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SAMPLING AND ANALYSIS PLAN FOR SILO 3 TREATED WASTE MATERIAL

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

AUGUST 2000

U.S. DEPARTMENT OF ENERGY

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REVISED SAMPLING AND ANALYSIS PLAN

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ACRONYM LIST

ASL	Analytical Support Level
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Constituent of concern
DOE	Department of Energy
DOT	Department of Transportation
DQOs	Data Quality Objectives
EPA	U.S. Environmental Protection Agency
EP Tox	Extraction Procedure Toxicity (analysis)
ESD	Explanation of Significant Differences (for Operable Unit 4 Silo 3 Remedial Action)
FACTS	Fernald Analytical Computerized Tracking System
FAT&LC	Fernald Atomic Trades and Labor Council
FEMP	Fernald Environmental Management Plan
GFAA	Graphite Furnace Atomic Absorption Spectrometry
ICP-MS	Inductively coupled plasma – mass spectroscopy
IIMS	Integrated Information Management System
mg/L	milligrams per Liter
NTS	Nevada Test Site
OEPA	Ohio Environmental Protection Agency
OU4	Operable Unit 4
pCi/g	picoCurie per gram
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RMRS	Rocky Mountain Remediation Services
ROD	Record of Decision
SAP	Sampling and Analysis Plan
SCQ	Sitewide CERCLA Quality Assurance Project Plan
SED	Sitewide Environmental Database
SVOCs	Semivolatile organic compounds
TAL	Target analyte list
TCLP	Toxicity Characteristic Leaching Procedure
TSCA	Toxic Substance Control Act
VOCs	Volatile organic compounds
WAC	Waste acceptance criteria
WISDM	Windows Integrated Sample and Data Management system

1.0 INTRODUCTION

This Sampling and Analysis Plan (SAP) has been developed to document sampling and analysis activities to be performed in support of remedial action activities for the Silo 3 Project. Specifically, this SAP has been prepared for U.S. Environmental Protection Agency (EPA) and Ohio Environmental Protection Agency (OEPA) review, to provide details associated with the sampling and analysis of the Silo 3 materials to support the transportation of waste, and its subsequent disposition at either the Nevada Test Site (NTS) or at Envirocare of Utah, Inc. (Envirocare).

Existing analytical data were reviewed in determining the analytes to be monitored and the frequency of sampling required. Techniques to be used for collecting and analyzing samples, as well as general methodologies, are described in this Plan. Details necessary to implement the program identified in this Plan are currently covered under existing procedures or will be written into standard analytical operating procedures to meet the objectives reflected in this Plan.

1.1 PROJECT BACKGROUND

The Fernald Environmental Management Project (FEMP) is a 1,050-acre government-owned, contractor-operated facility located in southwestern Ohio approximately 18 miles northwest of the city of Cincinnati. The facility is located just north of Fernald, Ohio, a small farming community, and lies on the boundary between Hamilton and Butler Counties. The FEMP, which operated under the name of the Feed Materials Production Center, produced high purity uranium metal products for the United States Department of Energy (DOE) and its predecessor agencies from 1952 to 1989. Former uranium processing operations at the FEMP were limited to a fenced, 136-acre tract, closed to public access, known as the production area. In June 1991, the site was officially closed for production by an Act of Congress. The Fernald site was included on the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) National Priorities List in 1989. The current mission of the site is the safe environmental restoration of the site in accordance with all applicable requirements.

Silo 3 is part of Operable Unit 4 (OU4) which is situated in the southwestern portion of the Waste Storage Area, west of the former Production Area. Silos 1, 2, and 4, which are also part of OU4, will not be discussed in this SAP; details on those silos can be found in the OU4 Record of Decision (ROD).

The material in Silo 3 is classified as byproduct material, as defined in Section 11e.(2) of the Atomic Energy Act of 1954. This material is known as cold metal oxides and were generated at the FEMP site during uranium extraction operations in the 1950s. These oxides were formed by calcining residues from

the solvent extraction process used to extract uranium from ore concentrates and residues. The material in Silo 3 is substantially different from that in Silos 1 and 2. Silo 3 material is dry and powdery and contains similar radiological constituents as those found in Silos 1 and 2. However, certain radionuclides (such as radium) are present in much lower concentrations. On an activity basis, the predominant radiological constituent of the Silo 3 material is thorium-230 (Th-230). Data from the OU4 Remedial Investigation (RI) (Extraction Procedure Toxicity [EP Tox] analysis, since replaced by the Toxicity Characteristic Leaching Procedure [TCLP]) indicates Silo 3 material contains eight metals, with the highest mean concentrations being attributed to arsenic (9.48 milligrams per Liter [mg/L]), cadmium (0.85 mg/L), chromium (5.05 mg/L), and selenium (2.65 mg/L). Although one sample exhibited a total lead concentration above the EPA 20x limit, the corresponding EP Tox result for the sample did not leach lead above the EP Tox limits. Therefore, lead will not be retained as a Constituent of Concern (COC).

As detailed in the OU4 ROD, the identified remedy for Silos 1,2, and 3 material was retrieval, vitrification, and disposal at NTS. The Explanation of Significant Differences (ESD) for OU4 Silo 3 Remedial Action, approved March 1998, documented the change in remedy for Silo 3 material to retrieval, treatment by polymer encapsulation or chemical stabilization, and off-site disposal at NTS or an appropriately permitted commercial disposal facility.

1.2 SCOPE OF ACTIVITIES

This Plan describes the sampling and analysis strategy to satisfy Waste Acceptance Criteria (WAC) requirements at either NTS or the Envirocare commercial disposal facility in Clive, Utah and demonstrate treatment requirements in the ROD are met. Since this plan is specific to NTS and Envirocare WAC, disposal at any other government or commercial site will require a revision of this SAP to reflect the receiving facility's licenses and permits.

1.2.1 Nevada Test Site

If the ultimate disposition for the Silo 3 material is NTS, this Plan will fulfill contractual SAP requirements contained in DOE's disposal contract with NTS. As required by the contract, this plan will undergo a concurrence review by NTS to ensure that mutually agreeable approaches and procedures for material characterization are being implemented.

1.2.2 Envirocare

If the ultimate disposition for the Silo 3 material is Envirocare, this Plan will fulfill contractual SAP requirements contained in the Army Corps of Engineering disposal contract with Envirocare.

The Army Corps of Engineering disposal contract with Envirocare requires that this SAP remain current at all times and be updated whenever necessary to address current operating conditions. In keeping with this "living document" obligation, this initial version of the Silo 3 SAP is written to apply conceptually to all of the processed Silo 3 wastes eligible for disposal at Envirocare. Should direct operating experience indicate a need later to revise the plan, the revision will be provided to Envirocare for information and to EPA and OEPA for approval as part of this "living document" obligation.

The Silo 3 sampling will be conducted on the final processed waste stream on a daily production basis as the processed materials are accumulated for disposition. This SAP does not include the sampling and analysis of anything other than the treated/processed Silo 3 material.

1.3 SAMPLING AND ANALYSIS PLAN OBJECTIVES

The objectives for this SAP are as follows:

- To satisfy the requirements of the OU4 ROD.
- To satisfy the analytical requirements for NTS OR Envirocare waste disposal.
- To satisfy a managerial need for key "risk management" sampling, where such sampling is considered appropriate, to further minimize the possibility or ramifications of material rejection upon its arrival at either NTS or Envirocare.
- To provide accurate Department of Transportation (DOT) waste packaging and shipping determination.

Each of these objectives has been considered in the formulation of the sampling protocols behind this SAP and the selection of an appropriate suite of analytical parameters and sample collection frequency to accomplish the ex-situ characterization of the materials prior to disposition. The sampling and analysis strategy contained in this SAP also considers the license and permits restrictions for WAC compliance at NTS and Envirocare.

1.4 ASSUMPTIONS

Because of a lack of final project definition at the time this SAP is being developed, several assumptions are being made. These assumptions include the following:

- Archive samples collected by the Fernald Atomic Trades and Labor Council (FAT & LC) from the untreated Silo 3 material for Rocky Mountain Remediation Services (RMRS) purposes will be maintained and stored by RMRS and are not covered by this SAP.
- Process capability of the treatment system is approximately 120 drums per day.

- The final processed material will be approximately 2.5- x 1.5- x 1-inch briquettes, weighing approximately 0.25 pounds each.
- Primary containers will be 55-gallon drums.
- Transportation will be by rail or by truck.
- Process material sampling will be done by the FAT&LC under RMRS procedures.
- Sample collection will be from treated (post-process) material.
- Analytes of concern are isotopic uranium (U-235 and U-238 [U-234 to be calculated]), isotopic thorium (Th-230 and Th-232), radium-226, actinium-227 (calculated), protactinium-231 (calculated), lead-210 (calculated), TCLP metals (arsenic, cadmium, chromium, and selenium), and pH.

If any of these assumptions change, a variance to this SAP explaining the significant differences will be generated and distributed.

1.5 PLAN ORGANIZATION

This plan consists of the following seven sections:

Section 1.0 Introduction – This section discusses the purpose of this plan, presents a project background, identifies the scope of activities relative to this plan (as well as identifying activities not covered by this plan, provides an overall presentation of the sampling and analysis objectives, and describes the organization of this plan.

Section 2.0 Sampling and Analysis Approach – This section provides the background and basis for the development of the sampling and analysis strategy for the Silo 3 materials. This section discusses the objectives and expectations which drive the need for data, the specifics of a sampling and analysis strategy needed to provide that data (i.e., the selection of analytical parameters, sampling frequency, and laboratories), and defines the approach to be used to collect and analyze the samples.

Section 3.0 Sample Identification, Labeling, and Chain of Custody – This section discusses the sample identification approach, the sample labeling process/approach, and the chain of custody process, which will be used in support of all Silo 3 sampling activities.

Section 4.0 Equipment Decontamination – This section provides a general discussion of the activities which will be performed relative to the decontamination of sampling equipment, used in support of the sampling program.

Section 5.0 Quality Assurance/Quality Control Requirements – This section provides a general discussion of the quality controls to be put in place relative to the collection of samples in the field, and in sample analysis.

Section 6.0 Record Keeping – This section provides a discussion of the documentation process to be used in the field and in the laboratory as a means for recording activities, observations, and findings relative to sample collection and analysis.

Section 7.0 Data Management and Reporting – This section provides a discussion of the need for, and the basis of, the planned data management system to be developed in support of the project, for the sampling and analysis program.

2.0 SAMPLING AND ANALYSIS APPROACH

Prior to developing the specific requirements of the sampling and analysis approach for the Silo 3 materials, the requirements, agreements, and criteria which drive the need for the data to be generated through the sampling and analysis program must be assessed. The purpose of this section is to assess the information which drives the data needs for the management of these waste materials and then, based on this assessment, verify the treated waste meets WAC and DOT requirements. Specifically, this section discusses the objectives, expectations, and specifics of a sampling and analysis strategy (i.e., the selection of analytical parameters, sampling frequency, and laboratories). This section details the approach to be used to collect and analyze the samples by identifying the analytical requirements for the Silo 3 materials.

2.1 NEVADA TEST SITE

If the chosen disposition site is determined to be the NTS, the Prototype Sampling and Analysis Plan for Waste at the FEMP, PL-3048, will be used for characterization of the Silo 3 materials (see Appendix A). The current version of PL-3048 is attached; however, since sampling of the Silo 3 material is not expected to commence immediately and the plan is controlled, it is imperative that the plan revision in place at the time of the sampling event be used.

2.2 ENVIROCARE

As previously mentioned, the Silo 3 material is characterized as 11e.(2) byproduct material. Envirocare is licensed by the Nuclear Regulatory Commission to receive this type of waste for disposal. The Envirocare 11e.(2) license allows an average concentration per transport vehicle rather than a "not to exceed" concentration limit.

This section discusses the requirements to verify the treated Silo 3 waste meets Envirocare's established WAC prior to disposition at Envirocare. The information contained in this section is based upon Envirocare guidelines and associated permit/license requirements.

2.2.1 Envirocare's Expectations of the Waste Generator

Envirocare requires that the waste generator perform sufficient sampling to verify the acceptance status of the waste. In general, these requirements can be summarized as follows:

- Obtain sufficient samples such that any/all radionuclides present in the material have been identified and quantitated; this information will be used to determine the range and weighted average activities of the radionuclides present in the material.

- Provide pH results as required by Envirocare's "11e.(2) Waste Profile Record, EC-3200."

- Provide "worst case" or "range" (as required by Envirocare's Radioactive Waste Profile Record) analytical results for the 8 Resource Conservation and Recovery Act (RCRA) TCLP metals (plus zinc), the 32 RCRA characteristic organics (listed in Table 1 of 40CFR261), and reactive cyanide/sulfide.

Upon review and approval of the FEMP's completed Radioactive Waste Profile Record, Envirocare will issue a "Notice to Transport, EC-1800". An update to the approved profile will be necessary if the reported concentration ranges exceed those originally reported on the Radioactive Waste Profile Record.

Table 2-1 summarizes Envirocare's WAC constituent list for radioactive materials (such Silo 3 materials) as contained in Envirocare's October 1998 facility license renewal and accompanying implementation guidance documents. Only those constituents expected to be present in the waste stream (by historical data, current sampling, or process knowledge) must be accounted for by the waste generator.

2.2.2 Envirocare's Receipt Sampling of Generator Shipments

In addition to the sampling conducted by the waste generator, Envirocare conducts receipt sampling for waste materials shipped to the facility. This receipt sampling is conducted independently from the waste generator's sampling. A summary of this receipt sampling for shipments is provided in the following subsections.

2.2.2.1 Receipt Sampling Parameters

Two types of parameters are considered by Envirocare during 11e.(2) receipt sampling: radiological parameters and visual comparison. A brief description of each of these parameters are listed below.

- Radiological parameters: gamma scan plus non-gamma analysis for specific constituents identified by the generator on the EC-3200 11e.(2) Waste Profile Record that require methods other than gamma spectroscopy; site scaling factors and calculations are acceptable where appropriate

- Visual comparison of the waste materials against the Profile Record physical description.

2.2.2.2 Receipt Sampling Frequencies

The following receipt sampling frequencies reflect the minimum frequencies for waste shipments conducted by Envirocare as part of their State of Utah operating license. While these represent the minimum frequencies, Envirocare can elect to conduct additional sampling whenever deemed appropriate. For each conveyance that is selected for sampling, Envirocare generally obtains six random

"grab" samples composited into one sample from which all the subsequent analyses are performed. The only receipt sample to be collected by Envirocare will be analyzed for radiological parameters. The sample(s) will be collected at a rate of 1 sample per 5000 yd^3 or may be collected up to 2 times per month.

Envirocare's receipt sampling program for WAC attainment serves as useful guidance for establishing sampling frequencies and analytical parameters for consideration in this SAP, particularly to frame the level of "risk management" sampling that is considered appropriate for satisfying the third objective identified in Section 1.3 (i.e., risk management sampling). Table 2-2 lists the analytical constituents and sample frequencies selected.

2.2.2.3 Relationship of Sampling and Analysis Activities to the EC-3200 11e.(2) Waste Profiling Process

For the Silo 3 material, the initial Envirocare EC-3200 form will be generated from existing data taken from the OU4 RI. As progressive sampling results are obtained under this SAP, the Profile Record will be updated under a "living document" approach, if and when maximum concentrations during operations supercede those delineated in the Envirocare profile. If this situation occurs, Envirocare will be notified and a new profile update will be submitted to reflect the new radiological ranges observed during operations. Materials affected by this situation will not be shipped until authorization is provided by Envirocare.

As stated above, operational decisions that rely on ex-situ information need to be made under conditions that offer less lead time for updates to the Profile Record and/or adjustment of screening-parameter tolerance limits compared to an in-situ approach. Successful implementation requires effective coordination of the Profile Record updates with appropriate "hold points" for retaining affected material while Envirocare's update approvals are pending. Typical hold points include profile approval, analytical exceedances which require profile revision, analytical exceedances which demonstrate treatment of metals was unsuccessful, and radiological exceedances requiring loading geometry configuration. Operating procedures will be prepared outside this SAP to describe this coordination and use of material hold points during operations.

2.2.3 Silo 3 Treated Material Sampling and Analysis Strategy

This section summarizes the sampling and analysis strategy (selection of analytes and sampling frequency) for the Silo 3 materials under the SAP. The overall intent is to verify or demonstrate compliance with Envirocare disposal requirements, the OU4 ROD, and DOT requirements.

