ER/WM&I DDT

8/19/97
~~8/12/97~~

Source/Driver: (Name & Number from ISP, IAG milestone, Mgmt. Action, Corres. Control, etc.)

Closure #: (Outgoing Correspondence Control #, if applicable)

Due Date

S. J. Myrick
M. C. Burmeister FOR
Originator Name

Gregory D. Gregorio
G. D. DiGregorio
QA Approval

A. M. Tyson AT
Contractor Manager(s)

Ann K. Sieben
Kaiser-Hill Program Manager(s)

T. G. Hedahl
Kaiser-Hill Director

Document Subject:

TRANSMITTAL OF THE DRAFT SAMPLING ANALYSIS PLAN FOR THE SOURCE REMOVAL AT TRENCH 1, IHSS 108, REV. 0 - AMT-087-97

KH-00003NS1A August 6, 1997.

Discussion and/or Comments:

Please find enclosed the ***Draft Sampling Analysis Plan (SAP) for the Source Removal at Trench 1, IHSS 108*** for your review and comment. Comments on the SAP are requested by August 12, 1997 on the attached review comment form. If you have any questions regarding this document, please contact Steve Paris at extension 3656.

Attachments:
As Stated

cc:
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Susan Myrick, T893B
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John Schmuck, RMRS, T893B

ADMIN RECORD

I108-A-~~00005~~ 000005

REVIEW COMMENT SHEET

Please review the attached procedure: _____ Number _____ Rev. _____ Draft _____ Title

Comment Due Date: _____

☐ Internal Review ☐ Parallel Review ☐ Verification ☐ Validation ☐ Revalidation

QA _X_ Peer ____

General (G) comments require resolution but do not require resolution acceptance. Mandatory (M) comments require resolution and resolution acceptance. 1-88000-PP-004 provides complete definitions of General and Mandatory comments.

ITEM G or M	PAGE	SECTION OR STEP	COMMENT	RESOLUTION	Resolution accepted INIT/DATE

POC/Reviewer: (Comments not signed by Reviewer/POC will be considered unofficial and not subject to resolution)

- ☐ No Comments
- ☐ This procedure revision has no impact or relevance to our discipline or organization and we waive need to concur. We acknowledge this concurrence waiver does not affect our responsibility to implement the requirements of this procedure when needed.

_____ Name _____ Signature

_____ Ext./Pager/Fax _____ Bldg./Dept. _____ Date

Return to:

_____ FAX _____ Name _X_ Ext. _____ Location

If questions on content, please call the SME:

_____ Name _____ Ext.

SAMPLING AND ANALYSIS PLAN
FOR THE SOURCE REMOVAL
AT TRENCH 1
IHSS 108

Rocky Mountain Remediation Services, L.L.C

August 7, 1997

Draft

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LIST OF ACRONYMS

APO	Analytical Projects Office
ASTM	American Society for Testing and Materials
CRZ	Contaminant Reduction Zone
CWTF	Consolidated Water Treatment Facility
DOE	Department of Energy
DQO	Data Quality Objective
DU	Depleted Uranium
EMD	Environmental Management Department
EPA	Environmental Protection Agency
FIDLER	Field Instrument for the Detection of Low Energy Radiation
FO	Field Operations
FIP	Field Implementation Plan
GT	Geotechnical
HASP	Health and Safety Plan
HCl	Hydrochloric Acid
HEAF	High Efficiency Air Filter
HEPA	High Efficiency Particulate Air
IHSS	Individual Hazardous Substance Site
LDR	Land Disposal Restrictions
LLMW	Low Level Mixed Waste
LLW	Low Level Waste
OVM	Organic Vapor Meter
PA	Protected Area
PAM	Proposed Action Memorandum
PARCC	Precision, Accuracy, Representativeness, Completeness, and Comparability
PID	Photoionization Detector
PPE	Personal Protective Equipment
QAPD	Quality Assurance Project Description
QA	Quality Assurance
QC	Quality Control
RAAMP	Rocky Flats Ambient Air Management Plan
RCRA	Resource Conservation and Recovery Act
RFCA	Rocky Flats Cleanup Agreement
RFEDS	Rocky Flats Environmental Database System
RFETS	Rocky Flats Environmental Technology site
RMRS	Rocky Mountain Remedial Services
ROI	Radiological Operations Instructions
RCT	Radiological Control Technician
RWP	Radiological Work Permit
SAP	Sampling and Analysis Plan
SCO	Survey for Contamination
SOP	Standard Operating Procedure
SZ	Support Zone
T-1	Trench 1

Acronyms (continued)

TCLP	Toxicity Characteristic Leaching Procedure
TDU	Thermal Desorption Unit
UCL	Upper Confidence Limit
VOC	Volatile Organic Compound
WAC	Waste Acceptance Criteria

