., no second stage is necessary). If process knowledge indicates possible I-129 contamination, then available sample results will be used to determine the level of effort for the second stage sampling (verification).

The second stage is the additional characterization called for in the *ICDF Complex Waste Verification Sampling and Analysis Plan* (DOE-ID 2003) for those sites containing I-129. The stage two sampling and the ICDF verification will be performed concurrently. Hereafter, the additional sampling will be referred to as verification. The second stage sampling effort will be determined using the *ICDF Complex Waste Verification Sampling and Analysis Plan*, based on stage one sample results, as described below.

For sites believed to contain I-129, the stage one sample results will be used to determine the level of effort for the second stage. The higher the sample concentration, the more verification samples will be required. The stage two sampling applies to lots of waste not to exceed 5,000 yd^3 and is based on the simple exceedance rule described in EPA (1989, 2002). The simple exceedance rule provides specified confidence ($1-\alpha$) that a percent (p) of the data are below the detection limit and does not require assumptions be made about the distribution of the data. The sample size can be determined for a specified confidence and percent using the following formula, Equation (3-3), found in EPA (2002):

$$n = \frac{\log(\alpha)}{\log(p)} \tag{3-3}$$

The required values for p and α are determined based on the concentrations from the stage one sample results and the WAC limit from the ICDF. The WAC limit for I-129 is 2.4 Ci. This translates to a concentration of 3.1 pCi/g, assuming that the entire disposed waste volume contains I-129.

The typical detection limit for I-129 is 1.0 pCi/g. If the stage one samples for sites believed to contain I-129 are all nondetectable, then ½ the detection limit will be used to determine the level of verification required. Because 0.5 pCi/g is 16% of the WAC, two samples per lot are required. For sites with detectable I-129, the verification sampling effort will be determined from the largest sample result. In general, the detectable quantities were at least 90% of the WAC, so 59 samples per lot are required.

The stage two samples will be collected either from containers during excavation or in situ. With either method, the waste will be divided into lots of no more than 5,000 yd^3. Containers to be sampled will be selected using a systematic sample with a random start. The sample will be collected from the selected container during loading to ensure mixing and representativeness. For sampling from in situ soils, a 3-D grid will overlay each lot. The number of grid-blocks will equal the number of verification samples required for that lot. One random sample will be selected from each grid-block. Some sites may be stratified, based on stage one results, into more than one material profile.

To track the mass of I-129 in the ICDF landfill, the 95% UCL for the mass will be determined and accumulated, to compare to the mass landfill WAC of 2.4 Ci. The 95% UCL for mass will be calculated using all sample results as long as all samples were collected and analyzed using comparable methods and are recent enough so that temporal change is not an issue. The mass will be estimated for a whole site, not individually for each lot within a site. The following formula assumes that the mean concentration is normally distributed, but is robust to this assumption (Conover 1980). The data will be tested for normality prior to calculation of the 95% UCL using a Shapiro-Wilk test and transformed if necessary. The 95% UCL is calculated as shown in Equation (3-4) as follows:

$$\bar{x} \times V + z_{0.95} \times \sqrt{\frac{s^2 \times V^2}{n}} \tag{3-4}$$

where

$\bar{x}$ = mean of the ^{129}I (Ci/g) sample results,

V = volume of ^{129}I bearing waste (g),

$z_{0.95}$ = 95th percentile of the standard normal distribution,

s2 = variance of the 129I sample results, and

n = number of samples from the volume of ^{129}I bearing waste.

3.7.3.1 CPP-97. I-129 was not analyzed for during previous sampling efforts. However, as discussed in Section 3 of the RD/RA Work Plan (DOE-ID 2004a), process knowledge indicates that Waste Calcining Facility condensate contamination may be present in the smaller stockpile (70 yd^3) that received waste with 3- to 50-mR/hr readings. Therefore, further characterization of I-129 will be performed for this stockpile. Three samples, using a population lot unit size of 25 yd^3, will be analyzed to determine the mass of I-129.

3.7.3.2 CPP-92. One sample was analyzed for I-129 from soil generated during the CPP-604/605 emergency fire exit tunnel construction (Site CPP-89). The soil was later containerized in boxes and became part of CPP-92. The I-129 concentration from this sampling effort was 3.1 pCi/g. This sample result, at least 90% of the WAC, indicates that 59 samples per lot of waste are required. The site has a volume less than 5,000 yd^3 and is contained in boxes. Thus, 56 random and three biased samples from the >50-mR/hr level will be selected for sampling. A sample will be collected at a random location within the selected boxes. The boxes from CPP-99 will be included in the lot for sampling.

3.7.3.3 CPP-98. Because this waste stream is debris only, sampling to determine adherence to the ICDF landfill WAC for I-129 will not be performed, as the waste profile will apply contaminants identified from the soil samples (e.g., CPP-99, -97, -92). Therefore, further characterization or verification is not necessary.

3.7.3.4 CPP-99. As described in Section 3.7.1.4, the soil data for CPP-97 and CPP-92 are assumed to be representative of CPP-99. However, these data are insufficient to characterize the mass of I-129. Therefore, I-129 data are required. The soil boxes in CPP-99 will be combined into one lot with the soil boxes from CPP-92 for I-129 sampling.

3.7.3.5 CPP-03. As described in the RD/RA Work Plan, process knowledge indicates that contamination at this site would be similar to CPP-34A/B. I-129 sampling data gathered from CPP-34 A/B will be used to determine if verification sampling for I-129 is required and to what extent.

3.7.3.6 CPP-67. Existing data for Pond 1 indicate that I-129 was analyzed for, but not detected at any sample location. Because 1/2 the detection limit is within 20% of the WAC, two verification samples will be collected from each 5,000-yd^3 lot. I-129 was also analyzed and detected in Pond 2. The sample results from stage one indicate detectable concentrations of I-129 are within the top 6 in. The largest sample result is at least 90% of the WAC; therefore, 59 verification samples per 5,000 yd^3 lot will be required for this site, for a total of 236 samples. Following Agency review of the sampling strategy, it was identified that this number would be reduced by 26 samples that will be collected for Site CPP-34A/B.

3.7.3.7 CPP-34A/B. Existing data indicate I-129 was analyzed for, but not detected. Following Agency review of the sampling strategy, it was determined that verification sampling will be performed at a frequency of two samples per 5,000 yd^3 for a total of 26 samples.

3.7.4 Site-Specific Sampling Design Strategy

This section describes the sampling design strategy for each of the Phase I sites.

3.7.4.1 CPP-97, Tank Farm Soil Stockpile. Existing sample data for CPP-97 lack various organic, inorganic, and radiological analyses necessary to complete the waste profile prior to disposal in the ICDF landfill. These piles will be sampled using grab samples (4-in. to 1-ft depth to avoid surface volatile organic compound [VOC] anomalies), and samples will be collected at random locations on the soil pile itself at the ends and side (east, west, and south face of pile) of each pile for a total of six samples. Figure 3-1 shows the proposed sampling locations at CPP-97.