A key ingredient to the success of the analytical evaluations involves the use of appropriate analytical methods and laboratories that can provide quick-response turnaround times to support real-time material dispositioning decisions. The processed materials will typically reside in the containers in a specified staging area until analytical results are received. Therefore, quick response laboratory methods and capabilities are imperative to disposition materials in a timely manner.

This version of the Silo 3 SAP presents those elements considered necessary to initiate the detailed WAC attainment demonstration process. If actual direct operating experience with the materials indicates a need to revise any elements of the approach, an updated variance or, depending upon significance of the change(s), a revised SAP will be submitted to key affected parties (Envirocare, EPA, and OEPA).

2.2.3.1 Selection of an Appropriate Sampling Frequency

The sampling frequency chosen for this SAP is focused primarily on satisfying the third objective identified in Section 1.3 (i.e., risk management sampling). The conservative managerial approach adopted for this objective meets the intentions of the first and second objectives (satisfy the OU4 ROD requirements and satisfy the off-site receiving facility's requirements, respectively).

The FEMP has elected to use the material quantities associated with daily production to select a sampling frequency for this plan. These quantities fulfill the most intensive sampling required by NTS and exceeds that required for Envirocare. Since it has not yet been decided which disposition option will be exercised, the more restrictive sample quantity will be used.

Samples will be collected from the containers at a frequency discussed in Section 2.2.6 to conduct the necessary radiological, chemical, and physical analyses required for Envirocare disposition. The basis for the frequency of the sampling is to ensure the treatment process is homogenous and does not exceed Envirocare's permit and license limits.

2.2.3.2 Selection of Appropriate Analytical Parameters

A graded approach has been utilized to select appropriate analytes for material characterization, based on an adoption of Envirocare's receipt sampling analytes and a general knowledge of contaminant concentration levels indicated by the OU4 RI. This graded approach is summarized below.

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Radiological Parameters

- Conduct radiological analyses for 100 percent of the samples
- Adopt existing data defaults for minor radiological constituents or perform calculations from concentrations of known radionuclides.

Alternate approaches utilizing a combination of gamma spectroscopy, alpha spectroscopy, and inductively coupled plasma-mass spectroscopy (ICP-MS) may also be considered, if necessary.

Chemical Parameters

- Conduct RCRA characteristic analyses (D001 through D043) on the first collected sample of treated material
- Conduct analysis for four TCLP metals (arsenic, cadmium, chromium, and selenium [the four inorganic parameters identified as above the RCRA Toxicity Characteristic limits in the OU4 ROD]) on 100 percent of the samples.

2.2.3.3 Selection of Appropriate Laboratories

All radiological analyses, inorganics, physical tests, and pH measurements will be conducted by the FEMP laboratory. All RCRA TCLP organic analyses will be conducted by an outside laboratory under contract to the FEMP. This outside laboratory will be expected to meet the analytical turnaround times demanded by the project's needs, as well as meet requirements for Utah laboratory certification.

2.2.3.4 Approach for Failure

In sampling the Silo 3 processed material for the analytical parameters discussed in Section 2.2.3.2, there may be an occasion when the material is identified as exhibiting radionuclide activities different than that submitted under the Envirocare profile but still within the Envirocare license and permit requirements. If this happens, the Envirocare profile will be modified to reflect the current concentrations exhibited by the Silo 3 processed waste.

The Data Quality Objectives (DQOs) for this SAP detail the consequences of failure [analytical results exceeding the Envirocare profile/permit/license (see Appendix B)]. Additionally, Figures 2-1 and 2-2 illustrate decision trees to be used for disposal determination. With the exception of the radionuclide constituents, if analytical data indicates exceedance of allowable constituent concentrations, the material will be reprocessed and retreated until the concentrations are acceptable.

2.2.4 Department of Transportation Hazard Class Determination

The radiological data collected under this SAP will also be used for determining the appropriate DOT hazard class. This will be accomplished by verifying that the material meets the definition of LSA-II waste, as defined in 49CFR173.403, through determining if the material is essentially uniformly distributed, and through the analytical data by performing the following calculation:

$$\sum_{i=1}^{n}(a_i / A_{2i}) < 10^{-6}$$

Where a_i is the activity per gram of the i radioisotope and A_{2i} is the DOT A_2 value of the i isotope. The data collected under this SAP will provide the information required for DOT shipping determination.

2.2.5 Analytical Requirements

As previously discussed, the number and type of analyses specified are designed to ensure with a reasonable degree of certainty that the Silo 3 materials will meet the Envirocare WAC. Table 2-3 provides summary information on the sampling requirements associated with these samples, while Table 2-4 provides information on the proposed radiological and chemical analytical methodologies. Table 2-5 lists the minimum detection concentrations for radionuclides. The method detection limits for the nonradiological parameters are delineated in the Sitewide CERCLA Quality Assurance Project Plan (SCQ).

The first treated material sample collected will be analyzed to affirm the Silo 3 treated materials are not RCRA characteristic (see Tables 2-2 and Table 2-6, Target Analyte List A). This sample will be sent to an off-site Utah-certified laboratory for TCLP inorganic analyses (TCLP 8 metals plus zinc), TCLP organic constituents (32 constituents), reactive cyanide/sulfide, and pH. Subsequent samples will be sampled and analyzed at the frequency and for the Target Analyte Lists (TALs) listed in Table 2-2.

2.2.6 Sample Collection Approach

The sample collection approach employed by this SAP is based on a total waste stream volume of 5100 yd^3 of untreated Silo 3 material which is expected to be volume reduced by 50 percent to a total treated volume of 2550 yd^3. To determine the efficiency of the treatment process, grab samples will be collected from three drums and composited for analyses. The initial drum number will be randomly selected from the first 40 drums of treated waste generated per day (e.g., drum number 17); the remaining two drums selected for sample collection will be the 40th drum generated after the initial drum (e.g., the 57th drum) and the 80th drum generated after the initial drum (e.g., the 97th drum). In addition, if the

resulting composite analysis indicates a failure (TCLP metals), material collected from each of the three drums originally composited will be analyzed individually to determine which fraction of the treated waste must be reprocessed.

Since the treated material is shaped as briquettes, sample collection for TCLP metals will consist of placing an adequate number of randomly chosen briquettes for analysis from each drum targeted for sampling in a wide-mouth glass container with a Teflon-lined closure. The samples will be appropriately labeled (see Section 3.2) and submitted to the on-site FEMP Sample Processing Lab (SPL). Upon receipt in the FEMP analytical laboratory, one briquette from each of the samples submitted for the day's run will comprise the composite sample (total of three separately identified briquettes). Excess briquettes designated for TCLP metals analysis will be retained in the original sample collection container and archived in the analytical laboratory for potential future analyses. If analytical results on the composite sample are acceptable, the corresponding individual samples may be returned to the treatment process for disposition. Tables 2-2 and 2-6 list the applicable TCLP metal parameters.

For daily radiological analysis, an adequate number of randomly chosen briquettes from the first and last drum targeted for sampling will be placed in the same wide-mouth glass container with a Teflon-lined closure as the first and last drum as the TCLP metals samples. The samples will be appropriately labeled (see Section 3.2) and submitted to the SPL. Upon receipt in the FEMP analytical laboratory, the three daily collected samples will be composited and analyzed for the appropriate radionuclides (see Table 2-6).

Duplicate samples will be collected, for quality assurance purposes, at a 1 in 20 frequency, as required by the SCQ for Analytical Support Level (ASL) B data.

TABLE 2-1

ENVIROCARE FACILITY WASTE ACCEPTANCE CRITERIA CONSTITUENT LIST

Radiological:		TCLP Organics:
Americium-241	Plutonium-241	1,4-dichlorobenzene
Americium-243	Plutonium-242	2,4,5-trichlorophenol
Antimony-124	Polonium-210	2,4,6-trichlorophenol
Antimony-125	Potassium-40	2,4-dinitrotoluene
Barium-133	Promethium-147	Cresol
Beryllium-7	Radium-226	Hexachlorobenzene
Bismuth-207	Radium-228	Hexachlorobutadiene
Cadmium-109	Rubidium-83	Hexachloroethane
Calcium-45	Ruthenium-106	m-Cresol
Carbon-14	Samarium-151	Nitrobenzene
Cerium-139	Scandium-46	o-Cresol
Cerium-141	Selenium-75	p-Cresol
Cesium-134	Silver-108m	Pentachlorophenol
Cesium-135	Silver-110m	1,1-dichlorethylene
Cesium-137	Sodium-22	1,2-dichlorethane
Chromium-51	Strontium-85	Chlordane
Cobalt-56	Strontium-89	Endrin
Cobalt-57	Strontium-90	Heptachlor
Cobalt-58	Sulfur-35	Heptachlor epoxide
Cobalt-60	Tantalum-182	Lindane
Copper-67	Technetium-99	Methoxychlor
Curium-242	Thallium-204	Toxaphene
Curium-243	Thorium-230	Benzene
Curium-244	Thorium-232	Carbon tetrachloride
Europium-152	Tin-113	Chlorobenzene
Europium-154	Uranium-233	Chloroform
Europium-155	Uranium-234	Methyl ethyl ketone
Gadolinium-153	Uranium-235	Pyridine
Germanium-68	Uranium-236	Tetracholorethylene
Gold-195	Uranium-238	Trichloroethylene
Hafnium-181	Uranium-depleted	Vinyl chloride
Hydrogen-3 (Tritium)	Uranium-natural	2,4,5-TP (Silvex)
Iodine-125	Yttrium-88	2,4-D
Iodine-129	Yttrium-91	
Iridium-192	Zinc-65	**TSCA CONSTITUENTS:**
Iron-55	Zirconium-95	Polychlorinated biphenyls
Iron-59		
Lead-210	**TCLP INORGANICS:**	**GENERAL INDICATORS:**
Manganese-54	Arsenic	Solid/soil pH
Mercury-203	Barium	Paint Filter Liquids Test
Neptunium-237	Cadmium	Oxidizer/reducer test
Nickel-59	Chromium	Cyanide/sulfide test
Nickel-63	Copper	Photoionizer "sniffer" test
Niobium-94	Lead	Pyrophoricity
Plutonium-238	Mercury	Shock sensitivity
Plutonium-239	Selenium	Air reactive
Plutonium-240	Silver	Water reactive
	Zinc	

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TABLE 2-2

SAMPLING FREQUENCY FOR SILO 3 TREATED MATERIAL

Parameter	Target Analyte List (See Table 2-6)
1st sample:	
Radionuclides	A
RCRA Characteristics (D001 through D043)	B
Subsequent samples:	
Radionuclides	A
TCLP metals	C

TABLE 2-3

SUMMARY OF SAMPLE CONTAINERS, PRESERVATION, AND HOLD TIME FOR SILO 3 SAMPLES

Parameter	Container	Preservative	Hold Time
Radionuclides	1 L widemouth glass (same sample container as TCLP metal samples)	None	12 months
TCLP metals	1 L amber glass with Teflon-line closure	Cool (2-6 degrees C)	180/180 days[a]
TCLP organics	VOCs-120 mL widemouth glass with Teflon-lined closure SVOCs-120 mL glass with Teflon-lined closure	Cool (2-6 degrees C) for both VOCs and SVOCs	14/40 days[a]
Reactive cyanide, reactive sulfide, corrosivity, ignitability	250 mL widemouth amber glass with Teflon-lined closure	Cool (2-6 degrees C)	28 days
TCLP VOC Trip Blank	40 mL glass with Teflon-lined closure	Cool (4 degrees C) pH < 2 by H_2SO_4	14 days

[a]For holding times listed as xx/yy days, the first number is the allowed holding time for extraction or preparation of the sample for analysis and the second number is the allowed holding time for analysis of the extract.

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TABLE 2-4

SUMMARY OF SILO 3 SAMPLE ANALYSES METHODS

Parameter	Standard Analytical Method	FEMP Method	Turnaround Time	Laboratory	Analytical Support Level
Radionuclides	See SCQ, Appendix G	See note	30 days	FEMP	E
Reactive cyanide, Reactive sulfide	SW-846, Parts 7.3.3 and 7.3.4	--	14 days	Off-Site	B
TCLP Metals					
Extraction	SW-846, 1311	6505	14 days	FEMP	B
ICP	SW-846, 3010A	6523	14 days	FEMP	B
GFAA	SW-846, 3020A	6517	14 days	FEMP	B
Mercury	SW-846, 7470A	6526	14 days	FEMP	B
pH (corrosivity)	9040B	6516	14 days	Off-site	B
TCLP organics	SW-846 8260, 8270, 8082, 8150	Not applicable	14 days	Off-site	B

NOTE: FEMP methods for radionuclide analyses are as follows:
Isotopic uranium – 4508
Isotopic thorium – 4512
Radium-226 – 4509
Actinium-227 – 4518 (read from gamma peak)
Protactinium-231 – 4518 (read from gamma peak)
Lead-210 – will be calculated from radium-226
ICP = Inductively coupled plasma
GFAA = Graphite Furnace Atomic Absorption Spectrometry
As = Arsenic
Cd = Cadmium
Cr = Chromium
Se = Selenium

TABLE 2-5

RADIOCHEMICAL MINIMUM DETECTION CONCENTRATIONS FOR SILO 3 SAMPLES[a]

Isotope	Minimum Detection Concentration (pCi/g)
Uranium-235	9
Uranium-238	102
Thorium-230	Approximately 660
Thorium-232	1.5
Radium-226	30
Actinium-227[b]	9
Protactinium-231[b]	21
Lead-210	Calculated from radium-226

[a]Assumes 180 grams of sample, 20-minute count time, and a total uranium activity of 3,000 pCi/g. Minimum detection concentration will be elevated if less sample is packed and/or sample activity increases (>3,000 pCi/g).
[b]If the gamma spec MDCs for Actinium-227 and Protactinium-231 are not achievable, then a ratio will be calculated from existing RI/FS data based on the constituent's relationship with uranium-235.

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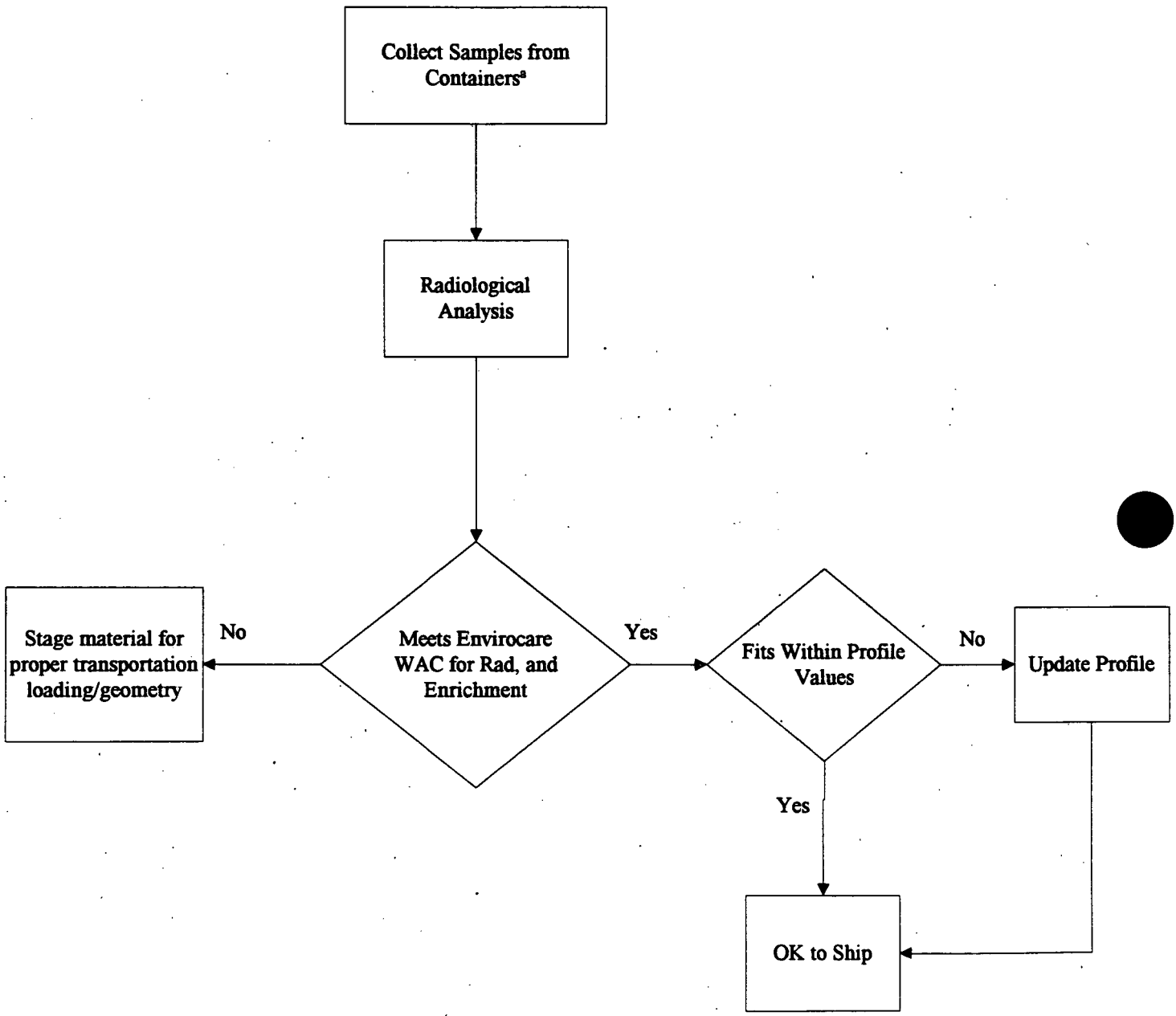
TABLE 2-6