LIST OF STANDARD OPERATING PROCEDURES

Procedure Number, Procedure Name

ROI-6.6, Use of Bicron FIDLER

4-S23-ROI-03.02, Radiological Requirements for Unrestricted Release

4-Q97-REP-1003, Radiological Evaluation for Unrestricted Release of Property/Waste

4-U50-REP-1006, Radiological Characterization of Bulk or Volume Material

2-G32-ER-ADM-08.02, Evaluation of ERM Data for Usability in Final Reports

5-21000-OPS -FO.1, Air Monitoring and Particulate Control

5-21000-OPS-FO.03, General Equipment Decontamination, Section 5.3, Cleaning Procedures for Stainless Steel or Metal Sampling Equipment.

5-21000-OPS-FO.13, Containerization, Preserving, Handling, and Shipping of Soil and Water Samples.

4-B29-ER-OPS-FO.14, Field Data Management.

5-21000-OPS-FO.15, Photoionization Detectors and Flame Ionization Detectors

4-E42-ER-OPS-GT, GT-08, Surface Soil Sampling

L-6245-F, Sampling Procedure for Waste Characterization

1.0 INTRODUCTION

This Sampling and Analysis Plan (SAP) supports the accelerated Source Removal at the Trench 1 (T-1) Site, Individual Hazardous Substance Site (IHSS) 108, at the Rocky Flats Environmental Technology Site (RFETS), located near Golden, Colorado. The T-1 source removal project is described in the Proposed Action Memorandum (PAM) for the Source Removal at Trench 1, IHSS 108 (RMRS, 1997a).

This SAP was developed to support the characterization and disposal of the environmental media including excavated soils, incidental waters, and natural soils. This SAP also includes the screening, sampling and analysis of numerous waste streams to be generated during the remediation of T-1. The waste streams may include drums containing waste materials, empty drums/drum fragments, debris, bulk liquids, sludges/still bottoms, cemented cyanide, treated waste (cemented depleted uranium), sanitary waste, high efficiency particulate air (HEPA) filters and used personal protective equipment (PPE). Sampling and analytical testing activities will be conducted in accordance with the RMRS Quality Assurance Program Description (QAPD) (RMRS, 1996a). Site and ambient air monitoring will also be conducted, however, these activities will be addressed in the T-1 health and safety plan (HASP) and in enhancements to the Rocky Flats Ambient Air Management Plan (RAAMP).

Background

The T-1 site is located just northwest of the inner east gate, and about 40 feet south of the southeast corner of the Protected Area (PA) fence (Figure 1.1). The trench is approximately 250 feet long, 16 to 22 feet wide, and 10 feet deep. Historical documentation indicates depleted uranium (DU) metal chips (lathe and machine turnings) originating from Building 444 were packed with lathe coolant and buried in the west end and possibly the east end of T-1 in 125 drums. The drums were reportedly double stacked end-on-end in the trench and covered with one to two feet of soil. No written documentation exists for the contents of the center and east end of the trench. However, interviews with former site workers indicate that the eastern two-thirds of the trench is likely to contain trash consisting of pallets, paper, and other debris such as empty or crushed drums. Burial operations in the trench continued intermittently from November 1954 to December 1962.

Weed cutting activities conducted in October and November 1992 unearthed the upper portion of two drums not adequately covered with fill material. Samples of the liquids and sludges contained in these drums were collected for analyses and yielded low levels of uranium and plutonium.

Since discovery of the drums a site investigation has been conducted to evaluate the suspected area of impact and the potential contaminants. This investigation has included additional soil and groundwater samples at locations surrounding the trench area; a soil gas survey; an electromagnetic and ground penetrating radar survey; a review of historic aerial photographs; employee interviews; and a detailed records search. Based on a review of these data, impacts of the T-1 contaminants are considered to be primarily confined to the soil within the trench boundaries. The T-1 contents are thought to consist of 125 drums of DU chips and lathe coolant, soil, and debris, mostly contaminated with depleted uranium and possibly volatile organic compounds (VOCs). In addition, 10 drums of cemented cyanide and one drum of "still bottoms" (recovered waste solvents or evaporated lathe coolant sludge) are suspected to be buried in T-1.