3.7.4.2 CPP-92, -98, -99 Boxed Soil Sites. Existing sample data from Sites CPP-92, -98, and -99 lack various organic, inorganic, and radiological analyses necessary to complete the waste profile prior to disposal in the ICDF landfill. Because CPP-98 consists of containers of debris only, sampling is not required.

There are some physical sampling data from the Site CPP-89 and Site CPP-17A/-17B waste that was placed into waste containers at CPP-92. Twenty-five samples were collected at the two sites (5 samples from CPP-17A, 2 samples from CPP-17B, and 18 samples from CPP-89) resulting in two COCs exceeding the ROD RGs (Cs-137 at 7,730 pCi/g and Sr-90 at 10,800 pCi/g). These samples were characterized by 3 inorganic analyses and 15 radionuclide analyses. One sample had I-129 analysis performed at Site CPP-89 with a reported value of 3.1 pCi/g. No organic analyses were performed on these samples.

Based on data from the Integrated Waste Tracking System, radiation measurements of some of the waste boxes at these sites indicate levels exceeding 200 mR/hr on contact. The distribution of this radiation data indicates this waste stream may not be homogenous. Initially, one material profile is planned for the collection of soil waste boxes. For characterization purposes, the soil waste boxes will be sampled using a stratified approach. The stratification will be based on the radiation measurement guidelines below:

- Radiation measurements ≤5 mR/hr on contact (Level 1)
- Radiation measurements >5 and ≤50 mR/hr on contact (Level 2)
- Radiation measurements >50 mR/hr on contact (Level 3).

Once waste boxes are sorted into Levels 1, 2, or 3, they will be segregated by waste type (soil or debris). A random approach for sampling the waste boxes containing soil will subsequently be implemented (no sampling is required for debris) within each level. This sampling approach entails selecting 5% of the boxes from each level, except Level 3. in which samples will be collected from all the boxes. Pertinent information regarding soil waste containers and their respective grouping into Levels 1, 2, or 3 is listed in Table 3-2.

The Level 3 soil waste containers from CPP-92 and -99 include 16 waste containers, of which only three have been identified as soil waste containers. Due to the small number of designated soil waste boxes and the high level of radionuclide contamination in the Level 3 grouping, one sample will be collected from each soil box.

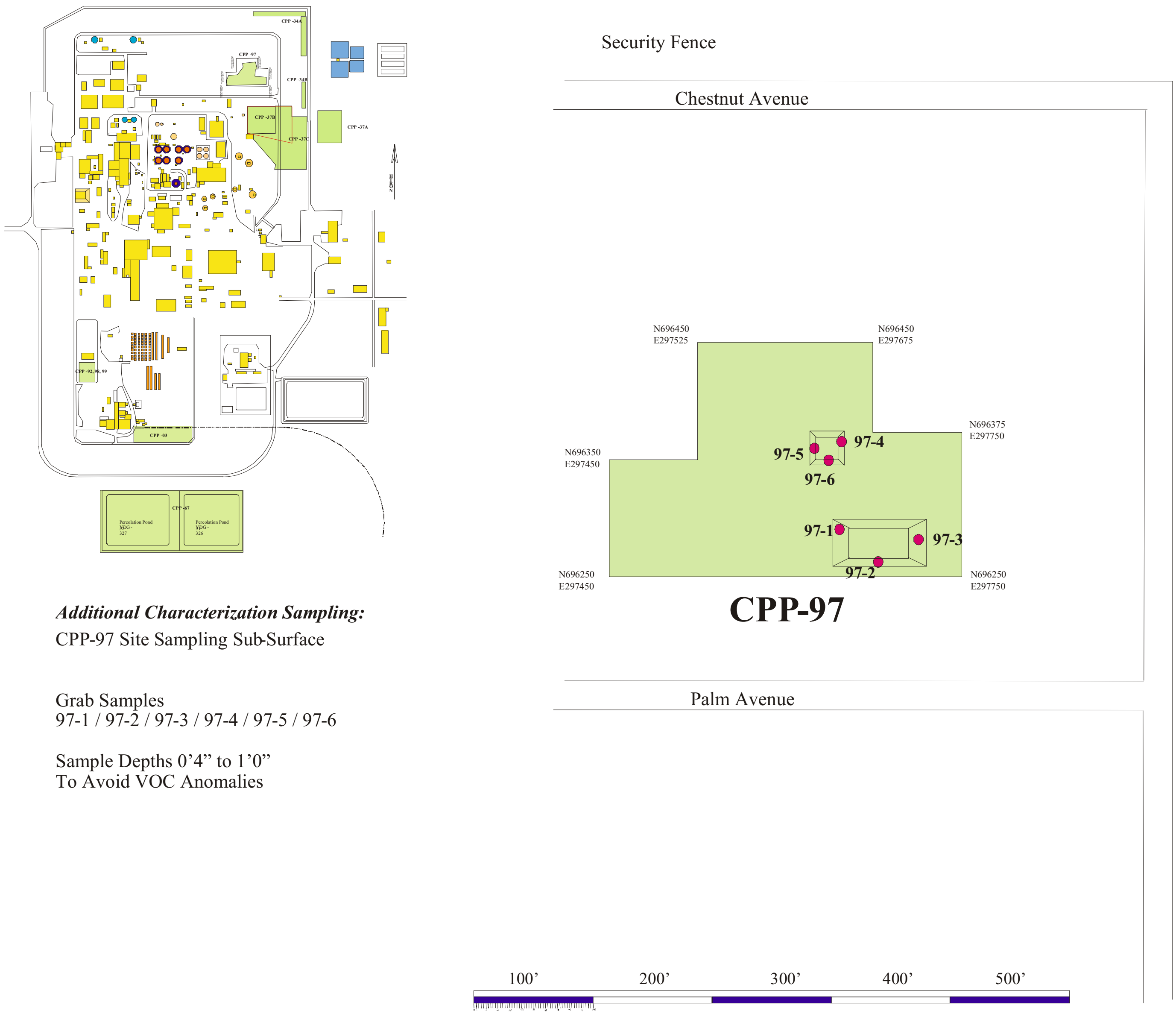


Figure 3-1. Proposed characterization sampling locations for CPP-97.

Table 3-2. Sampling strategy for CPP-92, -98, -99 soil waste boxes.

Description	Level 1 ≤5 mR/hr	Level 2 >5 mR/hr and ≤50 mR/hr	Level 3 >50 mR/hr
CPP-92 soil boxes[a]	466	100	3
CPP-98 soil boxes[b]	—[c]	—[c]	—[c]
CPP-99 soil boxes[d]	10	3	—[c]
Total soil boxes	476	103	3
Volume (yd^3)	1,128	265	9
Number of boxes to be sampled	24	6	3

a. CPP-92 inventory includes 571 soil and 82 debris boxes.

b. CPP-98 inventory includes 119 debris boxes.

c. — = not applicable.

d. CPP-99 inventory includes 14 soil boxes, 43 debris boxes, and 1 box with unspecified content.

Contents of waste containers will be verified prior to disposal at the ICDF in accordance with the *ICDF Complex Waste Verification Sampling and Analysis Plan* (DOE-ID 2003). If the container contents were incorrectly identified (e.g., initially identified as debris but found to be >50% soil), the profile and waste description will be corrected. At that time, the sample data obtained will be used to fill out the waste profile for the waste stream. If the levels are believed to represent more than one population, more than one material profile may be completed.