TARGET ANALYTE LIST

TAL A Radiological:	TAL B RCRA Characteristic:	TAL C TCLP Metals:
Uranium 235	Ignitability	Arsenic
Uranium 238	Corrosivity	Cadmium
Thorium 230	Reactivity	Chromium
Thorium 232	TCLP:	Selenium
Radium 226	Arsenic; Barium; Cadmium; Chromium; Lead; Mercury; Selenium; Silver; Endrin; Lindane; Methoxychlor; Toxaphene; 2,4-D; 2,4,5-TP (Silvex); Benzene; Carbon tetrachloride; Chlordane; Chlorobenzene; Chloroform; 0-Cresol; m-Cresol; p-Cresol: Cresol; 1,4-Dichlorobenzene; 1,2-Dichloroethane; 1,1-Dichloroethylene; 2,4-Dinitrotoluene; Heptachlor (and its epoxide); Hexachlorobenzene; Hexachlorobutadiene; Hexachloroethane; Methyl ethyl ketone; Nitrobenzene; Pentachlorophenol; Pyridine; Tetrachloroethylene; Trichloroethylene; 2,4,5-Trichlorophenol; 2,4,6-Trichlorophenol; Vinyl chloride	
Actinium 227		
Protactinium 231		

FIGURE 2-1

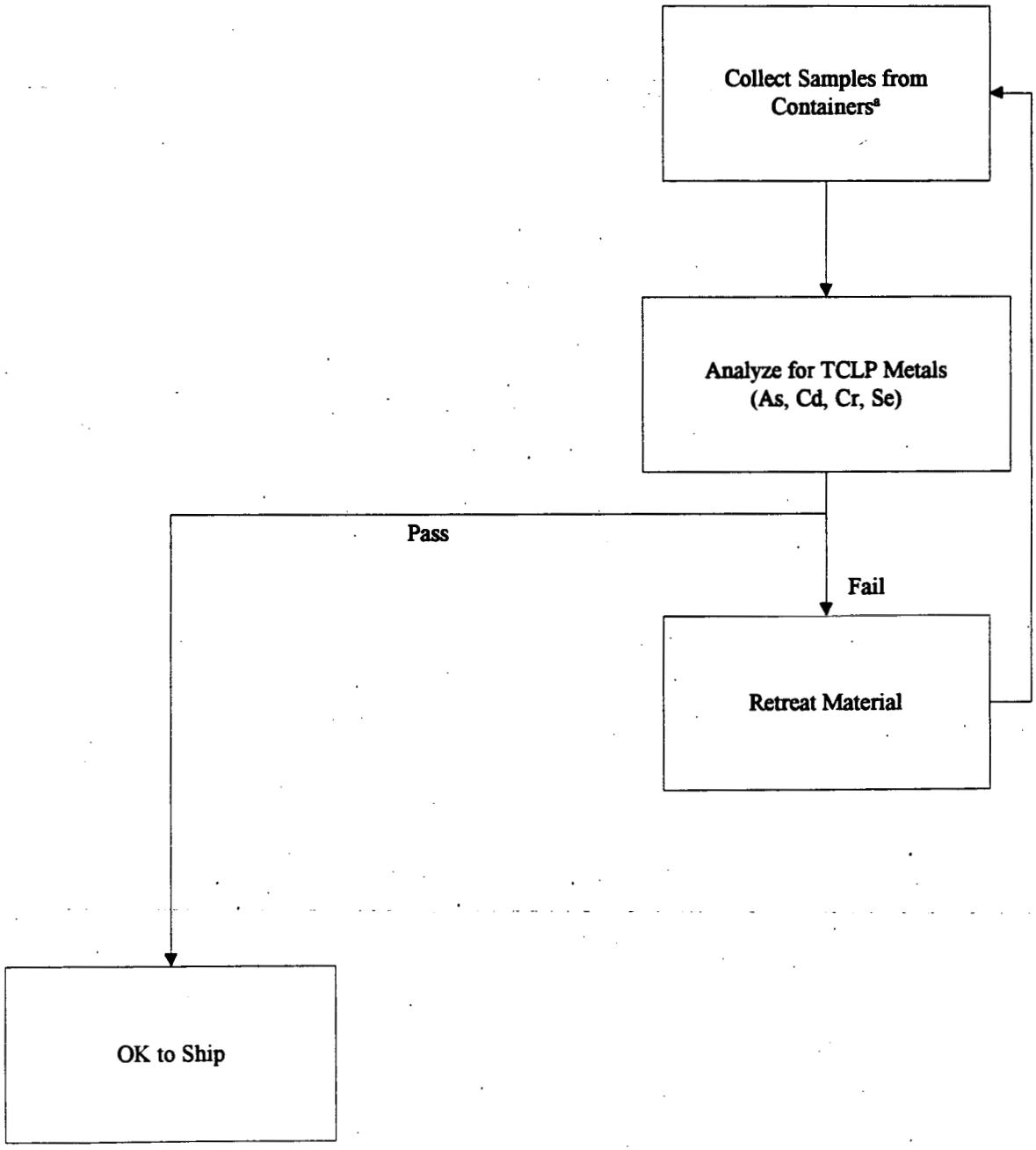
RADIOLOGICAL DECISION TREE FOR SILO 3 WASTE TO BE DISPOSED AT ENVIROCARE



[a]For the purposes of this SAP, a container is defined as a drum. If a drum is used as the container, samples will be collected from three random drums for each day of production.

FIGURE 2-2

TCLP METALS DECISION TREE FOR SILO 3 WASTE TO BE DISPOSED AT ENVIROCARE



[a]For the purposes of this SAP, a container is defined as a drum. If a drum is used as the container, samples will be collected from three random drums for each day of production.

3.0 SAMPLE IDENTIFICATION, LABELING, AND CHAIN OF CUSTODY

The data generated from the Silo 3 material sampling effort represents the waste stream to be sent off-site for disposal. This material must meet the receiving facility's requirements, permits, and licenses. In order to accomplish that, the data must be defensible, thereby requiring integrity of the sample and resulting data. The following sections discuss the means to ensure these requirements are met.

3.1 SAMPLE IDENTIFICATION

All samples collected for laboratory analysis will be assigned a unique sample identifier. This identifier will consist of a prefix designating the area name (Silo 3), followed by the drum number, the sample sequence (1 through X, with a "-D" identifier for duplicate samples), and the type of sample ("R" for radionuclides, "TM" for TCLP metals, "P" for pesticides/polychlorinated biphenyls (PCBs), " L" for VOCs, " SV" for SVOCs, "AB" for alpha/beta screen, "TB" for trip blank). For example:

- Silo3-80-2-TMR is the Silo 3 treated materials from Drum #80, the second sample collected from the process, to be analyzed for TCLP metals and radionuclides.
- Silo3-40-1-R-D is the Silo 3 treated materials from Drum #40, is a duplicate of the first sample collected from the process, to be analyzed for radionuclides.
- Silo3-TB-1 is the first trip blank collected and is associated with specific Silo 3 treated material samples (identified through the chain of custody and field logs).

3.2 SAMPLE LABELING

Sample labeling will be conducted as directed in the RMRS procedure to be generated separate from this SAP.

3.3 CHAIN OF CUSTODY

Although the Silo 3 treated material samples will be collected by FAT&LC under RMRS procedures, the samples collected for WAC attainment analyses at the FEMP laboratory or forwarded to an off-site laboratory for analyses will be entered onto a Fluor Fernald chain of custody (most current revision of form FS-F-3361) than that completed for the RMRS archived samples. The procedure for completing and routing the chain of custody form can be found in FEMP procedure EW-0002 and in Section 7 of the SCQ.

4.0 SAMPLE EQUIPMENT DECONTAMINATION

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Sample equipment decontamination will be conducted as specified by the RMRS procedure to be generated separate from this SAP.

5.0 QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS

5.1 QUALITY CONTROL SAMPLES, ANALYTICAL REQUIREMENTS, AND DATA VALIDATION

Field quality control samples include trip blanks and duplicate samples. The trip blanks will be associated with the collection of samples for volatile organic compound analyses and will accompany the associated samples from the field to the laboratory. Trip blanks will identify any external volatile organic compound contaminants that the associated field samples may be exposed to during sample collection, processing, or analysis. Trip blanks will be collected once per each shipping container of VOC samples transmitted to an off-site laboratory. Duplicate samples will be collected for quality assurance purposes, at a 1 in 20 frequency, as required by the SCQ for ASL B data.

All sampling and laboratory analysis will be performed at ASL B for nonradiological parameters and at ASL E for radiological parameters, in accordance with DQO WS-012 (see Appendix B).

Analytical data will undergo a verification review as described in Section 7.0. The extent of the quality review will be based on the ASL for the analytical data as identified in the SCQ.

A Quality Assurance (QA) representative will conduct independent assessments of the work process and operations by conducting surveillances. The assessments will encompass technical and procedural requirements of this SAP and the SCQ. Surveillances will be implemented by monitoring/observing ongoing project activities and work areas to verify conformance to specified requirements. Surveillances will be planned and documented according to the SCQ.

5.2 PROJECT-SPECIFIC PROCEDURES AND MANUALS

To assure consistency and data integrity, field activities in support of this SAP will follow the requirements and responsibilities outlined in controlled procedures (both RMRS and FEMP) and manufacturers' operational manuals.

5.3 IMPLEMENTATION OF FIELD CHANGES

If field conditions require changes or variances to this SAP, verbal or written approval (electronic mail is acceptable) must be obtained from the appropriate managers and the appropriate Quality Control (QC) representative before the changes may be implemented. Changes to the SAP will be noted in the

applicable field or laboratory logs and on a Variance/Field Change Notice Form. The completed form, including the required signatures. must be completed and distributed to the appropriate personnel within seven working days of the granting of the verbal approval.

Laboratory variances will be handled and documented as specified in the SCQ.

6.0 RECORD KEEPING

Field documentation of recorded observations and findings during field activities will be conducted according to RMRS procedures to be generated separate from this SAP.

All FEMP-generated records and documents will be generated, stored, and filed in accordance with the SCQ (which incorporates applicable DOE Orders) and FEMP procedures.

7.0 DATA MANAGEMENT

Data management will be conducted to meet the requirements of the project. The objective of the Silo 3 data management process is to compile field and analytical data, to develop a database for data retrieval, and to maintain records which can be used to demonstrate compliance with the specific (regulatory and contractual) requirements/criteria for shipment of Silo 3 wastes to Envirocare. The data management system utilized by the project is designed to ensure the following:

- Data and records accessibility.
- Correctness and completeness of information.
- Documented change control.
- Timely data reporting.

Existing integrated site database infrastructure will serve as the primary data management tools for the project and will be utilized to generate summary reports directly to meet operational needs and compliance reporting obligations. Specifically,

- the Fernald Analytical Computerized Tracking System (FACTS) will be utilized to manage on-site analytical data.
- the Windows Integrated Sample and Data Management (WISDM) system will be utilized to track the sample process through the system.
- the Sitewide Environmental Database (SED) will serve as repository for both off- and on-site analytical data and related sampling and processing information.

The appropriate waste tracking system will depend on the off-site disposal option and shipping container configuration. The Integrated Information Management System (IIMS) is used for bulk waste and SWIFTS is used for containerized waste. Use of these systems will be as directed by existing FEMP procedures.

7.1 DATA REDUCTION AND MANAGEMENT

Data reduction involves the process and the calculations used to convert raw field or laboratory measurements/analytical data into final results with proper reporting units. All data reduction processes and calculations will be documented in the project files, as necessary, to ensure that the final data output is reproducible and defensible.

7.1.1 Field Data Reduction and Management

Field measurements that are direct readouts require no reduction or calculation. Such data will be entered into field logbooks immediately after the measurements are taken, as directed by the RMRS procedure generated separate from this SAP.

7.1.2 Laboratory Data Reduction and Management

Analytical data are generated and reduced by extracting required information from laboratory worksheets, run logs, and instrument printouts and making necessary calculations to reduce the data to its final reporting concentrations. Sample results are calculated by using the equations provided in the approved analytical methods. In many cases, this is performed by proprietary equipment manufacturer software. All raw data necessary to support the calculations and quality assurance are archived at the laboratory. This raw data must be readily available for inspection and auditing by interested parties such as regulatory agencies or quality oversight personnel. Data reduction and management will be conducted in accordance with Section 11 of the SCQ.

7.2 Data Validation

The following sections provide a general discussion of the data validation process as it will be applied in the field and in the laboratory.

7.2.1 Procedures Used to Validate Field Data

All field data generated will be validated (see Section 7 of DQO WS-012 [Appendix B]).

7.2.2 Procedures Used to Validate Laboratory Data

A minimum of 10 percent of the analytical data from each laboratory will be subject to analytical validation to ASL B requirements in the SCQ.

7.3 SUMMARY REPORTING

Summary reports will be generated for each sample or sample set as needed to fulfill regulatory and contractual obligations for the characterization and shipment of waste materials. The reports may be issued electronically and/or hard copy to meet the operational needs and regulatory commitments of the Silo 3 project. Summary reports will be generated directly from the existing site database systems, which are integrated such that they allow for the easy development of individual reports that display data from all the systems. Precise reporting requirements will be refined as they become specifically known.

APPENDIX A

PROTOTYPE SAMPLING AND ANALYSIS PLAN FOR WASTE AT THE FEMP
PL-3048, REVISION 2, JANUARY 31, 2000

Fernald Environmental Management Project Fluor Daniel Fernald Inc. Functional Area Document Program	Plan Number: PL-3048 Effective Date: 01-31-2000 Revision No. 2 UDC No. None UDC Effective Date: N/A
PROTOTYPE SAMPLING AND ANALYSIS PLAN FOR WASTE AT THE FEMP	Page 1 of 42
Issue Authorization Signature: T J Walsh Date 01-19-2000 Tom Walsh, Environmental Restoration and Waste Management FAM	Supersedes: PL-3050

SUBJECT EXPERT: Bill Neyer, x5469

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RECORD OF ISSUE/REVISIONS

ISSUE AUTHORIZATION DATE	EFFECTIVE DATE	PCN No.	REV. No.	DESCRIPTION
N/A	09-21-95		0	Issued the Plan for Prototype Sampling and Analysis.
02-24-98	02-25-98	1	0	Added Record and revision page; Section for Special Requirements for Enriched Nuclear Material Sampling; Added Notes for Maximum Total Grams of U-235 to be collected in attachments.
06-15-99	06-23-99		1	Major rewrite of the plan to reformat to conform to the latest format requirements of MS-2001; update references; change forms for sample request, box plan and drum plan; and to reflect current practices. This plan also supersedes plan PL-3050.
ISSUE AUTHORIZATION DATE	**EFFECTIVE DATE**	**UDC No.**	**REV. No.**	**DESCRIPTION**
01-19-2000	01-31-2000		2	Change all references from Environmental Monitoring to Waste Characterization and incorporate comments resulting from review.

1.0 INTRODUCTION

1.1 Purpose

1.1.1 The purpose of this Plan is to provide a master Sampling and Analysis Plan (SAP) for characterization of containerized and non-containerized waste (which will be containerized) and materials at the Fernald Environmental Management Project (FEMP).

1.1.2 This plan provides reference information on sampling design, field and analytical quality control, collection methods, and analytical methods to develop condensed, project-specific SAPs.