3.7.4.3 CPP-37B, Gravel Pit and Debris Landfill Inside INTEC Fence. The existing data for Site CPP-37B are insufficient to determine whether RGs are exceeded at this site. Because this site was previously used as a landfill, a phased characterization sampling approach is planned.

A geophysical survey (ground-penetrating radar system) of the area will be conducted to determine the boundary of the site, to determine extent of debris, and, potentially, to confirm the pit edges (based upon material density variations). Analysis of this nonphysical survey information will provide information regarding the debris pit boundaries and the relative concentration of debris piles and will guide the selection of sample locations. A 140.0-ft grid system will be established over the CPP-37B and CPP-37C sites for guidance in sample selection. Then, six additional biased sample locations will be selected at CPP-37B and samples collected from various depths (2.0, 5.0, 10.0, 15.0, 20.0, 25.0, 30.0, and 35.0 ft) based upon previous sampling depths, historical photos of the waste pit, and historical survey data of waste pit depths. The number of additional sample locations was selected to supplement the sampling conducted at this site during the Track 2 investigation (DOE-ID 1997). The locations will be biased to avoid boring into debris. Figure 3-2 shows the proposed sampling locations for CPP-37B. Samples from 2.0, 5.0, and 10.0 ft may be composited to form a sample representative of the depth range of 0-10.0 ft for each borehole. Samples from 15.0, 20.0, 25.0, 30.0, and 35.0 ft may be composited to form a representative sample of the depth range of 15.0-35.0 ft for each borehole.

Also based on the geophysical survey results, test pits/trenches will be excavated to extract buried debris for radiological field screening and visual inspection to determine waste types by physical configuration (piping, concrete, soil, building debris, etc.). There will be a maximum of three test pits in the CPP-37B area to the maximum depth of 10.0 ft, per the ROD risk-driven depth determination. The screening data will be evaluated to determine the disposition of the debris (e.g., leave in place or excavate and dispose at ICDF). This evaluation is described in the RD/RA Work Plan (DOE-ID 2004a). Field screening using high-purity germanium (HPGe) detectors will be used during the test pit operation for real-time characterization onsite to minimize sampling costs and provide faster results.

3.7.4.4 CPP-37C, Contamination Discovered Southeast of CPP-37B. The current boundary established for Site CPP-37C is based on historical photographic evidence of waste pits in the area. Limited data are available to determine whether RGs are exceeded at this site or if a waste profile should be completed. Therefore, a phased sampling approach is planned.

A geophysical survey (ground-penetrating radar system) of the area will be conducted to determine the boundary of the site, to determine extent of debris, and, potentially, to confirm the pit edges (based upon material density variations). Analysis of this nonphysical survey information will provide information regarding the debris pit boundaries and the relative concentration of debris piles and will guide the selection of sample locations.

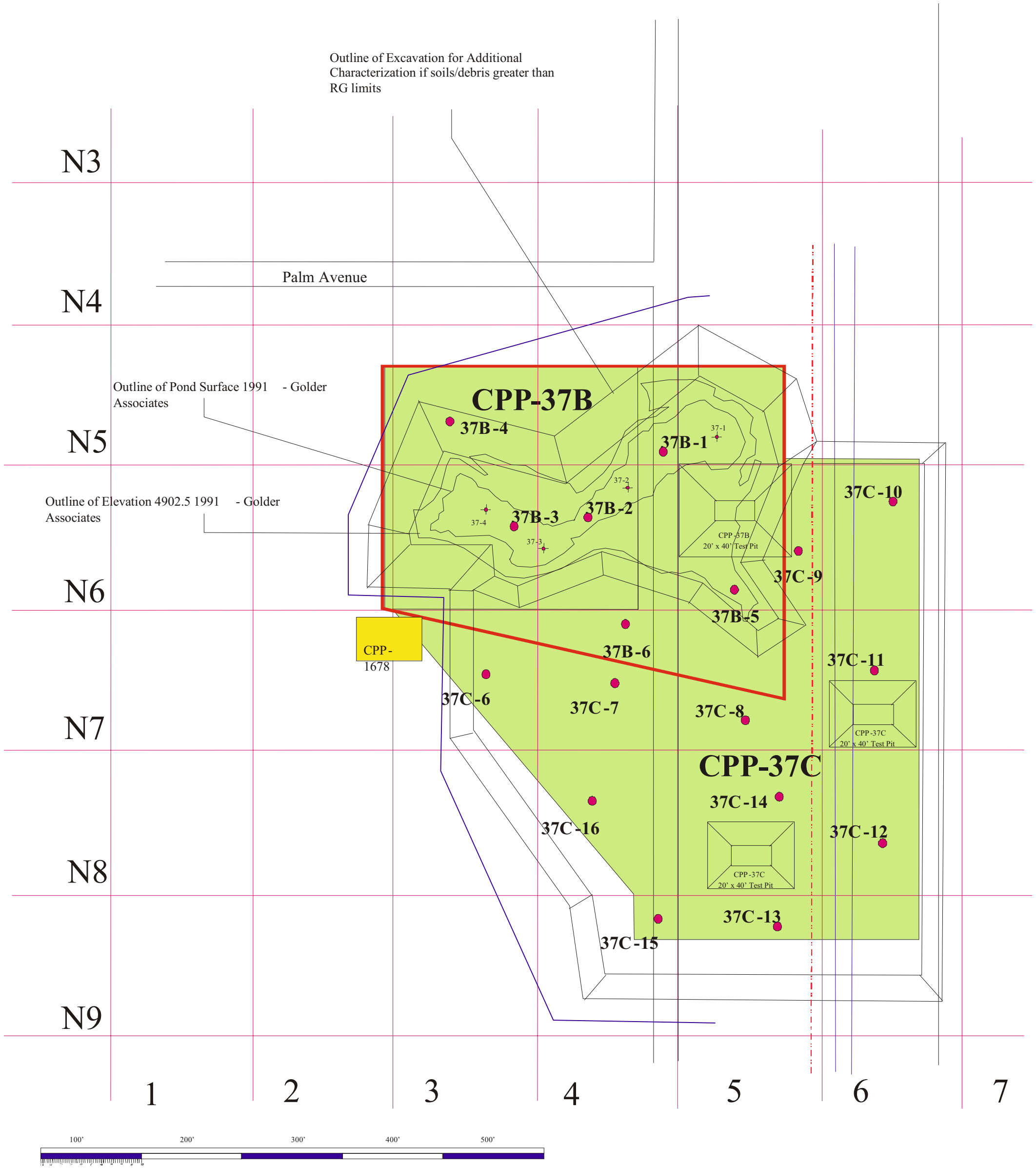
A 140.0-ft grid system will be established over the CPP-37B and CPP-37C sites for guidance in sample selection. Then, 11 biased locations be selected and sampled from inside the CPP-37C site boundary. Samples will be collected from various depths (2.0, 5.0, 10.0, 15.0, and 20.0 ft) based upon the results of the geophysical survey, historical photos, and historical survey data. Figure 3-2 shows the proposed sampling locations for CPP-37C. Samples from 2.0, 5.0, and 10.0 ft may be composited to form a sample representative of the depth range of 0-10.0 ft for each borehole. Samples from 15.0 and 20.0 ft may be composited to form a representative sample of the depth range of 15.0-20.0 ft for each borehole.