1.2 Scope

1.2.1 This plan applies to all sampling and analysis requirements for all containerized waste and materials stored within cans or pails, drums, metal boxes, T-Hoppers or J-Hoppers, International Shipping Organization (ISO) containers or Top Load Boxes, Tank/Sump Materials, and other miscellaneous container types being sampled at the FEMP.

1.2.2 This plan applies to product and residues which require characterization (items declared or which may be declared waste).

1.2.3 Project-specific Sampling and Analysis Plans (PSAPs) will be developed based on the requirements of this Sampling and Analysis Plan (SAP).

1.3 SAP Objectives

1.3.1 The primary objective of this SAP is to generate data of sufficient quality to identify the regulatory status of, and safely manage containerized waste materials.

1.3.1.1 Secondary objectives are to develop information required to determine appropriate waste disposition options, including disposal and/or treatment.

1.3.1.2 This SAP has been developed to meet the requirements for waste management and disposal within the DOE complex and at commercial facilities. Specifically, it meets the requirements of NTS-WAC, "Nevada Test Site (NTS) Waste Acceptance Criteria".

1.3.2 Specific objectives of this SAP are as follows:

1.3.2.1 Determine the presence and concentrations of RCRA hazardous constituents and radiological activities to support waste characterization.

1.3.2.2 Provide sufficient information to ensure that the sub-waste stream is managed safely.

1.3.2.3 Support identification of the appropriate disposal or treatment option (e.g., determine if the sub-waste stream meets NTS-WAC waste acceptance criteria).

1.3.2.4 Identify potential hazards or risks to public health or the environment associated with storage of the sub-waste stream, if disposal or treatment is not feasible or practical.

1.4 Description of Containerized Waste Sampling Locations

1.4.1 Containerized waste may be sampled at one of following general locations:

1.4.1.1 the container storage area,

1.4.1.2 a container staging area established for sampling activities, or

1.4.1.3 an established container sampling line.

1.4.2 The sample plan writer determines the appropriate container sampling location based on the environmental setting, the contaminants of concern, the logistics and feasibility of transporting containers from their staging/storage area to a different site location. The selected container sampling location shall be identified in Section A.8 of the PSAP. If the container sampling location identified in Section A.8 of the PSAP must be changed, the sampling crew shall contact the PSAP writer to obtain verbal approval of the change. This variance will be documented on the PSAP and the associated field logbook page(s).

1.5 Use of Process Knowledge/Existing Analytical Data/Visual Inspections

1.5.1 In general, the use of process knowledge (PK) alone (without confirmatory sampling and analyses) shall be appropriate for waste characterization when one or more of the following conditions exist:

1.5.1.1 The sub-waste stream is difficult to sample because of physical form. This primarily applies to solid matrix waste such as metal, glass, or wood, rather than as a residue that could be removed for testing or in a decontamination process.

1.5.1.2 Sampling and analysis (S&A) of sub-waste stream would result in unacceptable risk of radiation exposure, (i.e., violate the As Low As Reasonably Achievable, ALARA, precept of the DOE).

1.5.1.3 Sub-waste stream is too heterogenous in composition (e.g., compactible trash containing clothing, booties, plastic, paper, experiment-driven, and decontamination and decommissioning waste).

1.5.2 PK is used to provide information related to the waste materials and their generation process(es). This information may be used for waste material segregation to ensure that representative samples are collected for sub-waste stream characterization. In addition, PK may be used to support "non-RCRA" (not RCRA hazardous) or "RCRA" (RCRA hazardous) determinations for appropriate waste materials.

1.5.3 Previous analytical data may be used for waste material segregation to ensure that representative samples are collected for sub-waste stream characterization. In addition, these data may be used to determine the number of samples required to characterize the waste materials (using the SW-846 equation, or parametric method), determine the appropriate analyses required for waste characterization, and determine the appropriate level of personal protective equipment (PPE) required during sampling activities.

1.5.4 Visual inspections are typically used to verify that the container's contents match the description provided on the MEF and document the physical characteristics of the waste materials. In addition, visual inspections may be used for waste material segregation to ensure that representative samples are collected for sub-waste stream characterization.

1.5.5 PK, previous analytical data, and visual inspection review documentation is prepared by Waste Characterization (WC). A brief summary of this document is incorporated into Section A.9 of the PSAP. The entire PK/previous analytical data/visual inspection review document is in the waste characterization file.

1.6 Sampling and Analysis Schedule

1.6.1 To manage the large amount of sampling and analyses conducted by the FEMP, schedules for individual projects are controlled by an independent support organization within Project and Configuration Control (P&CC). Start and end dates associated with the following specific milestones are generally tracked:

1.6.1.1 Request Sampling and Analysis

1.6.1.2 Prepare PSAP

1.6.1.3 Collect Samples

1.6.1.4 Analyze Samples

1.6.1.5 Conduct Data Review and Validation

1.6.1.6 Prepare Statistical Analysis Report

1.6.1.7 Completion and transfer of file record.

2.0 REFERENCES

2.1 EW-0002, Chain of Custody/Request for Analysis Record for Sample Control

2.2 EW-0010, FEMP Data Validation Procedure

2.3 EW-0015, FEMP RCRA Operating Records

2.4 EW-1016, Waste Management Task Order Planning Process

2.5 RM-0005, FEMP Lot Marking Codes and Color Coding System

2.6 FD-1000, (SCQ) Sitewide CERCLA Quality Assurance Project Plan

2.7 WM:CHAR-T-0006, Sampling Material and Waste

2.8 34-00-002, Soil & Water Project Control of Fissile Special Source Materials Within The Laboratory Building

3.0 RESPONSIBILITIES

3.1 Waste Characterization

3.1.1 Receives an FS-F-3787, "FEMP Request for Sampling and Analysis/Field Activities" (RSA), from requestor.

3.1.2 Prepares a PSAP based on information supplied on the RSA.

3.1.3 Obtains the required concurrences and approvals prior to initiating sampling activities.

3.1.4 Initiates Task Order, in accordance with EW-1016, to direct container movement and sampling implementation.

3.1.5 Maintains supporting documentation traceable to the sub-waste stream and characterization file.

3.2 Waste Storage & Sampling

3.2.1 Collects and delivers the wastes samples to Analytical Laboratory Services (ALS) for analysis or shipment to FEMP approved laboratories.

3.3 Analytical Laboratory Services/Sample Data Management (ALS/SDM)

3.3.1 Performs laboratory analysis of samples or prepares Task Order for analysis to be performed by an off-site subcontract laboratory. Also prepares samples for shipment to off-site laboratories.

3.3.2 Upon completion of sample analysis, reviews the data package and forwards data package to Waste Characterization for statistical analysis.

4.0 GENERAL

4.1 Objectives

4.1.1 Containerized waste and surface impoundment material sampling and analysis is required to satisfy the following data needs:

4.1.1.1 Determine the regulatory status of the waste materials (at a 90% confidence level) and ensure compliance with NTS-WAC, Envirocare WAC, OSDF WAC,or other applicable requirements

4.1.1.2 Determine the appropriate level of health and safety requirements for protection of site workers during waste handling, disposal, treatment, or storage

4.1.1.3 Determine the waste characteristics to evaluate the proper disposal, treatment, or storage option

4.1.1.4 Assess risks to human health or the environment if wastes must be stored at the FEMP.

4.1.2 Data Quality Objectives (DQOs) are defined in Appendix C of FD-1000, "(SCQ) Sitewide CERCLA Quality Assurance Project Plan." Appropriate Analytical Support Levels (ASLs) for each data needed are presented in Table 4.1.

Table 4.1
Summary of Analytic Parameters and Appropriate ASLs

Analytical Parameter	ASL (s)
Organic/Radiologic Screening	A
Total/TCLP VOAs, SVOAs, Metals, Pesticides/Herbicides	B
Flash Point, pH, Corrosivity	B
F001 - F005 Solvents, Cyanides, Sulfides, PCBs	B
Paint Filter Liquids Test	B
Total/Isotopic U and Th	B
TAL VOAs, SVOAS, Pesticides/PCBs, Inorganics	B, C and D
Full Radiological	B, D and E

4.1.3 DQO NTW-003, ACharacterization Sampling and Analysis of Containerized Wastes for Final Disposition or Treatment@ was developed for containerized waste material sampling, analysis, and characterization.

4.1.4 In general, the DQO provides a technically-sound sampling and analysis approach capable of satisfying the following items: representativeness, sampling accuracy, sampling precision, analytical method detection limits, completeness, and comparability. These items are addressed in the following sections of this sampling and analysis plan

4.2 Representativeness

4.2.1 Representativeness, or the collection of samples that are unbiased and exhibit average properties of the population sampled, is achieved by segregating the containerized wastes into sub-waste streams. A sub-waste stream is generally comprised of a group of containers labeled with the same Material Type and Source Code. Material Type and Source Code identifiers are provided in each PSAP, in Sections A.5 and A.6, respectively. Requirements Manual RM-0005 identifies the applicable material types and source codes.

4.3 Sampling Accuracy

4.3.1 Sampling accuracy, or the closeness of a sample value to its true value, is achieved through randomized sampling of the waste containers within a given sub-waste stream. Randomized sampling minimizes bias in the sample selection process by giving each container an equal probability of being sampled.

4.4 Sampling Precision

4.4.1 Sampling precision, or the closeness of repeated sample values, is achieved by increasing the number of samples to be collected, increasing the actual volume of the samples, or dividing a population into appropriate strata prior to sampling. Additional samples may be collected when the uniformity of the waste is not known and when sample collection is difficult. In general, the volume of sample material collected at the FEMP exceeds the minimum amount needed for analytical sample preparation and analysis. Lastly, when a sub-waste stream is suspected or known to contain separate physical phases (i.e., solids and liquids), the number of samples required is calculated for each waste phase. During sample collection activities, a sample is collected from each waste phase from the randomly selected waste containers.

4.5 Analytical Method Detection Limits

4.5.1 In general, analytical method detection limits are provided in Appendix G of FD-1000. Method detection limits for solid- and liquid-phased non-radiological analyses, are based upon EPA SW-846 or Contract Laboratory Program (CLP) protocol. Method detection limits for radiological analyses are based on typical laboratory detection compatibilities and are presented in FD-1000.

4.6 Completeness

4.6.1 To satisfy FD-1000 completeness requirements of 90%, the number of samples required to be collected will be calculated in accordance with methods described in EPA/230-02-89-042, Feb. 1989, "Methods for Evaluating the Attainment of Cleanup Standards, Vol. I, Soils and Solid Media". The following equation will be used to determine the number of samples to obtain a 90% completeness level:

Minimum number of samples required

$$\#\text{ of Samples}_{(90\%\ \text{comp})} = \frac{\text{Minimum number of samples required}}{(1 - R)}$$

where,

R = 0.20 (20%), the expected percent of missing or unusable data (i.e., sample holding times exceeded, improper preservation of samples, sample container breakage during shipment to laboratory, etc.)

4.6.2 An R-value of 0.20 (20%) was selected to take the most conservative approach for minimization or elimination of the potential need for resampling activities.

4.7 Comparability

4.7.1 Laboratory facilities contracted to provide chemical analytical services are required to comply with all provisions in FD-1000. Therefore, data sets from differing laboratory facilities should be comparable since the same analytical method and method detection limit is required. However, in order to measure comparability between data sets from distinct laboratories, the FEMP may periodically use split samples. Split sample analytical data may also be used to identify false negative or false positive errors.

5.0 SAP/PSAP DEVELOPMENT CRITERIA

5.1 Sampling Approach

5.1.1 The sampling approach for containerized wastes at the FEMP is dependent on the characteristics of the sub-waste stream as determined by PK/previous analytical data/visual inspection reviews.

5.1.1.1 Sub-waste streams which contain heterogenous materials and lack sufficient PK data will be subjected to "comprehensive" sampling and analysis (i.e., rate of 10% or cube root).

5.1.1.2 Sub-waste streams which contain homogenous materials and/or have preliminary determinations based on PK/previous analytical/visual inspection reviews may be subjected to "confirmatory" sampling and analyses (i.e., log base 10 + 1).

5.1.2 The sampling approach for surface impoundment material is dependent on the following factors:

5.1.2.1 matrix of surface impoundment materials (e.g., liquids only, solids only, or combination thereof),

5.1.2.2 target analytes of concern,

5.1.2.3 number and lateral/vertical extent of distinct solid layers,

5.1.2.4 basin geometry, and

5.1.2.5 location of waste generation source(s) and loading rate(s) to surface impoundment.

5.1.3 In order to increase the probability that representative samples are collected from the respective surface impoundment, extensive PK/analytical data/visual inspection reviews will be conducted. Data generated by these reviews will be used for evaluation of the previously-mentioned variables and determination of the appropriate sampling approach.

5.1.4 Simple-, systematic-, or stratified-random sampling techniques may be employed based upon the material characteristics, process history, and project-specific data needs.

5.1.4.1 Systematic or stratified random sampling methods will be used for containerized waste for sub-waste streams that have been segregated into multiple container groups (lots).

5.1.4.2 "Stratified" simple- or systematic-random sampling methods will be used for surface impoundment materials that have been segregated into multiple "strata".

5.1.4.3 Containerized waste and surface impoundment materials sampling methods will be based upon differences in: physical characteristics (i.e., phase and degree of homogeneity) of the waste materials, origin (time and location) of waste materials and their generation processes, or distribution and concentration of contaminants.

5.1.5 Methods of determining simple random sample locations include using a random number generator program or random number lists. In order to maintain representativeness and sampling accuracy, sample depths shall be randomly selected using computer algorithms. If the surface impoundment contains multiple strata or media types, samples will be collected at randomized depths within each distinct stratum or media type.

5.2 Sampling Approach for Previously Generated Wastes

5.2.1 Sub-waste streams generated by previous FMPC/FEMP operations which contain homogenous waste materials or have preliminary determinations based on PK/previous analytical data/visual inspections, may be subjected to "confirmatory" sampling and analysis using simple-random sample selection techniques. Heterogenous sub-waste streams which lack sufficient PK/previous analytical/visual inspection data will be subjected to comprehensive sampling and analysis using simple-, systematic-, or stratified-random sample selection techniques.

5.3 Sampling Approach for Currently Generated Wastes

5.3.1 Sub-waste streams generated by current FEMP operations which contain homogenous waste materials based on PK/previous analytical data/visual inspection reviews may be subjected to "confirmatory" sampling and analysis. Appropriate process control will be identified and documented in WC files to demonstrate that the process generates homogenous sub-waste stream materials.

5.3.2 Heterogenous sub-waste streams which lack sufficient PK/previous analytical/ visual inspection data will be subjected to "comprehensive" sampling and analysis using simple- or systematic-random sample selection techniques. Comprehensive samples will be collected at random time intervals from initiation to completion of respective material processing operations. Comprehensive samples may be collected in distinct batches for long-term processes that may generate volumes of waste materials in excess of respective storage capacities.

5.4 Number of Samples for Containerized Waste

5.4.1 For drummed waste sampling at the FEMP, typically the number of samples required equals 10% of the number of drums in a sub-waste stream. However, for sub-waste streams containing more than 100 drums, collecting samples for analyses at a rate of 10% may not be economically feasible or practical. Therefore, the FEMP intends to use the 10% method for sub-waste streams with < 100 drums and the cube root method for sub-waste streams with > 100 drums. Using this approach, the number of samples required for waste characterization is as follows:

Number of Drums	Min. # of Samples for Analysis	Number of Samples for Completeness*
1 to 20	2	3
21 to 100	10%	12.5%
101 to 1000	10	13
1001 to 10000	22	28

* - Total number of samples required to maintain 90% completeness using a conservative R-value of 0.20 (20%).

5.4.2 For metal box, ISO, or Top Load container sampling, the proposed number of samples required shall be as follows:

Number of Boxes	Min. # of Boxes to be Sampled	Number of Samples/Boxes for Completeness*
1	1	3
2 to 100	10% + 1	12.5% + 1.25
101 to 1000	11	14
1001 to 10000	23	29

* - Total number of samples required to maintain 90% completeness using a conservative R-value of 0.20 (20%). This number includes collecting one random sample from metal box, ISO, or Top Load containers in addition to the minimum number of containers to be sampled.

5.4.3 For sub-waste streams that have been characterized by process knowledge but do not meet one of the conditions in Section 1.5 of this SAP, the number of required confirmatory samples per sub-waste stream is as follows:

Number of Containers	Min. # of Samples for Analysis	Number of Samples for Completeness*
1 to 10	2	3
11 to 100	3	4
101 to 1000	4	5
over 1001	5	6

* Total number of samples required to maintain 90% completeness using a conservative R-value of 0.20 (20%). If the containers are white metal, Sea/Land[R], or Top Load boxes, the required number of samples is equal to the number of samples in this table plus one additional sample.