Also, based on the geophysical survey results, test pits/trenches will be excavated to extract buried debris for radiological field screening and visual inspection to determine waste types by physical configuration (piping, concrete, soil, building debris, etc.). There will be a maximum of three test pits in the CPP-37C area to the maximum depth of 10.0 ft per the ROD risk-driven depth determination. The screening data will be evaluated to determine the disposition of the debris (e.g., leave in place or excavate and dispose at ICDF). This evaluation is described in the RD/RA Work Plan (DOE-ID 2004a). Field screening using HPGe detectors will be used during the test pit operation for real-time characterization onsite to minimize sampling costs and provide faster results.

3.7.4.5 CPP-67, Percolation Ponds 1 and 2. Existing sample data are adequate to complete waste profiling prior to disposal in the ICDF landfill.

Existing data for Pond 1 indicate that I-129 was analyzed for, but was not detected at any sample location. One-half of the detection limit will be used as the I-129 concentration in this soil. Because 1/2 of the detection limit is within 20% of the ICDF WAC, two samples will be collected from each 5,000 yd^3 lot as verification sampling.

Analysis for I-129 was also performed at Pond 2. The sample results from stage one indicate detectable concentrations of I-129 are only within the top 6 in. The largest sample result is at least 90% of the WAC; therefore, 59 verification samples per 5,000-yd^3 lot will be required, reduced by the samples collected for Site CPP-34A/B. Verification sampling for I-129 in both Ponds 1 and 2 will be performed as described in the *ICDF Complex Waste Verification Sampling and Analysis Plan* (DOE-ID 2003).



Grid Established per the Site Surface Exposure Area (EA) Limit
Less than 0. 5 acres or 146 lf x 146 lf ==> 140 lf Grid Used

Borehole Locations are Based Upon BIASED Placement to Define the Boundary of the CPP -37C Burial

Proposed Additional Characterization Sampling:
Previous Borehole Location - within old Pond Location
37-1 / 37-2 / 37-3 / 37-4 ==> Golder Associates 1991

CPP-37B Site Sampling Boreholes
Recommended Sampling Depths
2.0 lf / 5.0 lf / 10.0 lf / 15.0 lf / 20.0 lf / 25.0 lf / 30.0 lf / 35.0 lf
Interior Boundary Samples
Biased - Located between previous samples
37B-1 / 37B-2 / 37B-3
Biased - Located outside pond area
37B-4 / 37B-5 / 37B-6

CPP-37C Site Sampling Boreholes
Recommended Sampling Depths
2.0 lf / 5.0 lf / 10.0 lf / 15.0 lf / 20.0 lf
Exterior Boundary Samples
Not Required due to "Known" Boundary of Landfill from Aerial Photo
Interior Boundary Samples
37C-6 / 37C-7 / 37C-8 / 37C-9 / 37C-10 / 37C-11
37C-12 / 37C-13 / 37C-14 / 37C-15 / 37C-16

ROD Recognized these Sites as "LANDFILLS"
Recommended Approach Sequencing
- Geophysical Surveys (Rapid Ground Penetrating Radar Mapping)
- Location of Biased Boreholes
- "Test Trenches / Pits"
Test Trenches 20'0" wide at bottom with variable lengths
[25'0" depth] - Slopes 1.5:1 ==> Top 100'0" wide
[15'0" depth] - Slopes 1.5:1 ==> Top 65'0" wide
[10'0" depth] - Slopes 1.5:1 ==> Top 50'0" wide
NOTE:
- Typical Test Trench / Pit configurations are shown on drawing for graphical
- Typical Trench / Pit depth - Minimum of 6'0" Maximum of 10'0"

Figure 3-2. Proposed characterization sampling locations for CPP-37B and CPP-37C.

3.8 Measurement Performance Criteria

Table 3-3 defines the analytical performance requirements for the data that need to be collected to resolve the decision statements. These performance requirements include the practical quantitation limit, precision, and accuracy requirements for each of the contaminants.

The measurement quality objectives (MQOs) specify that measurements will meet or surpass the minimum requirements for data quality indicators (precision, accuracy, representativeness, completeness, and comparability) established in the QAPjP (DOE-ID 2002a). As a result, the technical and statistical quality of these measurements must be properly documented. Precision, accuracy, method detection limits, and completeness will be specified for physical/chemical measurements. Qualitative characteristics will be specified with representativeness and comparability measures. These MQOs are described in the following sections.

Table 3-3. Analytical performance requirements for the Operable Unit 3-13, Group 3 sites.

Analyte List	Survey/Analytical Method	Preliminary Action Level	Practical Quantitation Limit	Precision Requirement	Accuracy Requirement
Gamma emitters	Gamma survey	≥5 mrem/hr	See RadCon Manual (PRD-183)	See RadCon Manual (PRD-183)	See RadCon Manual (PRD-183)
	Gamma spectroscopy	≥23 pCi/g	0.1 pCi/g	±20%	80–120
Alpha emitters	Alpha spectroscopy	Refer to disposal site WAC	QAPjP	±30%	70–130
Beta emitters	Liquid scintillation and/or gas flow proportional counting	Refer to disposal site WAC	QAPjP	±30%	70–130
Universal treatment standard (UTS) metals	SW-846	Refer to disposal site WAC	QAPjP	±30%	70–130
VOCs	SW-846	Refer to disposal site WAC	QAPjP	—[a]	—[a]
Semivolatile organic compounds (SVOCs)	SW-846	Refer to disposal site WAC	QAPjP	—[a]	—[a]

a. Precision and accuracy requirements for organics are indicated in the method associated with each analyte.

3.8.1 Precision

Precision is a measure of agreement or reproducibility among individual measurements for the same property under the same conditions. Precision is expressed as relative percent difference, which is defined and shown in Equation (3-5) as the absolute value of the difference divided by the mean, expressed as a percentage:

$$RPD = \frac{(MS - MSD)}{(MS + MSD)/2} X100 \qquad (3\text{-}5)$$

where

RPD = relative percent difference

MS = measured concentration of parameter in matrix spike sample

MSD = measured concentration of parameter in matrix spike duplicate sample.

The analytical laboratory will report the precision of their measurements of the matrix spike and matrix spike duplicate analyses conducted for organic and most inorganic analyses. For all radiochemical and some inorganic measurements, precision will be calculated using duplicate measurements of the same sample. Replicate measurements are used for metals determination after sample preparation, during instrumental analysis, and for mercury determinations post-digestion. Radiochemical measurements will use separate sample splits for solid samples to determine measurement precision.

Acceptable laboratory precision will be determined by method-specific criteria outlined in SW-846, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (EPA 1996), for total metals and each requested organic analysis. Acceptable radiochemical measurement precision will be determined using the guidance outlined in "Idaho National Engineering and Environmental Laboratory Sample and Analysis Management Statement of Work for Analytical Services" (ER-SOW-394).