5.4.4 For larger container lots (> 100), an alternate method for determining the sample number may be applied dependent on the waste stream=s homogeneity. This alternate determination method will be documented in the PSAP where applicable.

5.4.5 Parametric analysis, or EPA SW-846 Equation 8, is the preferred method to determine the required number of samples required to satisfy the NTS WAC 90% confidence level requirement. However, EPA SW-846 Equation 8 requires previous analytical data to determine the mean and associated standard deviation for the analyte with the most restrictive regulatory threshold level. EPA SW-846 Equation 8 may be used as a secondary method, in situations where the upper limit of a 90% confidence level approximates or exceeds the regulatory threshold value for a given analyte, to determine if additional sample collection and analysis is warranted. In addition, in situations where sufficient previous analytical data exists for a sub-waste stream, EPA SW-846 Equation 8 may be used in lieu of the sample frequency identified above.

5.5 Number of Samples for Surface Impoundment Materials

5.5.1 Parametric analysis, or EPA SW-846 Equation 8, is the preferred method to determine the required number of samples to satisfy the NTSWAC 90% confidence level requirement. This method requires either previous analytical data, the collection and analysis of a minimum of four samples, or extensive process knowledge to determine an estimate of the mean and standard deviation for the analyte with the most restrictive regulatory threshold level. Since a majority of the surface impoundments at the FEMP have been investigated as part of the Remedial Investigation/Feasibility Study, the use of this method may be practical or feasible. As mentioned previously, computer algorithms employing EPA SW-846 Equation 8 may be used to determine the number of samples required. The computer program applies the correction factor "R" described in Step 4.6.1 for missing or unusable data.

5.5.2 For containerized waste sampling at the FEMP that have not been characterized by PK, typically the number of samples required equals 10% of the number of containers in a waste stream. However, sample areas for surface impoundments may contain material volumes of several thousand to several hundred thousand drum equivalents. Collecting samples at a rate equal to 10% of the drum equivalents is not economically feasible or practical. However the cube root method may be substituted to determine the number of required sample points as follows:

Number of Drum Equivalents	Min. # of Samples for Analysis	Number of Samples for Completeness*
1 to 100	4	5
101 to 1000	10	13
1001 to 10000	22	28
10001 to 100000	46	58
100001 to 500000	75	94
over 500000	100	125

* - Total number of samples required to maintain 90% completeness using a conservative R-value of 0.20 (20%).

5.5.3 For surface impoundment materials that have been characterized by process knowledge and do not meet one of the conditions in Section 1.5 of this SAP, the number of required samples, per media or strata, is as follows:

Number of Drum Equivalents	Min. # of Samples for Analysis	Number of Samples for Completeness*
1 to 100	3	4
101 to 1000	4	5
1001 to 10000	5	6
10001 to 100000	6	8
100001 to 1000000	7	9

* - Total number of samples required to maintain 90% completeness using a conservative R-value of 0.20 (20%).

5.5.4 Regardless of the primary method for determining sample size, EPA SW-846 Equation 8 is used as a secondary method (i.e., incorporated into statistical spreadsheets), to determine if additional sample collection and analysis is warranted.

5.6 Sample Volumes, Containers, Preservation and Holding Times

5.6.1 Required sample volumes, containers, preservatives, and holding times are provided in Appendix A, Table 6.1 of FD-1000. Sample volumes, containers, preservatives, and holding times are presented in Section 7.0 of this SAP, and in Sections B.2, B.3, and C of each PSAP.

5.6.2 Sample Collection Procedures/Equipment

▼**Note: Drummed waste sample collection procedures and appropriate sampling equipment, in accordance with Appendix K of FD-1000 and FEMP Waste Management Projects Sampling Procedures.**

5.6.3 Sample collection procedures and appropriate sampling equipment are contained in Appendix K of FD-1000 and Waste Management Projects Division Procedure WM :CHAR-T-0006.

5.7 Sample Handling and Shipment

5.7.1 Field storage and shipment of samples procedures are presented in Section 6.7 and Appendix K of FD-1000.

6.0 DOCUMENTATION AND SAMPLE CUSTODY

6.1 Sample Identification and Labeling

6.1.1 Sample identification and labeling procedures are presented in Section 7.1.3 and Appendix K of FD-1000, Laboratory, and WMP procedures.

6.2 Recordkeeping

6.2.1 Field activities will be recorded on sequentially-numbered pages in logbooks or individual log sheets. Media-specific sample collection logs, calibration logs, sketches, and photographs may also be used to document field activities, site conditions, or unusual observations.

6.2.2 Detailed recordkeeping requirements are provided EW-0015

6.3 Sample Custody and Analysis Requests

6.3.1 Pertinent sample collection data will be recorded on the FS-F-3361, AChain of Custody/Request for Analysis Record@ (COC/RFA), in accordance with EW-0002, which will accompany the respective samples to the FEMP analytical laboratory facility for analysis or shipment to a FEMP-contracted laboratory for analysis. Samples shipped to offsite laboratories are accompanied the COC/RFA.

6.4 Other Miscellaneous Forms

6.4.1 All sampling and analysis projects at the FEMP require a Work Permit as a minimum. Other forms, such as a Chemical Hazard/Confined Space Entry Permit or a Construction/Excavation Permit may be required based on the nature of the project. In addition, sample line personnel complete a Task Order Briefing at the initiation of each project. This briefing is valid for the duration of the project or until project conditions change.

6.4.2 Special Requirements for Enriched Nuclear Material Sampling

6.4.3 When Enriched Nuclear Materials are sampled, special notifications are required. These notifications are outlined in WMP sampling procedures. A calculation, performed by the Waste Characterization PSAP developer, will determine the total possible amount of U-235 in grams to be contained in the samples to be collected. After collection, an additional calculation will determine the actual maximum amount of U-235 grams contained in the samples. All calculations are based on best available information as described in 34-00-002, ASoil & Water Project Control of Fissile Special Source Materials Within The Laboratory Building@. The PSAP developer will include maximum total U-235 grams to be collected during sampling in the PSAP.

7.0 ANALYSIS OF WASTE SAMPLES

7.1 Waste Analytical Parameters and Methods

7.1.1 In general, WC personnel or other requesters determine the appropriate waste analytical parameters based on PK and/or reviews of previous analytical data. This information is incorporated into the PSAP.

7.2 Non-Radiological Parameters and Methods

7.2.1 Based on PK and/or previous analytical data reviews, one or more of the following non-radiological analyses may be performed to characterize the chemical constituents within, and identify the regulatory status of the waste materials:

Analytical Parameter		Test Method(s)
RCRA Analyses		
Ignitability	EPA 1010/1020	
Reactivity	40 CFR 261.23	
Corrosivity	EPA 9040	
Toxicity Characteristic		EPA 1311
LDR Solvents	TCLP (F001-F005)	
LDR Halogenated Org.		EPA 9020
Cyanides	EPA 9010/9012	
Sulfides	EPA 9030	

Other NTS-WAC Analyses
Free Liquids EPA 9095
PCBs EPA 8080

7.2.2 The FEMP intends to use analytical methods (Total concentrations) to determine if Toxicity Characteristic Leaching Procedure (TCLP) or Land Disposal Restriction (LDR) analyses are warranted. The proposed analytical methods are as follows:

Analytical Parameter	Test Methods (EPA)
Organics (Gas Chromatography) 8080, 8090, 8120 8140, 8150	8010, 8015, 8020 8030, 8040, 8060
Organics (Gas Chromatography/ Mass Spectroscopy)	8240, 8250 8270, 8280
Inorganics/Metals (Atomic Absorption Spectroscopy)	40 CFR 261, App. III
Inorganics/Metals (Inductively Coupled Plasma/ Atomic Emission Spectroscopy)	6010

7.2.3 In general, the FEMP uses a 20:1 ratio of Total concentration results for solid matrix samples to TCLP regulatory threshold limits to determine if TCLP analyses are required. If the analyte-specific upper limit of the 90% confidence interval exceeds the 20:1 ratio to its associated TCLP regulatory value, WC will evaluate the leachability of this analyte to determine if TCLP analyses are warranted. If additional analyses are not warranted, WC will prepare a letter to the waste characterization file documenting the reason(s) for this decision.

7.2.4 Additional analytical parameters may be required to satisfy secondary objectives identified in this SAP. For example, if the sub-waste stream is determined to be "mixed hazardous waste", then Target Analyte List (TAL) or Target Compound List (TCL) analytical data may be required to assess the potential risks of storing these containers at the FEMP. The need for these parameters will be reviewed on a case-by-case basis.

7.3 Radiological Parameters and Methods

7.3.1 Based on PK and/or previous analytical data reviews, one or more of the following radiological analyses may be performed to characterize the radiological component of the waste materials:

Analytical Parameter

Total/Isotopic Uranium
Total/Isotopic Thorium

7.3.2 To satisfy secondary objectives identified in this SAP, additional waste samples may be collected and analyzed for ASL B or D Total Radiological Parameter analyses to determine the following constituents:

7.3.2.1 Uranium (U-234, U-235, U-238), in pCi/g
7.3.2.2 Thorium (Th-230, Th-232), in pCi/g
7.3.2.3 Radium (Ra-226, Ra-228), in pCi/g
7.3.2.4 Actinium (Ac-230, Ac-232), in pCi/g
7.3.2.5 Lead (Pb-210), in pCi/g
7.3.2.6 Polonium (Po-210), in pCi/g
7.3.2.7 Technetium (Tc-99), in pCi/g
7.3.2.8 Neptunium (Np-237), in pCi/g
7.3.2.9 Plutonium (Pu-238, Pu-239, Pu-240), in pCi/g
7.3.2.10 Strontium (Sr-90), in pCi/g
7.3.2.11 Ruthenium (Ru-106), in pCi/g
7.3.2.12 Cesium (Cs-137), in pCi/g

7.4 Sample Container, Preservation, and Holding Time Requirements

7.4.1 Non-Radiological Analyses

7.4.1.1 Sample container, preservation, and holding time requirements for non-radiological analyses are provided in Table 7.1.

7.4.2 Radiological Analyses

7.4.2.1 Sample container, preservation, and holding time requirements for radiological analyses are provided in Table 7.2.

Table 7.1
Sample Container, Preservation, and Holding Time Requirements
Non-Radiological Samples

Analytical Parameter	Sample Matrix	Sample Container	Preservation	Holding Time
Total/TCLP VOAs	Liquid	3 x 40-mL VOA vials, TLS	HCl to pH < 2 Cool 4 deg. C	14 days
Total/TCLP SVOAs/Pest. Herb./PCBs	Liquid	1 Gal. Amber Glass, TLC	Cool 4 deg. C	7 days
Total/TCLP Metals	Liquid	1 x 1-liter polyethylene	50% HNO_3 to pH < 2	180 days 28 days (Hg)
Cyanide	Liquid	1 x 1-liter polyethylene	NaOH to pH > 12 Cool 4 deg. C	14 days
Flash Point pH	Liquid	8-oz. widemouth Glass, TLC	None	28 days, ASAP for pH
Sulfides	Liquid	1 x 1-liter polyethylene	NaOH to pH > 9 Cool 4 deg. C	7 days
Total/TCLP VOAs	Solid	3 x 4-oz. jars* glass, TLC	Cool 4 deg. C	14 days
Total/TCLP SVOAs/Pest. Herb./PCBs	Solid	1 x 8-oz jar** Amber Glass, TLC	Cool 4 deg. C	14 days
Total/TCLP Metals	Solid	1 x 8-oz jar** Glass, TLC	Cool 4 deg. C	180 days 28 days (Hg)
PFLT	Solid	1 x 4-oz. glass or polyethylene	None	28 days

Notes:

VOA, SVOA = Volatile Organic Analysis, Semi-Volatile Organic Analysis
Pest., Herb., PCBs = Pesticides, Herbicides, Polychlorinated Biphenols
PFLT = Paint Filter Liquids Test
TLC, TLS = Teflon-Lined Closure, Teflon-Lined Septum
HCl, HNO_3, NaOH = Hydrochloric acid, Nitric acid, Sodium hydroxide
* Minimum of 25 grams container for low-density waste materials
** Minimum of 100 grams container for low-density waste materials

Table 7.2
Sample Container, Preservation, and Holding Time Requirements
Radiological Samples

Analytical Parameter	Sample Matrix	Sample Container	Preservation	Holding Time
Total Uranium	Solid	8-ounce jar Plastic/Glass	None	180 days
Total Uranium	Liquid	1-liter bottle Plastic/Glass	HNO_3 to pH <2	180 days
Isotopic Uranium	Solid	8-ounce jar Plastic/Glass	None	180 days
Isotopic Uranium	Liquid	1-liter bottle Plastic/Glass	HNO_3 to pH <2	180 days
Total Thorium	Solid	8-ounce jar Plastic/Glass	None	180 days
Total Thorium	Liquid	1-liter bottle Plastic/Glass	HNO_3 to pH <2	180 days
Isotopic Thorium	Solid	8-ounce jar Plastic/Glass	None	180 days
Isotopic Thorium	Liquid	1-liter bottle Plastic/Glass	HNO_3 to pH <2	180 days
Total Radiological Parameter	Solid	1-Quart Jar Plastic/Glass	None	180 days
Total Radiological Parameter	Liquid	4-Liter Cubetainer	HNO_3 to pH <2	180 days

8.0 QUALITY ASSURANCE/QUALITY CONTROL

8.1 Field QC Samples

8.1.1 The following field QC samples may be collected (types selected based on the project-specific needs and identified in Section B.11 of the PSAP) and analyzed for the constituents identified in Section 7.0:

8.1.1.1 Container blanks - not required when vendor-supplied assay data is provided with container shipment. When required, collect one blank per each container batch or one per sampling round, whichever is more frequent.

8.1.1.2 Duplicate samples - one per every twenty samples per media matrix or one per sampling round per media matrix, whichever is more frequent.

8.1.1.3 Equipment rinsates - one per twenty pieces of a type of equipment cleaned by a specific decontamination method or one per sampling round, whichever is more frequent.

8.1.1.4 Field Blanks - one per twenty samples or one per sampling round, whichever is more frequent.

8.1.1.5 Preservative blanks - not required when vendor-supplied assay data is provided with preservative shipment. When required, collect one blank per each container batch or one per sampling round, whichever is more frequent.

8.1.1.6 Split samples - if required, one per every twenty samples per media matrix or one per sampling round per media matrix.

8.1.1.7 Trip blanks - daily, one trip blank per cooler containing Volatile Organics samples sent to laboratory. Analyzed for Volatile Organics only.

8.1.2 In accordance with Appendix D of FD-1000, field duplicate sample analytical data may be used to calculate the relative percent difference (RPD) for evaluation of sampling precision or degree of homogeneity/heterogeneity of the waste materials.

8.1.3 Equipment rinsate analytical data may be used to evaluate the effectiveness of the decontamination procedure or estimate the amount of cross contamination between sample point locations.

8.1.4 Field blank analytical data may be used to estimate the amount of contamination associated with the sampling environment.

8.1.5 Split sample analytical data may be used to evaluate the accuracy of analytical performance between two distinct laboratory facilities and identify the potential for false positives or false negatives.

8.2 Field Screening Equipment Calibration and Documentation

8.2.1 Field screening instrumentation, such as radiation detection and photoionization detection (PID) devices, will be checked on a daily basis for proper operation. Any equipment that fails calibration (limit of +/- 10% of calibration gas value) or becomes inoperable will be tagged and taken out of service. Such equipment will be repaired and recalibrated before reuse.

8.2.2 Radiation detection devices will be checked before each use to ensure that the date of required calibration has not been exceeded. PID devices will be calibrated, on a daily basis and prior to use, to a known concentration of volatile gas in air mixture (i.e., isobutylene, etc.). Subsequent to completion of field activities, on a daily basis, the PID instrument will be checked by analyzing the respective gas-air mixture used for calibration. Field screening instrumentation checks and calibration will be recorded in bound field logbooks or field activity daily logs and instrument-specific calibration logs.

8.3 Field Audits/Surveillances

8.3.1 In accordance with NTS WAC, DOE-NV may conduct a triannual audit of the sampling activities covered under this SAP. In addition, the FEMP may conduct surveillances of sampling activities to verify conformance with the requirements and procedures identified in this SAP. These surveillances will be documented in accordance with Section 12 of FD-1000.

8.3.2 Upon completion of each sampling event, QC shall review field logbook entries, COC/RFAs, etc., to ensure that sample collection and documentation were conducted in accordance with requirements of this SAP, its respective PSAP, and FD-1000. The completed field-generated documentation will be retained in WC MEF files.

8.4 Laboratory QC Samples

8.4.1 Laboratory QC sample requirements are provided in Appendix A (Table 2-2) and Appendix G of FD-1000 and based upon the requested ASL. In general, the types of laboratory QC samples will be selected based on project-specific needs.

8.5 Analytical Instrumentation/Equipment Calibration and Documentation

8.5.1 Analytical laboratory instrument and equipment calibration procedures are provided in Section 8.0 and Appendix E of FD-1000. The FEMP and FEMP-contracted analytical laboratory facilities will be responsible for ensuring that all analytical instrumentation and equipment is operating properly and is within prescribed calibration limits.

8.6 QA/QC Checks and Procedures

8.6.1 Laboratory quality control checks and procedures for inorganic, organic, and radiological analyses are provided in Section 10.0 and Appendices A, B and E of FD-1000. The FEMP and FEMP-contracted laboratory facilities will be responsible for adherence to these quality control checks and procedures.

8.6.2 In accordance with NTS WAC and Section 12.4 of FD-1000, the FEMP will conduct a laboratory qualification audit prior to contract award for analytical services. In addition, a system audit will be conducted for each FEMP-contract laboratory on an annual basis to assure continued acceptable performance. Each data package submitted by a FEMP-contract laboratory is reviewed by Analytical Data Management to ensure that contractual issues have been satisfied.

8.7 Data Reporting and Validation

8.7.1 The FEMP laboratory and FEMP-contracted laboratory facilities shall provide data packages on floppy disk and/or hard copy in such a fashion that allows for DOE-NV to validate data. In addition, field- and laboratory-generated data packages shall be validated in accordance with the FEMP Validation Plan in Appendix D of FD-1000 and EW-0010, "FEMP Data Validation Procedure". Validated data shall be used to support waste determinations.

8.8 Waste Disposition

8.8.1 Contact Wastes

8.8.1.1 Contact wastes, such as personal protective equipment (PPE) and rags or wipes (paper towels, Chemwipes[R], etc.), are typically placed in 5-gallon pails or 55-gallon drums, lot marked so that they can be traced to (associated with) the waste stream sampled, and stored at the FEMP for appropriate disposition. Separate 55-gallon drums will be provided, for segregation of PPE wastes, and labeled as follows:

A. Used Respirators

B. Used Rubber Shoe Covers

C. Used Tyvek/Saranex, Cartridges, Tape, Gloves

8.8.2 Decontamination Solutions

8.8.2.1 Equipment decontamination solutions are typically transferred to DOT-approved, bung-type, 55-gallon drums or 5-gallon pails, lot marked so that they can be traced to (associated with) the waste stream being sampled. The drums are placed within a Satellite Accumulation Area (SAA) with diked Herculite sheeting or containment devices, capable of capturing 2 the capacity of the drum volume, to prevent contaminant migration resulting from spills, or leaks. The drummed decontamination solutions are stored at the FEMP until the appropriate disposal or placement option can be identified.

9.0 DISTRIBUTION AND CONTROL OF PSAPS

9.1 Control of PSAPs

9.1.1 Once a PSAP is generated, approved and signed by an authorized individual, the PSAP shall be controlled by Waste Characterization.

9.1.2 An individual project-specific file shall be maintained, and contain, at a minimum, the following:

9.1.2.1 FEMP Waste Program Management/Waste Sampling Request for sampling

9.1.2.2 Project Sampling Plan Development/Sampling and Analysis/Field Activities

9.1.2.3 Master copy of the PSAP

9.1.2.4 Associated documentation (i.e. copies of logbook, log forms, chain of custody, data reports, etc.).

9.1.3 Upon completion of a project, this project-specific file will either be:

9.1.3.1 Forwarded by Waste Characterization to the requestor, or

9.1.3.2 Waste Characterization will maintain the file for approximately one year, then the file will be archived.

9.2 Distribution of PSAPs

9.2.1 Once a PSAP is generated, distribution will be controlled by Waste Characterization.

9.2.2 Distribution will be as follows:

9.2.2.1 One working copy shall be forwarded to ACS

9.2.2.2 One working copy shall be forwarded with the Task Order.

9.2.3 In the event of a revision or addendum, Waste Characterization shall distribute the revised copies or addendum with instructions to the distribution points listed in Step 9.2.2

9.2.4 All revisions and addendums shall include an effective date.

10.0 APPLICABLE DOCUMENTS

10.1 Drivers

10.1.1 NTS WAC, Nevada Test Site Waste Acceptance Criteria

10.1.2 Environcare WAC

10.1.3 Onsite Disposal Facility (OSDF) WAC

10.1.4 TSCA Inc. WAC

10.1.5 FD-1000, (SCQ) Sitewide CERCLA Quality Assurance Project Plan

10.2 Forms

10.2.1 FS-F-3361, Chain of Custody/Request for Analysis Record

10.2.2 FS-F-3787, FEMP Request for Sampling and Analysis/Field Activities

10.3 Information Sources

10.3.1 PL-3078, Waste Characterization Program Plan

10.3.2 D22-11-001, Statistical Report Writing For Waste Acceptance Criteria

10.3.3 EPA SW-846, Test Methods for Evaluating Solid Wastes

10.3.4 EPA 230-02-89-042, Methods for Evaluating the Attainment of Cleanup Standards, Volume 1, Soils and Soiled Media

10.3.5 EPA 600/R-92/033, Characterizing Heterogenous Wastes: Methods and Recommendations

10.3.6 34-00-002, Soil & Water Project Control of Fissile Special Source Materials Within The Laboratory Building

10.3.7 34-10-504, Dispositioning Samples from the On-Site Laboratory (and Retrieving Sample From) the Sampling Disposition Facility

10.3.8 DQO NTW-003, Characterization Sampling and Analysis of Containerized Wastes for Final Disposition or Treatment

11.0 DEFINITIONS

11.1 **Characterization**: The determination of the physical, chemical, radiological, and biological properties of a material to the extent necessary to support informed decision making regarding the management of a waste.

11.2 **Confidence Coefficient**: The probability statement that accompanies a confidence interval and is equal to unity minus the associated type I error rate (false positive rate). A confidence coefficient of 0.90 implies that 90% of the intervals resulting from repeated sampling of a population will include the unknown (true) population parameter.

11.3 **Confidence Interval**: The numerical interval constructed around a point estimate of a population parameter, combined with the probability statement (the confidence coefficient) linking the interval to the population's true parameter value.

11.4 **Disposal**: The systematic and orderly placement, long term storage, distribution, or transformation of wastes (treatment).

11.5 **Disposal**: (NTS-WAC): The emplacement of low-level radioactive wastes in a manner which is considered permanent in that routine recovery is not provided for.

11.6 **Facility - RCRA**: (EPA 40 CFR 260.10): All contiguous land, and structures, other appurtenances and improvements on the land used for treating, storing, or disposing of hazardous waste. A facility may consist of several treatment, storage, or disposal operational units (e.g., one or more landfills, surface impoundments, or combinations of them).

11.7 **Facility - Waste**: (EPA 40 CFR 260.10): All contiguous land, and structures, other appurtenances and improvements on the land used for treating, storing, or disposing of waste. A facility may consist of several treatment, storage, or disposal operational units (e.g., one or more landfills, surface impoundments, or combinations of them).

11.8 **Hazardous Waste**: (DOT 49 CFR 171.8): Any material that is subject to the Hazardous Waste Manifest Requirements of the Environmental Protection Agency specified in 40 CFR Part 262.

11.9 **Hazardous Waste**: (DOE EH-231-003/0191): A solid waste that must be treated, stored, or transported, and disposed of in accordance with applicable requirements under Subtitle C of RCRA.

11.10 **Low-Level Waste**: (NTS-WAC): All radioactive waste not classified as high-level waste, spent nuclear fuel, transuranic waste, uranium mill tailings, mixed waste, or 11e(2) by-product material as defined in DOE Order 5820.2a. Test specimens of fissionable material irradiated for research and development only, and not for the production of power or plutonium, may be classified as low-level waste, provided the concentrations of transuranics is less than 100 nanocuries (nCi/g).

11.11 **Mixed Waste**: (NTS-WAC): Waste containing both radioactive and hazardous components as defined by the Atomic Energy Act and the RCRA, respectively. Mixed waste must meet the Land Disposal Restrictions (LDR) as listed in 40 CFR 268.

11.12 **Operable Unit**: (EPA 40 CFR 300.6) A discrete part of the entire response action that decreases a release, threat of release, or pathway of exposure.

11.13 **Radioactive Waste**: (NTS-WAC): Solid, liquid, or gaseous material that contains radioactive nuclides regulated under the Atomic Energy Act of 1954, as amended, and of negligible economic value considering costs of recovery.

11.14 **Radioactive Waste**: (DOE 5480.2): Solid or fluid materials of no value containing radioactivity; discarded items such as clothing, containers, equipment, rubble, residues, or soils contaminated with radioactivity; or soils, rubble, equipment or other items containing induced radioactivity such that the levels exceed safe limits for unconditional release.

11.15 **Solid Waste**: (NTS-WAC): Waste material that is an essentially dry, solid form. The waste stream may include well-drained containers or liquids which have been entrapped or otherwise solidified so that they will retain their solid form without the presence of free liquids during handling, transportation, storage, or disposal. Viscous material is determined to be a solid by testing in accordance with American Society for testing Materials Standard D 4359, "Standard Test Method for Determining Whether a Material is a Liquid or a Solid."

11.16 **Solid Waste**: (EPA 40 CFR 260.10, 261.2): Garbage, refuse, and other discarded solid materials, including solid waste materials resulting from industrial, commercial, and agricultural operations, and from community activities, but does not include solid or dissolved materials in domestic sewage or other significant pollutants in water resources, such as silt, dissolved or suspended solids in industrial wastewater effluent, dissolved materials in irrigation return flows, or other common water pollutants. It generally does not include mining, agricultural, and industrial solid wastes; hazardous wastes; sludges; construction and demolition wastes; and infectious wastes.

11.17 **Sub-Waste Stream**: A group of containers that contain similar material based on process knowledge and are labeled with the same Material Type and Source Code as part of the FEMP's Lot Marking System Number.

11.18 **Waste Stream**: (NTS-WAC) The categorization of waste defined by the ability or method of characterization and certification. Examples are (1) by matrix; e.g., compactible trash, metal, wood, sludge, filter cakes, glass; and (2) by process; e.g., controlled experiments, decommissioning activities as described in DOE Order 5820.2A, Section V.

Attachment 1
Format for Boxed Waste Material PSAP
Project-Specific Sampling and Analysis Plan

Number:
Date:
Page 1 of 4

A. Identifying Information

1) **Project Name:**
2) **Plan No.:**
3) **Material Description/Matrix Code(s):**
4) **Number of Boxes in Sub-Waste Stream:**
5) **Material Type:**
6) **Source Code:**
7) **Material Evaluation Form #:**
8) **Sampling Location for Boxes:**
9) **Process Knowledge:**

B. Sampling Information

1) **General:** Samples taken will be contained in glass or polyethylene jars with Teflon lined lids.
2) **Preservation Method:** See Analytical Requirements in Section C.
3) **Holding Times:** See Preservative and Holding Time Requirements in Section G Holding times and sample volume/container requirements for media-specific analyses not listed in FD-1000 are provided by the FEMP laboratory facility.
4) **Sample Technique:**
5) **Number of Boxes to be Sampled and Analyzed:** , see page 2.
6) **Composite Samples:** No
7) **Visual Inspection Performed?:** No
8) **Field Contact:**
9) **Send Results to:** Bill Neyer, ext. 5469, MS 46
10) **Charge No./Project Manager:**
11) **Required QA/QC Samples:**

Field QC	Yes	No	Notes
Trip Blank	___	___	volatile organic samples
Field Blank	___	___	1 per 20 samples or 1 per sampling event
Equipment Rinsate	___	___	1 per 20 samples or 1 per sampling event
Duplicate	___	___	1 per 20 samples or 1 per sampling event
Container Blank	___	X	analytical data supplied by supplier
Preserv. Blank	___	X	assay data supplied by supplier

Laboratory QC
Laboratory QC sample type and frequency requirements are provided in Appendix G of FD-1000.

Attachment 1
Format for Boxed Waste Material PSAP
Project-Specific Sampling and Analysis Plan

Number:
Date:
Page 2 of 4
Charge:

B. Sampling Information

12) **Box/Grid/Random Depth Information:** See Appendix A for grid layout.
The duplicate sample is to be taken from the container noted with an asterisk (*). The duplicate sample will be given the next consecutive sample number.

Sample Number	Lot Number	Inv. Number	Grid Number	Random Depth (ft)
FIELD(1)-1				
FIELD(1)-1				
FIELD(1)-1-				
FIELD(1)-1				
FIELD(1)-1				
FIELD(1)-1				

NOTE: If the material in the box does not match the material description, do not sample. Perform a visual inspection of the contents of the box.

If there is not enough material to meet the volume requirements, do not sample the box. Perform a visual inspection of the contents of the box.

Refer to page 1, Section B-7 for requested visuals. These will be performed regardless of the contents of the box.

When Enriched Materials is sampled, include the following as a note:
"Material to be sampled is enriched, notifications per WMP Sampling Procedures are required."

Attachment 1
Format for Boxed Waste Material PSAP
Project-Specific Sampling and Analysis Plan

Number:
Date:
Page 3 of 4

C. Analytical Requirements

In order to satisfy waste characterization requirements the following analyses may be performed.

Analysis Requested ASL B	Solid Matrix Samples Container and Preservative/Units		Liquid Waste Samples Container and Preservative/Units		Quality Control Samples Container and Preservative/Units	
Total VOA Table 5 (off-site)	200 g, GTL	Cool 4°C/ mg/kg	(4) x 40 mL GTS	Cool 4°C/ mg/L	(4) x 40 mL GTS	Cool 4°C & HCl to pH < 2/mg/L
Volatiles Table 26 (off-site)		Cool 4°C/, mg/Kg		Cool 4°C/ mg/L		Cool 4°C & HCl to pH < 2 /mg/L
TCLP VOA Table 4 (off-site)	200 g GTL	Cool 4°C/mg/L				
Total Alcohols Table 6 (off-site)	200 g AGTL	Cool 4°C/ mg/kg	(2) x 1 L AGTL	Cool 4°C/mg/L	(2) x 1 L AGTL	Cool 4°C/ mg/L
Total SVOA Table 8 (off-site)	-----	---	(3) x 1 L AGTL	Cool 4°C/ mg/L	(3) x 1 L AGTL	Cool 4°C/ mg/L
TCLP SVOA Table 7 (off-site)	200 g AGTL	Cool 4°C/ mg/L				
Total SVOA Table 8 (off-site)			4.5 L AGTL	Cool 4°C/ mg/L	4.5 L AGTL	Cool 4°C/ mg/L
Total Pest/Herbicides Table 10 & 12 (off-site)		---		Cool 4°C/ mg/L		Cool 4°C/ mg/L
Total Metal Table 3 (off-site)	-----	---	(1) x 1 L GTL	Cool 4°C/ mg/L	(1) x 1 L jar, P	Cool 4°C & HNO_3 to pH < 2/mg/L
TCLP Metal Table 2 (off-site)	250 g, G or P	Cool 4°C/ mg/L	-----	---	-----	---
TCLP Pest/Herbicides Table 9 & 11 (off-site)	100 g AGTL	Cool 4°C/ mg/L	---	---	---	---
Flashpoint (on-site)			(1) x 250 mL GTL	None/ °F		
Total U (on-site)	350 g G or P	None/ ppm	(1) x 120 mL G or P	None/ ppm	(1) x 250 mL G or P	HNO_3 to pH < 2/mg/L
pH (on-site)		---		None/ pH units		
Quantitative PFLT (on-site)		None/ present/ absent		---		---
Percent Moisture (on-site)		None/ Wt%		---		---
U-235 (on-site)	250 g G or P	None/ Wt%	(1) x 250 mL G or P	None/ Wt%	(1) x 250 mL G or P	HNO_3 to pH < 2/mg/L
Alpha-Beta (on-site)		None/ pCi/g		None/ pCi/L		
Description of material (Color, appearance, consistency, etc.)						