3.8.2 Accuracy

Accuracy is the relative agreement or nonagreement between a measured value and an accepted reference value. Accuracy reflects the measurement error associated with a measurement and is determined by assessing actual measurements in the sample matrix during the analysis of matrix spike samples. Accuracy is assessed by means of determining analyte recovery from matrix spikes, samples, or laboratory reference samples and is expressed as a percent recovery (%R), defined as the measured value divided by the true value expressed as a percent, as shown in Equation (3-6):

$$\%R \frac{C_{ss} - C_{us}}{C_{as}} x100 \qquad (3\text{-}6)$$

where

$\%R$ = percent recovery

C_{ss} = measured analyte concentration in spiked sample

C_{us} = measured analyte concentration in nonspiked samples (or zero for laboratory reference samples)

C_{as} = calculated or certified analyte concentration added to sample.

For organic and inorganic analyses, the analytical laboratory will represent the accuracy of their measurements in the sample matrix as the results of the matrix spike data. For organic analyses, an additional measure of accuracy is provided by surrogate spike data. Surrogate spike compounds are analytes of similar chemical characteristic to the analytes of interest. They are added to all samples, matrix spikes, and blanks to test for possible bias added during the entire sample preparation and measurement process. Acceptable laboratory accuracy will be determined by assessing the results against method-specific criteria outlined in SW-846 (EPA 1996) for total metals, and each requested organic analysis. Radiochemical method accuracy will be determined by assessing the results against the criteria outlined in ER-SOW-394. During the DQO process, accuracy of the environmental measurements (in the form of bias, may be indicated by the measure discussed above) will be assessed to determine if there are any impacts on data use due to the accuracy of the data.

3.8.3 Detection Limits

The laboratory will use guidance found in SW-846 (EPA 1996) or 40 CFR 136, Appendix B, to aid in appropriately determining method detection limits (MDLs) for organic and inorganic analytical methods and the requirements of ER-SOW-394 for setting minimum detectable activities (MDAs) for radiochemical measurements. The MDLs and MDAs are defined as the minimum concentration or activity of a substance that can be reliably measured and reported by a particular analytical method. Matrix effects, sample size, radiation levels, or other analytical interferences may increase MDLs or MDAs. The effects of these conditions on the laboratory's MDLs or MDAs, if determinable, will be documented.

Chemical methods for all total metals, anions, and organic analyses typically use the standard deviation of replicate measurements of standards multiplied by a factor specified by the method or laboratory SOW to determine minimum MDLs. Estimated detection limits are provided in each of the appropriate analytical methods for chemical determinations and serve as a guide for purposes of this plan. The laboratory will use standard radiochemistry and chemical analysis practices to ensure the MDLs approach those prescribed in the analytical laboratory statement of work (SOW). Any significant deviations will be identified in the reported data.

Methods for the determination of radionuclides and applicable MDAs will be as defined in ER-SOW-394 or as defined in the project-specific analytical laboratory SOW. The laboratory will attempt to keep MDAs as low as possible given the constraints of the sample matrix and any remote sample handling operations required to assure the safety of laboratory personnel.

The laboratory analysts will follow the SW-846 (EPA 1996) and ER-SOW-394 methods as closely as possible to ensure the data are compliant with the requirements of the project. A smaller sample size may introduce a dilution effect, thereby elevating the detection level for a given sample or analysis. In the event that sample volume (or mass) prohibits the use of SW-846 protocols, the laboratory will make a good faith effort to assign methods that will provide acceptable/usable data and document all method deviations in the case narrative provided with the data package. Table 3-4 describes the analytical methods and detection limits for each contaminant of potential concern (COPC).

Table 3-4. Analytical methods and detection limits for each contaminant of potential concern.

Constituent	Analytical Method	Solids Detection Limits
UTS metals	EPA Methods 1311, 3010A, 7760A, 6010B, and 7470A	0.2–1000 mg/kg depending on metal
CLP target analyte list (TAL) metals	EPA Methods 3010A, 7760A, 6010B, and 7470A	0.2–1000 mg/kg depending on metal
Appendix IX[a] TAL VOCs (including acetone, methylene chloride, 1,1,1-trichloroethane, tetrachloroethene, and trichloroethylene)	EPA Method 8260B	5–100 µg/kg depending on VOC (must meet UTS detection limits for those analytes in parentheses)
Appendix IX TAL SVOCs	EPA Method 8270C	660–3300 µg/kg depending on SVOC
PCBs	EPA Method 8082	350 ug/kg
Tritium (H-3)	Liquid scintillation counting (LSC)	20 pCi/g
Strontium-90	Gas flow proportional (GFP)	0.5 pCi/g
Technetium-99	LSC or GFP	1 pCi/g
Iodine-129	Low-energy photon spectrometry (LEPS), GFP, or mass spectrometry technique	1 pCi/g
Radium-226	Gamma spectrometry (GMS) or GFP	0.5 pCi/g
Neptunium-237	Alpha spectrometry (ALS)	0.05 pCi/g
Uranium isotopes	ALS	0.05 pCi/g
Plutonium isotopes	ALS	0.05 pCi/g
Americium-241	ALS	0.05 pCi/g
Thorium-228	ALS	0.05 pCi/g
Thorium-232	ALS	0.05 pCi/g
Ruthenium-106	GMS	—[b]
Silver-108	GMS	—[b]
Antimony-125	GMS	—[b]
Cesium-134	GMS	—[b]
Cesium-137	GMS	—[b]
Cerium-144	GMS	—[b]
Europium-152	GMS	—[b]
Europium-154	GMS	—[b]
Europium-155	GMS	—[b]
Gamma emitters	GMS	~0.1 pCi/g

a. 40 CFR 264.

b. Detection limit is indicated in the analytical method for each constituent.

3.8.4 Completeness

Completeness is the measure of the amount of valid analytical data obtained compared to the total number of data points planned. Valid analytical data are those generated when analytical systems and the resulting analytical data meet all DQOs outlined for the project (i.e., all calibration verification interference, and other checks not affected by the sample matrix meet acceptance criteria). It is important to understand that data that are flagged during the data validation process are not necessarily invalid data. Part of the data quality analysis process is the review of flagged data to determine whether the validation flags impact the intended use of the data. Therefore, the definition of "valid data" in the context of calculating completeness is "data that are acceptable for their intended purpose." Completeness of the reported data (expressed as a percentage) is calculated, as shown in Equation (3-7).

$$C(\%) = M_v / Mt \times 100 \qquad (3\text{-}7)$$

where

C(%)	=	completeness
M_v	=	number of measurements determined to be valid per analyte
Mt	=	total number of measurements performed per analyte.

A completeness of 90% is a common goal. All data obtained from this project should meet the quality requirements and reporting protocols unless irregularities in the matrix (a.k.a. matrix effects) impede contaminant recovery or a broken, spilled container results in a loss of sample materials. The completeness goal for the project is to obtain enough valid data to satisfy the DQO specifications.

3.8.5 Comparability

Comparability is the degree to which one data set can be compared to another obtained from the same population using similar techniques for data gathering. Comparability will be achieved through the use of consistent sampling procedures, experienced sampling personnel, the same analytical method for like parameters, standard field and laboratory documentation, and traceable laboratory standards.

3.8.6 Representativeness

Representativeness is a measure of the degree to which data accurately and precisely represent a characteristic of a population parameter at a sampling point, a process condition, or an environmental condition. Representativeness is a qualitative term that should be evaluated to determine whether in situ and other measurements are made and physical samples are collected in such a manner that the resulting data appropriately reflect population parameter of interest in the media and phenomenon measured or studied.

The sampling design discussed in Section 3.7 of this plan is the basis for obtaining representative data for the WAG 3, Group 3 sites. A final determination of representativeness for the initial data set will be made by the project manager (PM) and other project personnel following the return of the chemical and radiological analytical data.

3.9 Data Quality

In addition to primary project samples, quality assurance/quality control (QA/QC) samples will be collected to establish the quantitative and qualitative criteria necessary to support the RA decision process and to describe the acceptability of the data by providing information both comparable to and representative of actual field conditions. Quality assurance/quality control samples consisting of field blanks and equipment rinsate blanks will be used to determine field accuracy. Quality control (duplicate) samples are used to measure field and laboratory precision. The QA/QC sample results will be evaluated as outlined in the QAPjP (DOE-ID 2002a). Table 3-5 provides an overview of QA/QC sample analysis for this sampling effort.

3.10 Data Validation

Data will be acquired, processed, and controlled before input to the Integrated Environmental Data Management System (IEDMS). For the samples submitted to the analytical laboratory, all data will be validated to Level B, in accordance with the QAPjP (DOE-ID 2002a).

A data limitation and validation report, including copies of chain-of-custody forms, sample results, and validation flags, will be generated for each sample delivery group. All data limitation and validation reports associated with a site will be transmitted to the EPA and Idaho Department of Environmental Quality (IDEQ) within 120 days from the last day of sample collection. All definitive data will be uploaded to the IEDMS.

The Sample and Analysis Management (SAM) group will ensure the data are validated to Level B, as specified. The analytical method data validation will be conducted in accordance with current INEEL SAM data validation procedures. Validated data are entered into the IEDMS.

Table 3-5. Quality assurance/quality control samples.

QA/QC Sample Type	Comment
Duplicate	Duplicate samples will be collected at a minimum frequency of 1/20 samples or 1/day/matrix, whichever is less.
Field blanks	Field blanks are only recommended for subsurface soils (>6 in.) collected for radionuclide analyses. Field blanks will be collected at a minimum frequency of 1/20 samples or 1/day whichever is less.
Trip blanks	Trip blanks are not recommended for soil samples.
Equipment rinsate	Equipment blanks will be collected from the same equipment used to collect samples and will be analyzed for the same constituents. Equipment blanks are not required if dedicated or disposable equipment is used. Appropriate equipment blanks will be collected at a minimum frequency of 1/day/matrix or 1/20 samples, whichever is less.

4. SAMPLE COLLECTION, ANALYSIS, AND DATA MANAGEMENT

Specific procedures are required to handle samples collected during Group 3, Phase I site sampling activities to ensure that data are representative of the soil and debris at each site. This section outlines the specific sampling process designed for these activities.

The QAPjP (DOE-ID 2002a) is the guiding document for this section. The sampling requirements discussed here will guide the collection of representative samples as specified in the DQOs (Section 3 of this plan).

4.1 Sample Collection

4.1.1 Presampling Meeting

Before sampling takes place, project personnel will meet to ensure the sampling and analysis can be performed in a safe manner and that sampling activities will provide the project with usable data. Personnel will ensure that necessary equipment and documentation are present and that project scope and objectives are understood.

4.1.2 Sampling and Analysis Requirements

Sampling and analysis plan tables, prepared by the SAM, provide a summary of sample locations, analytical parameters and container, volume, holding times, and preservation requirements. Analytical requirements for each constituent and sample media are provided. These tables will be prepared prior to the sampling activities. The INEEL SAM is responsible for obtaining laboratory analytical services. The SAM will prepare task order statement of work (TOS) documents if needed for laboratory services.

If a sample is lost, containers are broken, or the sample is unusable, the sample will be retaken where possible. The sampling field team leader (FTL) will ensure that any changes to this document regarding sampling frequency, location, and/or analysis are documented in the sample logbook. The PM is responsible to ensure that a document action request (DAR) is written and approved for any changes to this document.

4.1.3 Sampling Documentation and Equipment

A sampling logbook will be maintained for all field data gathered, field observations, field equipment calibrations, samples collected for analysis, and sample custody. Field logbooks, as legal documents, will be maintained to ensure that field activities are properly documented as they relate to site safety meetings and that site work is conducted in accordance with the health and safety procedures. Field logbooks will be bound, and they will contain consecutively numbered pages. All entries in field logbooks will be made using permanent ink pens or markers. All mistakes made as entries will be amended by drawing a single line through the entry and then initialed and dated by the person making the correction.

The FTL will be responsible for controlling and maintaining all field documents and records, and for ensuring that all required documents will be submitted to the Idaho Completion Project Administrative Records and Document Control Office at the conclusion of the project.

Sample documentation, shipping, and custody procedures for this project are based on EPA-recommended procedures that emphasize careful documentation of sample collection and sample transfer. The appropriate information pertaining to each sample will be recorded in accordance with INEEL logbook practices, chain-of-custody procedures, and the QAPjP (DOE-ID 2002a). All personnel involved with handling, managing, or disposing of samples will be familiar with INEEL handling and shipping sample procedures, and all samples will be dispositioned accordingly.

A DAR is required when field conditions dictate making any changes to this plan, the project HASP, or other controlled project procedures (e.g., requiring additional analyses to meet appropriate WAC). If necessary, a DAR will be executed in accordance with Idaho Completion Project document procedures.

All information recorded on project field documentation (e.g., logbooks, chain-of-custody forms) will be made in permanent ink. All field documentation errors will be corrected by drawing a single line through the error and entering the correct information, and all corrections will be initialed and dated. In addition, photographs will be taken to document the field sampling activities.

Included below is a tentative list of necessary equipment and supplies. This list is as extensive as possible, but not exhaustive, and should only be used as a guide. Other equipment and supplies specified in the project-specific HASP and/or field sampling plan (FSP) may not be included in this section. Sampling equipment that will come into contact with sample material will be cleaned before use with an appropriate method (e.g., Alconox or similar nonphosphate soap with de-ionized water rinse, or equivalent). Field sampling and decontamination supplies may include the following:

- Stainless-steel hand augers
- Push probe/split spoon
- Power augers or small drill
- Tape measure (30.5 m [100 ft])
- Wood stakes and ribbon (30.5 m [100 ft])
- Stainless steel spoons
- Stainless steel or aluminum composting pans
- Paper wipes
- Plastic garbage bags
- De-ionized water (20 L [5.3 gal] minimum)
- Nonphosphate-based soap
- Isopropanol
- Spray bottles
- Aluminum foil
- Pipe wrench

- Crescent wrench
- Hammer
- Tables
- Certified ultrapure water (5 L [1.3 gal] JT Baker)
- Sample and shipping logbook
- FTL logbook
- Controlled copies of the FSP, QAPjP, HASP, and applicable referenced procedures
- Black ink pens
- Black ultrafine markers
- Sample containers, as specified in the QAPjP
- Preprinted sample labels and field guidance forms
- Nitrile or latex gloves
- Leather work gloves
- Ziploc™ plastic bags
- Custody seals.