ATTACH COPY OF THIS PAGE TO THE CHAIN-OF-CUSTODY.
NOTE TO LAB: IF PFLT FAILS, PERFORM pH AND FLASHPOINT.
ACS CONTACT: JENNY VANCE EXT 5372

Lab Information:
Requested TAT -- 30 days (analysis)
-- 14 days (validation)
Send Data Validation Summary to Jenny Vance.

NOTE: [illegible] Boxed Material is sampled, included the following as a note:
"[illegible] of U-235 to be collected _____ grams"

Attachment 1
Format for Boxed Waste Material PSAP
Project-Specific Sampling and Analysis Plan

Number:
Date:
Page 4 of 4

D. Waste Stream Description

The sub-waste stream consists of box(e's) in lot(s). The material type of "" and the source code of "" indicate that this material is .

E. Precautions and Limitations

See WMP Sampling Procedures for precautions and limitations. Also see Job Safety Analysis 272 for on-site metal box sampling.

F. Representative Sampling Procedure

The boxes chosen at random are listed on page 2 of this form. If visual inspection indicates that the material has free liquid or is completely dry, then a quantitative P.F.L.T and Percent Moisture are not necessary. Record pertinent information in the Field Log Book for each box sampled as specified in WMP Sampling Procedures. Excess sample material from samples analyzed on-site will be dispositioned as per 34-10-504, "Dispositioning Samples from the On-Site Laboratory (and Retrieving Sample From) the Sampling Disposition Facility."

G. Preservative and Holding Time Guidelines

See Tables 7.1 and 7.2 of the "Prototype Sampling and Analysis Plan for Containerized Waste at the FEMP" and/or Table 6-1 "Sample Container and Preservation Requirements," of the Sitewide CERCLA Quality Assurance Project Plan (FD-1000). Sample container , preservative, and holding time requirements for analytical parameters not provided in these tables have been obtained from federal or state of generation policies/directives, or from the FEMP or FEMP-contracted laboratory facility; and incorporated into this PSAP as permitted in Section 3.3.2 of FD-1000.

H. Variances

The grids within the boxes indicated on page 2 of this PSAP, may be replaced with an adjacent grid due to the following: material cannot be sampled or there is inadequate volume to meet the specified volume requirements. A formal variance is not required , logbook entries will record the specific variance(s).

This form must be dated and signed by an authorized individual.

If this Sub-Waste Stream is sampled and analyzed according to the information on this form, the results generated will be in agreement with the sampling and analysis requirements of PL-3048, "Prototype Sampling and Analysis Plan for Containerized Waste at the FEMP;" NTSWAC, "Nevada Test Site Defense Waste Acceptance Criteria" and the Fernald Environmental Management Project (FEMP) "(SCQ) Sitewide CERCLA Quality Assurance Project Plan (FD-1000)".

Sampling & Analysis Requestor	Date	PSAP Developer	Date	Project Manager	Date

ATTACHMENT A to Attachment 1
Diagram of Metal Boxes for Sampling

1	2	3	4
F 5	6	7	8
R 9	10	11	B 12
O 13	14	15	A 16
N 17	18	19	C 20
T 21	22	23	K 24
25	26	27	28

NOT TO SCALE
This diagram represents a metal box with dimensions of 7 ft. X 4 ft. Each sample location is approximately 1 ft. X 1 ft.

Attachment 2
Format for Surface Impoundment Material PSAP
Project-Specific Sampling and Analysis Plan

Number:
Date:
Page: 1 of 4

A. Identifying Information

1) **Project Name:**
2) **Surface Impoundment:**
3) **Material Description/Matrix Code(s):**
4) **Estimated Volume of Surface Impoundment Materials:**
   Surface Water = gallons (gals)
   Sludge = cubic feet (ft^3)
5) **Dimensions of Surface Impoundment:**
   East - West = feet
   North - South = feet
   Depth = feet (maximum)
6) **Process Knowledge:**

B. Sampling Information

1) **Containers/Preservative/Holding Times:** See Tables 6.1 and 6.2 of "Prototype Sampling and Analysis Plan for Surface Impoundment Materials. "Holding times for analyses not provided in these tables may be provided in Table 6-1, Appendix A, of the (SCQ) Sitewide CERCLA Quality Assurance Project Plan (FD-1000).
2) **Sample Technique:** See Section 4.4 of "Prototype Sampling and Analysis Plan for Surface Impoundment Materials at the FEMP."
3) **Sample Point Locations:** sludge and water, see pages 2 and 3.
4) **Composite Samples:** No
5) **Field Contact:**
6) **Send Results to:**
7) **Charge No./Project Manager:**
8) **Required QC Samples:**

Field QC	Yes	No	Notes
Trip Blank	___	___	daily, for Total VOA samples only
Field Blank	___	___	1 per 20 samples or 1 per sampling round
Equipment Rinsate	___	___	1 per 20 samples or 1 per sampling round
Duplicate/Split	___	___	1 per 20 samples or 1 per sampling round
Field Spike	___	___	1 per sixty days or 1 per project

Laboratory QC

Laboratory QC sample type and frequency requirements are provided in Appendix A (Table 2-4), and Appendix G of FD-1000.

-3195

Attachment 2
Format for Surface Impoundment Material PSAP
Project-Specific Sampling and Analysis Plan

Number:
Date:
Page: 2 of 4

Sampling Information

B.9) Start with Sample Number 93-xxx # for the first sample, then number consecutively until sampling is completed. The sample point location that is to be sampled in duplicate will be indicated with an asterisk (*). The duplicate samples will be given different sample numbers.

Sample Number	Sample Type	Sample Matrix	Sample Point Location@ Northing	Easting
93-xxx-*	Grab	Sludge	xxx'	xxx'
93-xxx-*	Grab	Sludge	xxx'	xxx'
93-xxx-	Grab	Sludge	xxx'	xxx'
93-xxx-	Grab	Sludge	xxx'	xxx'
93-xxx-	Grab	Sludge	xxx'	xxx'
93-xxx-	Grab	Sludge	xxx'	xxx'
93-xxx-	Grab	Liquid	xxx'	xxx'
93-xxx-	Grab	Liquid	xxx'	xxx'
93-xxx-	Grab	Liquid	xxx'	xxx'
93-xxx-	Grab	Liquid	xxx'	xxx'
93-xxx-*	Grab	Liquid	xxx'	xxx'
93-xxx-*	Grab	Liquid	xxx'	xxx'
93-xxx-	Grab	Liquid	xxx'	xxx'
93-xxx-	Grab	Liquid	xxx'	xxx'
93-xxx-	Trip	Water		
93-xxx-	Trip	Water		
93-xxx-	Trip	Water		
93-xxx-	Trip	Water		
93-xxx-	Field	Water		
93-xxx-	Rinse	Water		

Note: @ - Easting and Northing coordinates are relative to an origin point assumed to be located on top of the dike at the southwestern corner of the surface impoundment. See attached map for illustration of these sample points.

Attachment 2
Format for Surface Impoundment Material PSAP
Project-Specific Sampling and Analysis Plan

Number:
Date:
Page: 3 of 4

C. Analytical Requirements

In order to satisfy waste characterization requirements the following analyses shall be performed:

Analysis Requested (Analysis Code) **ASL = Analytical Support Level** **VOA = Volatile Organic Analysis** **SVOA = Semi-Volatile Organic Analysis**	**Solid Matrix Samples Container and Preservative/Unit Codes** **oz., g = ounce, gram** **mg, ug = milligram, microgram** **kg = kilograms** **P00 = No preservation needed** **P01 = Cool 4 deg. C** **U02, U04 = mg/L, mg/kg** **U06, U19 = ug/L, pCi/g** **TLC = Teflon-Lined Closure**		**QC/Liquid Matrix Samples Container and Preservative/Unit Codes** **mL, L = milliliter, Liter** **P01 = Cool 4 deg C** **P09 = HCl to pH < 2** **P11 = HNO_3 to pH < 2** **U02, U06 = mg/L, ug/L** **U18 = pCi/L** **TLS = Teflon-Lined Septum** **TLC = Teflon-Lined Closure**	
Total VOAs (2411)* TCLP VOAs (2459)** ASL B	(3) x 4-oz. glass, TLC	P01/U04 U06 for TCLP	(3) x 40-mL VOA vials, TLS	P09 & P01 /U06
Total SVOAs (2470)/ Pesticides (2486)* TCLP SVOAs (2471)/ Pesticides (2487)** ASL B	(1) x 8-oz. amber glass, TLC	P01/U04 U06 for TCLP	(1) x 1 gal amber glass, TLC	P01/U06
Total Metals (2402)* TCLP Metals (2401)** ASL B	(1) x 8-oz. glass or polyethylene	P01/U04 U02 for TCLP	(1) x 1 L polyethylene	P11 & P01 /U02
Alpha-Beta (2005)	(1) x 4-oz. glass or polyethylene	P00/U19	(1) • 120 mL glass or polyethylene	P11/U18
Description of material (Color, appearance, consistency, etc.)				

Note: * Analyze for QC/liquid matrix samples only.
** Solid matrix samples only. Prepare extract immediately. Use sample from a separate container for Total concentrations. If Total concentrations exceed 20 times the TCLP regulatory value, perform analysis of sample extract.

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Attachment 2
Format for Surface Impoundment Material PSAP
Project-Specific Sampling and Analysis Plan

Number:
Date:
Page: 4 of 4

D. Surface Impoundment Description

The surface impoundment, approximate dimensions of __ feet (east-west) by __ feet (north-south) by __ feet depth, consists of a plastic- and clay-lined structure used for _____. This structure is considered as a component of CERCLA/RCRA Unit x (CRUx), and is located between _____ _____.

E. Safety Concerns
See project-specific health and safety plan for _____.

F. Representative Sampling Procedure

1. The number of samples per each surface impoundment material phase (i.e., liquids and solids) were calculated by the use of the following equation:

2. The spatial location of the water/sludge sample points were determined by using computer algorithms developed based upon guidance provided in EPA/230-02-89-042, "Methods for Evaluating the Attainment of Cleanup Standards, Vol. I, Soils and Solid Media", February 1989.

3. The sample area for the sludge materials was limited to the area identified in the a ttached map, since this area contains sufficient material thicknesses to allow for sample collection.

4. The sludge/water samples will be collected in accordance with methodology provided in Section 4.4 of "Prototype Sampling and Analysis Plan for Surface Impoundment Materials at the FEMP," using the following sequence:

   Total VOAs
   Total SVOAs/Pesticides
   Total Metals
   Alpha/Beta Screen

This form must be dated and signed by an authorized individual.

If this Sub-Waste Stream is sampled and analyzed according to the information on this form, the results generated will be in agreement with the sampling and analysis requirements of PL-3048, "Prototype Sampling and Analysis Plan for Containerized Waste at the FEMP;" NTSWAC, "Nevada Test Site Defense Waste Acceptance Criteria" and the Fernald Environmental Management Project (FEMP) "(SCQ) Sitewide CERCLA Quality Assurance Project Plan (FD-1000)".

_____	____	_____	____	_____	
Sampling & Analysis Requestor	Date	PSAP Developer	Date	Project Manager	Date

Attachment 3
Format for Drummed Waste Material PSAP
Project-Specific Sampling and Analysis Plan

Number:
Date:
Page 1 of 4

A. Identifying Information

1) **Project Name:**
2) **Plan No.:**
3) **Material Description/Matrix Code(s):**
4) **Number of Drums in Sub-Waste Stream:**
5) **Material Type:**
6) **Source Code:**
7) **Material Evaluation Form #:**
8) **Sampling Location for Drums:**
9) **Process Knowledge:**

B. Sampling Information

1) **General:** Samples taken will be contained in glass or polyethylene jars with Teflon lined lids.
2) **Preservation Method:** See Analytical Requirements in Section C.
3) **Holding Times:** See Preservative and Holding Time Guidelines in Section G. Holding times and sample volume/container requirements for media-specific analyses not listed in FD-1000 are provided by the FEMP laboratory facility.
4) **Sample Technique:**
5) **Number of Drums to be Sampled and Analyzed:** , see page 2.
6) **Composite Samples:** No
7) **Visual Inspection Performed (# of visuals)?:** Yes ( ).
8) **Field Contact:**
9) **Send Results to:** Bill Neyer, ext. 5469, MS 46
10) **Charge No./Project Manager:**
11) **Required QA/QC Samples:**

Field QC	Yes	No	Notes
Trip Blank	___	___	volatile organic samples
Field Blank	___	___	1 per 20 samples or 1 per sampling event
Equipment Rinsate	___	___	1 per 20 samples or 1 per sampling event
Duplicate	___	___	1 per 20 samples or 1 per sampling event
Container Blank	___	X	analytical data supplied by supplier
Preserv. Blank	___	X	assay data supplied by supplier

Laboratory QC

Laboratory QC sample type and frequency requirements are provided in Appendix G of FD-1000.

Attachment 3
Format for Drummed Waste Material PSAP
Project-Specific Sampling and Analysis Plan

Number:
Date:
Page 2 of 4
Charge:

Sampling Information

Start with Sample Number -1 for the first drum sample, then number consecutively until sampling is completed. The drum that is to be sampled in duplicate will be indicated with an asterisk (*). The duplicate samples will be given different sample numbers.

Sample Number	Inv. Number	Lot Number	Drum Number
FIELD (1)-1			
FIELD (1)			
FIELD (1)			
FIELD (1)			
FIELD (1)			
FIELD (1)			
FIELD (1)			
FIELD (1)			
FIELD (1)			

NOTE: If the material in the drum does not match the material description, do not sample. Perform a visual inspection of the contents of the drum.

If there is not enough material to meet the volume requirements, do not sample the drum. Perform a visual inspection of the contents of the drum.

Refer to page 1, Section B-7, for requested visuals. These will be performed regardless of the contents of the drum.

NOTE: When Enriched Material is sampled, include the following as a note:
"Material to be sampled is enriched, notifications per WMP Sampling Procedures are required."

Attachment 3
Format for Drummed Waste Material PSAP
Project-Specific Sampling and Analysis Plan

TAL Number:
Date:
Page: 3 of 4

C. Analytical Requirements

In order to satisfy waste characterization requirements the following analyses shall be performed:

Analysis Requested ASL B	Solid Matrix Samples Container and Preservative/Units		Liquid Waste Samples Container and Preservative/Units		Quality Control Samples Container and Preservative/Units	
Total VOA (off-site)	200 g, GTL	Cool 4°C/ mg/kg	(3) x 40 mL GTS	Cool 4°C/ mg/L	(3) x 40 mL GTS	Cool 4°C & HCl to pH < 2/ mg/L
TCLP VOA (off-site)	200 g GTL	Cool 4°C/ mg/L	---	---	---	---
Total Alcohols (off-site)	200 g AGTL	Cool 4°C/mg/kg	(2) x 1 L AGTL	Cool 4°C/mg/L	(2) x 1 L AGTL	Cool 4°C/ mg/L
Total SVOA (off-site)	-----	------	(3) x 1 L AGTL	Cool 4°C/ mg/L	(3) x 1 L AGTL	Cool 4°C/ mg/L
TCLP SVOA (off-site)	200 g AGTL	Cool 4°C/ mg/L	---	---	---	---
Total SVOA (off-site)	---	---	4.5 L AGTL	Cool 4°C/ mg/L	4.5 L AGTL	Cool 4°C/ mg/L
Total Pest/Herbicides (off-site)		---		Cool 4°C/ mg/L		Cool 4°C/ mg/L
Total Metal (on-site)	-----	---	(1) x 1 L GTL	Cool 4°C/ mg/L	(1) x 1 L jar, P	Cool 4°C & HNO_3 to pH < 2/mg/L
TCLP Metal (on-site)	250 g G or P	Cool 4°C/ mg/L	-----	---	-----	---
TCLP Pest/Herbicides (off-site)	100 g AGTL	Cool 4°C/ mg/L	---	---	---	---
Flashpoint (on-site)	-----	----	(1) x 250 mL GTL	None/ °F	-----	---
Total U (on-site)	350 g G or P	None/ ppm	(1) x 120 mL G or P	None/ ppm	(1) x 250 mL G or P	HNO_3 to pH < 2/mg/L
pH (on-site)		---		None/ pH units		---
Quantitative PFLT** (on-site)		None/ present/ absent		---		---
Percent Moisture (on-site)		None/ Wt%		---		---
U-235 (on-site)	250 g G or P	None/ Wt%	(1) x 250 mL G or P	None/ Wt%	(1) x 250 mL G or P	HNO_3 to pH < 2/mg/L
Alpha-Beta (on-site)		None pCi/g		None/ pCi/L		---
Description of material (Color, appearance, consistency, etc.)						