Sample preparation and shipping supplies include the following:

- Pipettes
- pH paper
- Nitrile or latex gloves
- Paper wipes
- Parafilm™
- Clear tape
- Strapping tape
- Resealable plastic bags (such as Ziploc™) in various sizes
- Chain-of-custody forms

- Shipping request forms
- Names, addresses, telephone numbers, and contact names for analytical laboratories
- Task order statements of work for analytical laboratories and associated purchase order numbers
- Vermiculite or bubble-wrap (packaging material)
- Plastic garbage bags
- Blue Ice™
- Coolers
- "This Side Up" and "Fragile" labels
- Address labels
- Sample bottles and lids
- Custody seals.

4.1.4 Field Equipment Calibration and Setup

The FTL will work closely with sampling personnel to ensure that sampling equipment is operating as recommended by the manufacturer and/or according to design specifications. Presampling inspections of equipment will be performed to ensure the equipment is functioning properly. Corrective actions for the repair or maintenance of any sampling equipment will be immediate and will be confirmed by the FTL or PM before proceeding with sampling.

Radiological control personnel are responsible for the calibration of all radiological monitoring equipment and the placement and handling of telemetry dosimeters. The industrial hygienist (IH) will be responsible for the measurement and evaluation of other chemical hazards.

4.1.5 Sample Designation and Labeling

Each sample bottle will contain a label identifying the field sample number, the analyses requested, the sample date and time, and the name of the person performing the sampling. Labels will be secured on the sample using clear plastic tape.

A systematic character identification code will be used to uniquely identify all samples. Uniqueness is required to maintain consistency and prevent the same code from being assigned to more than one sample.

The first designator of the code, 3, refers to the sample originating from WAG 3. The second and third designators refer to the sample being collected in support of the RA. The next three numbers designate the sequential sample number for the project. Regular and field duplicate samples will be designated with a two-character set (e.g., 01, 02). The last two characters refer to a particular analysis and bottle type. For example, a soil sample collected in support of the RA might be designated as 3RA00101R4, where (from left to right):

- **3** designates the sample as originating from WAG 3
- **RA** designates the sample as being collected for the RA
- **001** designates the sequential sample number
- **01** designates the type of sample (01 = regular, 02 = field duplicate)
- **R4** designates gamma spectrometric analysis.

The IEDMS database will be used to record all pertinent information associated with each sample identification code. Preparation of the plan database and completion of the SAM request for services are used to initiate the sample and sample waste tracking activities performed by the SAM.

4.1.6 Sample Containers

Table 4-1 identifies container volumes, types, holding times, and preservative requirements that apply to all soil and liquid samples being collected under this plan. All containers will be precleaned (typically certified by the manufacturer) using the appropriate EPA-recommended cleaning protocols for the bottle type and sample analyses. Extra containers will be available in case of breakage, contamination, or if the need for additional samples arises. Prior to use, preprinted labels with the name of the project, sample identification number, location, depth, and requested analysis will be affixed to the sample containers.

Table 4-1. Sampling bottles, preservation types, and holding times.

Analysis	Volume and Type	Preservative	Holding Time
UTS metals	Glass or plastic	4°C	180 days for all metals except mercury, which is 28 days
CLP TAL metals	Glass or plastic	4°C	180 days for all metals except mercury, which is 28 days
Appendix IX[a] TAL VOCs (including acetone, methylene chloride, 1,1,1-trichloroethane, tetrachloroethene, and trichloroethylene)	Glass	4°C	14 days
Appendix IX[a] TAL SVOCs	Glass	4°C	14 days
PCBs	Glass	4°C	14 days
Alpha radionuclides	High-density polyethylene (HDPE)	NA	180 days for all isotopes
Beta radionuclides	HDPE	NA	180 days for all isotopes except I-129, which is 28 days
Gamma emitters	HDPE	NA	180 days for all isotopes

a. 40 CFR 264.

4.1.7 Sample Preservation

Water samples will be preserved in a manner consistent with the QAPjP (DOE-ID 2002a). If cooling is required for preservation, the temperature will be checked periodically prior to shipment to certify adequate preservation for those samples that require temperatures of 4°C (39°F) for preservation. Ice chests (coolers) containing frozen reusable ice will be used to chill samples in the field after sample collection, if required.

4.1.8 Chain-of-Custody

The INEEL chain-of-custody procedures will be followed as well as the requirements in the QAPjP (DOE ID 2002a). Sample bottles will be stored in a secured area accessible only to the field team members.

Chain-of-custody procedures will begin immediately after collection of the first sample. At the time of sample collection, the sampling team will initiate a chain-of-custody form for each sample. All samples collected will then remain in the custody of a member of the sampling team until the custody is transferred to the analytical laboratory sample custodian (SC). Upon receipt at the laboratory, the SC will review the sample labels and the chain-of-custody form to ensure completeness and accuracy. The laboratory SC will sign and date the chain-of-custody form signifying acceptance of delivery and custody of the samples. If discrepancies on the form are noted, immediate corrective action will be sought with the sampling team member(s) identified on the form.

Custody seals will be placed on all shipping containers to ensure that tampering or unauthorized opening will not compromise sample integrity. The seal will be attached in such a way that opening the container requires the seal to be broken. Clear plastic tape will be placed over the seals to ensure that the seals are not damaged during shipment. Seals will be affixed to containers before the samples leave the custody of the sampling personnel.

4.1.9 Sample Collection Procedures

Sample collection procedures will be performed in accordance with existing INEEL sampling collection and handling procedures.

A scoop, hand corer/auger, power auger, or other typical soil sample collection tool will be used to collect soil samples. Prior to collection, sampling tools will be decontaminated to prevent cross-contamination of samples.

Deep sampling will require a drill-rig system and will be performed in accordance with existing INEEL drilling sampling collection and handling procedures. Special precautions will be implemented during the utilization of drill-rig equipment to ensure that existing utilities locations are known and staked before drilling.

For each sample activity, sample locations will be chosen to be representative of the waste stream. All samples will be collected in appropriate containers based on the contaminant and the associated analytical method required for the analytical data. Either on-Site analysis will be performed or off-Site analytical laboratories will be used, depending on the contaminant, required detection level, and analytical technique. All samples requiring off-Site laboratory analysis must be collected in precleaned sample containers and follow the container requirements per the TOS. If sampling for volatile or semivolatile organics is required, these will be collected first to minimize disturbance of the soil.

4.1.10 Equipment Decontamination Procedures

Field decontamination procedures designed to prevent cross-contamination between locations and samples and prevent offsite contamination migration will be performed in accordance with INEEL sampling equipment decontamination procedures. All equipment associated with sampling will be thoroughly decontaminated prior to daily activities and between sample locations. Following decontamination, sampling equipment will be wrapped in foil to prevent contamination from windblown dust.