ATTACH COPY OF THIS PAGE TO THE CHAIN-OF-CUSTODY.
NOTE TO LAB: IF PFLT FAILS, PERFORM pH AND FLASHPOINT
ACS CONTACT: JENNY VANCE, EXT. 5372

Lab Information:
Requested TAT-- 30 days (analysis)
--- 14 days (validation)
Send Data Validation Summary to Jenny Vance.

NOTE When Enriched Material is sampled, included the following as a note:
"Maximum total grams of U-235 to be collected = _____ grams"

Attachment 3
Format for Drummed Waste Material PSAP
Project-Specific Sampling and Analysis Plan

Number:
Date:
Page: 4 of 4

D. Sub-Waste Stream Description

The sub-waste stream consists of drum(s) in lot(s). The material type of "" and the source code of "" indicate that this material is .

E. Precautions and Limitations

See WMP Sampling Procedures for Precautions and Limitations.

F. Representative Sampling Procedure

The drums to be sampled are listed on page 2 of this form. If visual inspection indicates that the material has free liquid or is completely dry, then a P.F.L.T and Percent Moisture is not necessary. Record pertinent information in the Field Log Book for each drum sampled as specified in WMP Sampling Procedures. Excess sample material from samples analyzed on-site will be dispositioned as per 34 -10-504, "Dispositioning Samples from the On-Site Laboratory (and Retrieving Sample From) the Sampling Disposition Facility."

G. Preservative and Holding Time Guidelines

See Tables 6.1 and 6.2 of the "Prototype Sampling and Analysis Plan for Containerized Waste at the FEMP" and/or Table 6-1 "Sample Container and Preservation Requirements," of (SCQ) Sitewide CERCLA Quality Assurance Project Plan (FD-1000). Sample container, preservative, and holding time requirements for analytical parameters not provided in these tables have been obtained from federal or state of generation policies/directives, or from the FEMP or FEMP-contracted laboratory facility; and incorporated into this PSAP as permitted in Section 3.3.2 of FD-1000.

H. Variances

Drums specified on page 2 of this PSAP, may be replaced due to the following: matrix can't be sampled, matrix does not match Material Type, or there is inadequate volume to meet the specified volume requirements. A formal variance is not required , logbook entries will record the specific variance.

This form must be dated and signed by an authorized individual.

If this Sub-Waste Stream is sampled and analyzed according to the information on this form, the results generated will be in agreement with the sampling and analysis requirements of PL-3048, NTSWAC, "Nevada Test Site Defense Waste Acceptance Criteria", and the Fernald Environmental Management Project (FEMP) "(SCQ) Sitewide CERCLA Quality Assurance Project Plan (FD-1000)".

Sampling & Analysis Requestor	Date	PSAP Developer	Date	Project Manager	Date

Attachment - 4
Statistical Calculations

Sampling Plan/MEF: 97-1507 NPDS
Mat. Type: cement-stabilized, solution of UNH and other uranium contaminated liquids.
Revised: 03/09/98

Analyte	Reg. Level (ppm)	Number of Samples	Statistical Mean (ppm)	Standard Deviation	Sample Variance	Standard Error	Upper CI Limit (90%)	COV sx/x	COV x/s2	# of additional samples required
TCLP Metal										
Constituent(s):										
Barium	100	3	0.718	0.085493	0.0073	0.0494	0.8111	0.0687	98.2343	0
Chromium	5	3	0.412833	0.02175	0.0005	0.0126	0.4365	0.0304	872.6817	0
Silver	5	3	0.005233	0.001595	0.0000	0.0009	0.0080	0.1477	2450.0545	0
Gamma Spectrometry										
Constituent(s):										
Uranium-238		3	851.66666	640.16274	409808.3337	369.5981	1548.7287	0.4340	0.0021	0
Thorium-232		3	0.648333	0.137143	0.0188	0.0792	0.7977	0.1221	34.4708	0
Radium-226		3	0.501667	0.179606	0.0323	0.1037	0.6972	0.2067	15.5516	0
Uranium-235		3	53.666667	35.92121	1290.3333	20.7391	92.7806	0.3864	0.0416	0
Potassium-40		3	2.375	1.67276	2.7981	0.9658	4.1964	0.4066	0.8488	0
Neptunium-237		3	0.526667	0.756593	0.5724	0.4368	1.3505	0.8294	0.9201	4
Gross Alpha (pCi/g)		3	1333.3333	960.90235	923333.3339	554.7772	2379.6432	0.4161	0.0014	0
Gross Beta (pCi/g)		3	1376.6666	962.09840	925633.3332	555.4678	2424.2789	0.4035	0.0015	0
Total U (ICP-MS) (PPM)		3	2455.3333	1572.2182	2471870.3325	907.7206	4167.2945	0.3697	0.0010	0

Discussion:

APPENDIX B

DQO WS-012
SILO 3 SAMPLING AND ANALYSIS OF TREATED WASTE MATERIAL

Fernald Environmental Management Project

Data Quality Objectives

Title: Silo 3 Sampling and Analysis of Treated Waste Material

Number: WS-012

Revision: 1

Effective Date: Draft

Contact Name: James Cross

Approval: _____ Date: 4/12/00
James Chambers
DQO Coordinator

Approval: _____ Date: 4/12/00
Karen Wintz
Silo 3 Project Director

Rev. #	0						
Effective Date:	4/14/2000						

DATA QUALITY OBJECTIVES
Sitewide Certification Sampling and Analysis

Members of Data Quality Objectives (DQO) Scoping Team

The members of the scoping team included individuals with expertise in Quality Assurance (QA), analytical methods, field sampling, statistics, laboratory analytical methods and data management.

Conceptual Model of the Site

Sampling of Silo 3 was originally conducted at the Fernald Environmental Management Project (FEMP), during the Operable Unit 4 (OU4) Remedial Investigation/Feasibility Study (RI/FS). Silos 1, 2, and 4, which are also part of OU4, will not be discussed in this DQO; details on those silos can be found in the OU4 Record of Decision (ROD).

The material in Silo 3 is classified as byproduct material, as defined in Section 11(e)(2) of the Atomic Energy Act of 1954. This material is known as cold metal oxides, which were generated at the FEMP site during uranium extraction operations in the 1950s. These oxides were formed by calcining residues from the solvent extraction process used to extract uranium from ore concentrates and residues. Silo 3 material is dry and powdery and contains similar radiological constituents as those found in Silos 1 and 2. However, certain radionuclides (such as radium) are present in much lower concentrations. On an activity basis, the predominant radiological constituent of the Silo 3 material is thorium-230 (^{230}Th). Other radionuclides seen in the material are thorium-232 (^{232}Th), uranium-235 (^{235}U), uranium-238 (^{238}U), actinium-227 (^{227}Ac), radium-226 (^{226}Ra), protactinium-231 (^{231}Pa), and lead-210 (^{210}Pb). Data from the OU4 Record of Decision [Extraction Procedure Toxicity analysis, since replaced by the Toxicity Characteristic Leaching Procedure (TCLP)] indicates Silo 3 material contains the eight Resource Conservation and Recovery Act (RCRA) metals. By agreement with the Ohio Environmental Protection Agency (OEPA), those with mean concentrations high enough to be considered constituents of concern are arsenic, cadmium, chromium, and selenium.

The OU4 Explanation of Significant Differences resulted in a recommendation to remediate and treat the material contained in Silo 3 separately from the materials contained in Silos 1 and 2. The recommended treatment for the Silo 3 materials is chemical stabilization.

1.0 Statement of Problem

After the Silo 3 material is stabilized, it must be tested to determine whether the stabilized material meets the more conservative of the Nevada Test Site (NTS) or Envirocare disposal requirements, since these are the two possible disposal locations. Additionally, the OU4 ROD commits the FEMP to perform TCLP testing for arsenic, cadmium, chromium, and selenium. Material not meeting the requirements cannot be sent to either location.

Appropriate sampling, analysis, and information management criteria must be developed to provide the required qualified data necessary to demonstrate compliance with disposal criteria. A sampling and analysis plan must be in place directing appropriate batch sampling frequency and analytical methodologies to provide the required data.

Available Resources
Project Constraints: Sampling and analytical testing must be performed with existing manpower, materials, and equipment. Fluor Fernald must demonstrate compliance with NTS and/or Envirocare disposal requirements and the RCRA limits for metals.

2.0 Identify the Decision

Decision
Demonstrate within each day's production/treatment that all constituents of concern pass the disposal criteria for NTS or Envirocare (whichever is used), and demonstrate the material passes the TCLP metals requirements. The Envirocare acceptance criteria are contained in *Envirocare Waste Acceptance Guidelines*, July 28, 1999. The NTS waste acceptance criteria are contained in Fernald plan PL-3048. For TCLP metals, the levels of concern are the RCRA limits.

Possible Results

1. The average concentration of each constituent of concern is demonstrated to be below the level of concern within the confidence level. The material then meets the waste disposal criteria.

2. The average concentration of at least one constituent of concern is demonstrated to be above the level of concern at the given confidence level.

3.0 Inputs That Affect the Decision

Required Information
Data will be obtained through physical sampling. Based on the analytical results, the average concentrations of each batch will be determined.

Levels of Concern
Specific radionuclide and characteristic action levels are contained in the Envirocare and NTS guidances. Organic and metals limits are the RCRA TCLP limits.

Methods of Sampling and Analysis
Samples will be collected in accordance with RMRS sampling procedures, which meet the intent of site requirements. Laboratory analysis will be conducted at Analytical Support Level (ASL) E for radiological constituents and ASL B for all other laboratory analyses using QA/QC protocols specified in the Siteewide CERCLA Quality Assurance Project Plan (SCQ). For FEMP-approved on- and off-site laboratories, the analytical method used will meet the required precision, accuracy and detection capabilities necessary to achieve waste acceptance criteria (WAC) analyte ranges.

4.0 The Boundaries of the Situation

Spatial Boundaries
Domain of the Decision: The boundaries of this DQO extend to all Silo 3 material.

Population of Material: Each day's production/treatment of silo material will consist of 120 drums of material.

5.0 Decision Rule

The material can only be released for disposal if it meets the waste disposal criteria for the applicable disposal location and the RCRA limits for TCLP metals agreed upon with the Ohio EPA.

Parameters of Interest
An agreement with Envirocare allows the testing for a subset of the list of analytes contained in their acceptance guidance. This agreement was possible due to the characterization of the material in the OU4 ROD. Specifically, each day's production of material must be tested for pH, pyrophoricity, and radionuclides (^{230}Th, ^{232}Th, ^{235}U, ^{238}U, ^{227}Ac, ^{226}Ra, ^{231}Pa, and ^{210}Pb). Analysis must also be performed for the 32 RCRA organics plus PCBs in the event of positive PID readings. Each day's production must also be analyzed to determine leachable arsenic, cadmium, chromium, and selenium by agreement with the Ohio EPA.

Action Levels
Specific radionuclide and characteristic action levels are contained in the Envirocare and NTS guidances. Organic and metals limits are the RCRA TCLP limits.

Decision Rules
If the average concentration of radiological constituents in a day's production is below the level of concern, the material may be disposed. If the average concentration of radiological constituents of a particular day's production exceeds the disposal criterion, the drums must be shipped with other drums of lower concentration such that the average concentration of all drums shipped together is less than the disposal criteria.

If the RCRA TCLP limits are exceeded in a day's production, individual samples making up the composite will be analyzed to determine which drums must be reprocessed, retreated, and reanalyzed until such time as the material meets the RCRA TCP limits.

6.0 Limits on Decision Errors

Types of Decision Errors and Consequences

Definition
Decision Error 1: This decision error occurs when the decision-maker decides that a day's production has met the disposal criteria, when in reality, the disposal criteria have not been met. This situation could result in refusal by an off-site facility to dispose of the waste and an increased risk to human health and the environment. In addition, this type of error could result in increased disposal fees or a return of the waste from the off-site facility to the FEMP. This error may also result in misidentification of DOT shipping determination.

Decision Error 2: This decision error occurs when the decision-maker decides a day's production does not meet the disposal criteria, when actually, the disposal criteria have been met. This error would result in unnecessary added costs and/or delays, and may also result in misidentification of DOT shipping determination.

True State of Nature for the Decision Errors
The true state of nature for Decision Error 1 is that the disposal criteria are not met. The true state of nature for Decision Error 2 is that disposal criteria are met. Decision Error 1 is the more severe error due to the potential threat this poses to human health and the environment.

7.0 Design for Obtaining Quality Data

Sample Locations
After treatment, the Silo 3 material will be staged in drums (approximately 120 drums per day). Samples will be taken from material from the beginning (40th drum), middle (80th drum), and end (120th drum or the last drum produced in a day) to ensure process consistency. These samples will be composited prior to analysis.

Laboratory Analysis

The samples will be submitted to the on-site laboratory or a FDF approved off-site laboratory for analysis. All analyses will meet ASL B requirements per the SCQ except for the HAMDCs of the radiological parameters. Analysis of the radiological parameters will be considered ASL E.

Validation

All field data generated will be validated. Also, a minimum of 10 percent of the analytical data from each laboratory will be subject to analytical validation to ASL B requirements in the SCQ.

Data Quality Objectives
Sitewide Certification Sampling and Analysis

1A. Task Description:

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

RI☐ FS☐ RD☐ RA☒ RvA☐ Other (specify) _____

1C. DQO No.: _____ DQO Reference No.: _____

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

Air☐ Biological☐ Groundwater☐ Sediment☐ Soil☐
Waste☒ Wastewater☐ Surface Water☐ Other (specify) _____

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

Site Characterization	Risk Assessment
A☐ B☐ C☐ D☐ E☐	A☐ B☐ C☐ D☐ E☐
Evaluation of Alternatives	Engineering Design
A☐ B☐ C☐ D☐ E☐	A☐ B☐ C☐ D☐ E☐
Monitoring During Remediation	Other
A☐ B☐ C☐ D☐ E☐	A☐ B☒ C☐ D☐ E☒

4A. Drivers: Remediation Area Remedial Action Work Plans, Applicable or Relevant and Appropriate Requirements (ARARs) and Operable Unit 4 Record of Decision (ROD).

4B. Objective: Confirmation that the treated Silo 3 waste meets the appropriate off-site disposal facility waste acceptance criteria requirements.

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5. Site Information (Description):

Silo 3 materials are classified as byproduct material as defined in Section II (e)(2) of the Atomic Energy Act of 1954. This material is known as cold metal oxides and was generated at the FEMP during uranium extraction operations in the 1950s. The OU4 Explanation of Significant Difference recommended remediation and treatment (chemical stabilization) for the material in Silo 3. The sampling and analysis performed under this DQO will provide the data required by the appropriate licensed off-site disposal facility.

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

1. pH	☒	2. Uranium	☒[1]	3. BTX	☐
Temperature	☐	Full Radiological	☒[2]	TPH	☐
Specific Conductance	☐	Metals	☒	Oil/Grease	☐
Dissolved Oxygen	☐	Cyanide	☐		
Pyrophoricity	☒	Silica	☐		
4. Cations	☐	5. VOA	☒	6. Other (specify)	
Anions	☐	BNA	☒		
TOC	☐	PEST	☒		
TCLP	☐	PCB	☐		
CEC	☐	COD	☐		

1 ^{235}U and ^{238}U
2 ^{230}Th, ^{232}Th, ^{227}Ac, ^{226}Ra, ^{231}Pa, and ^{210}Pb(value calculated)

6.B. Equipment Selection and SCQ Reference:

	Equipment Selection		Refer to SCQ Section
ASL A		SCQ Section	
ASL B	Per SAP	SCQ Section	Appendix G, Tbls. 1&3
ASL C		SCQ Section	
ASL D		SCQ Section	
ASL E	Per SAP	SCQ Section	Appendix H (final)

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

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

7B. Sample Work Plan Reference: Sampling and Analysis Plan for Silo 3 Treated Waste Material

Background samples: OU4 RI/FS

7C. Sample Collection Reference: RMRS Procedures

8. Quality Control Samples: (Put an X in the appropriate selection.)

8A. Field Quality Control Samples:

Trip Blanks	☒[1]	Container Blanks	☐
Field Blanks	☐	Duplicate Samples	☒
Equipment Rinsate Blanks	☐	Split Samples	☐
Preservative Blanks	☐	Performance Evaluation Samples	☐

Other (specify) _____

1) Collected for volatile organic sampling

8B. Laboratory Quality Control Samples:

Method Blank	☒	Matrix Duplicate/Replicate	☒
Matrix Spike	☒	Surrogate Spikes	☒
Tracer Spike	☒	Other (specify) _____	

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