4.1.11 Sample Transport

Samples will be shipped in accordance with the regulations issued by the U.S. Department of Transportation (DOT) (49 CFR 171 through 178) and EPA sampling handling, packaging, and shipping methods (40 CFR 262). All samples will be packaged in accordance with the requirements in INEEL chain-of-custody and sample labeling procedures. Sample transport will be between the site and the SAM facility. The SAM is responsible for all off-Site shipping.

4.1.12 Waste Management

Wastes generated during the characterization project will be addressed in accordance with the project Waste Management Plan (DOE-ID 2004b).

4.2 Sample Analysis

Sample analysis will be performed by laboratories approved by the INEEL SAM. These laboratories will perform analyses in accordance with project requirements, including ER-SOW-394.

Project-specific requests for analyses forms or TOS(s) identify additional requirements for laboratory analysis. The following sections identify analysis requirements for this characterization project.

4.2.1 Analytical Methods

To ensure that data of acceptable quality are obtained from characterization projects, standard EPA laboratory methods or technically appropriate methods for analytical determinations will be used. References for the most commonly used methods are listed here:

- *Soil Sampling and Analysis for Volatile Organic Compounds* (EPA 1991a, pages 1-22)
- *Characterizing Soils for Hazardous Waste Site Assessments* (EPA 1991b, pages 1-16)
- *A Compendium of Superfund Field Operations Methods* (EPA 1987, pages 7-1 through 7-9, 8.1-1 through 8.4-51, 13-1 through 13-10, 15-1 through 15-58)
- *Statement of Work for Organic Analysis-Multimedia, Multi-Concentration* (EPA 1994)
- *Statement of Work for Inorganic Analysis-Multimedia, Multi-Concentration* (EPA 1993)
- *Test Methods for Evaluating Solid Waste, Physical and Chemical Methods* (EPA 1996)
- *Methods for the Chemical Analysis of Water and Wastes* (EPA 1983).

The general sample volumes, preservation, container types, and holding times for many of the typically required analyses can be found in Tables 2-1 and 2-2 of the QAPjP (DOE-ID 2002a). American Society for Testing and Materials or EPA sampling methods will be used whenever possible. The specific information related to sampling bottles, preservation types, and holding times is found in Table 4-1 of Section 4.1.6 of this plan.

4.2.2 Instrument Calibration Procedures

Laboratory instrumentation will be calibrated in accordance with each of the specified analytical methods. The laboratory quality assurance plan shall include requirements for calibrations when specifications are not listed in analytical methods. Calibrations that are typically not called out in analytical methods include ancillary laboratory equipment and verification of reference standards used for calibration and standard preparation. Laboratory documentation will include calibration techniques and sequential calibration actions, performance tolerances provided by the specific analytical method, and calibrations dates and frequency. All analytical methods have specifications for equipment checks and instrument calibrations. The laboratory will comply with all method-specific calibration requirements for all requested parameters. If a failure of instrument calibration or equipment is detected, the instrument will be recalibrated, and all affected samples will be analyzed using an acceptable calibration.

4.2.3 Laboratory Records

Laboratory records are required to document all activities involved in sample receipt, processing, analysis, and data reporting. Sample management records document sample receipt, handling and storage, and the sample analysis schedule. The records verify that the COC and proper preservation were maintained, reflect any anomalies in the samples, note proper log-in of samples into the laboratory, and address procedures used to prioritize received samples to ensure that the holding time requirements are met.

The laboratory is responsible to maintain documentation demonstrating laboratory proficiency with each method as prescribed in standard operating procedures. Laboratory documentation will include sample preparation and analysis details, instrument standardization, detection and reporting limits, and test-specific QC criteria. Any deviations from prescribed methods must be properly recorded. QA/QC reports will include general QC records, such as analyst training, instrument calibration, routine monitoring of analytical performance, and calibration verification. Project-specific information, such as blanks, spikes, calibration check samples, replicates, and splits performed per project requirements, may be documented. Specific requirements for the quantity and types of QA/QC monitoring and associated reporting formats will be specified in the task-specific laboratory statement of work.

4.3 Data Management and Document Control

4.3.1 Data Reporting

Tier I data packages are suggested for all analyses so that Level B validation could be performed at a later date if determined necessary in the future. The final data package documentation will conform to the criteria specified in ER-SOW-394.

The ER SOW prepared by the INEEL SAM organization is the standard by which analytical data deliverable requirements are defined by INEEL projects to laboratories used by the INEEL. The document used to establish technical and reporting standards will be adhered to by all laboratories used by this project.

4.3.2 Data Validation

Data will be acquired, processed, and controlled prior to input to the IEDMS as required by the INEEL. For the samples submitted to the analytical laboratory, all data will be validated to Level B, in accordance with the QAPjP (DOE-ID 2002a).

A data limitation and validation report, including copies of chain-of-custody forms, sample results, and validation flags, will be generated for each sample delivery group. All data limitation and validation reports associated with a site will be transmitted to the EPA and IDEQ within 120 days from the last day of sample collection. All definitive data will be uploaded to the IEDMS.

The SAM group will ensure the data are validated to Level B, as specified. The analytical method data validation will be conducted in accordance with current INEEL SAM data validation procedures. Validated data are entered into the IEDMS.

4.3.3 Data Quality Assessment

The data quality assessment process is used to determine whether or not the data meet the project DQOs. Additional steps of the data quality assessment process may involve data plotting, testing for outlying data points, and other statistical analysis relative to the characterization project DQOs.

In addition to primary project samples, QA/QC samples will be collected to establish the quantitative and qualitative criteria necessary to describe the acceptability of the data by providing information both comparable to and representative of actual field conditions. QA/QC control samples consisting of field blanks and equipment rinsate blanks will be used to determine filed accuracy. QC (duplicate) samples are used to measure field and laboratory precision. The QA/QC sample results will be evaluated as outlined in the QAPjP (DOE-ID 2002a). Table 3-5 provides an overview of QA/QC sample analysis for the sampling effort.

The completeness of the data is the number of samples collected and analyzed compared to the number of samples planned. For this characterization plan, a 90% completeness objective for all analyses has been established because some sample locations may not contain enough material for all analyses requested.

Precision is a measure of agreement among replicate measurements of the same property. Accuracy is a measure of the closeness of an individual measurement to the true value. Field and laboratory precision and accuracy should be within the limits and goals mentioned in the QAPjP. Data results will be evaluated upon completion of the project to determine whether precision and accuracy goals were met.

4.3.4 Document Control

Document control consists of the clear identification of all project-specific documents in an orderly form, secure storage of the clear identification of all project-specific documents in an orderly form, secure storage of all project information, and controlled distribution of all project information. Document control ensures controlled documents of all types related to the project will receive appropriate levels of review, comment, and revision, as necessary.

The PM is responsible for properly maintaining project documents according to INEEL document control requirements. Upon completion of the characterization project, all project documentation and information will be transferred to compliant storage according to project, program, and company requirements. This information may include field logbooks, chain-of-custody forms, laboratory data reports, engineering calculations and drawings, and final technical reports.

5. REFERENCES

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