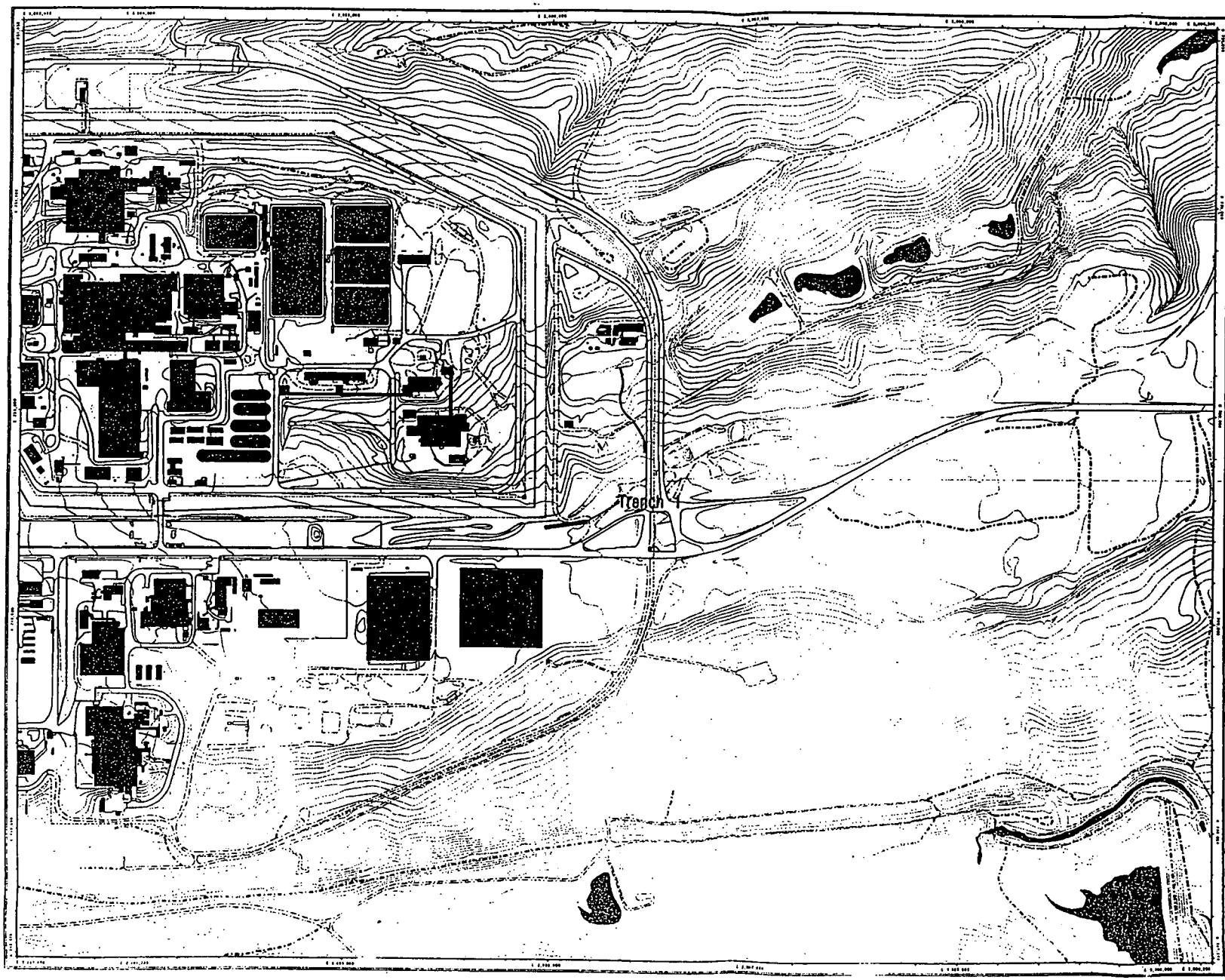


Figure 1-1

Trench 1
Site Location Map

EXPLANATION

Contours (5' Intervals)

Trench 1

Standard Map Features

Buildings or other structures

Lakes and ponds

Streams, ditches, or other drainage features

Fences

Paved roads

Dirt roads

DATA SOURCES
Buildings, roads, and fences provided by Rocky Flats, Rocket Rocky Flats, Inc. - 1991
Hydrology provided by RMRS - Data collected

Scale = 1 : 5430
1 inch represents approximately 453 feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

Prepared by:
RMRS Rocky Mountain Remediation Services, L.L.C.
Geographic Information Systems Group
Rocky Flats Environmental Technology Site
P.O. Box 464
Golden, CO 80402-0464

MAP ID: 97-0066

April 17, 1997

Additional information on the site background, investigation data, suspected radiological and chemical impacts, geology and hydrogeology have been collected and documented in the reports listed below:

- Historical Release Report for the Rocky Flats Plant (DOE, 1992);
- Phase II RFI/RI Report for Operable Unit No. 2 - 903 Pad, Mound, and East Trenches Area, Rocky Flats Environmental Technology Site (DOE, 1995);
- Proposed Action Memorandum for the Source Removal at the Trench T-1 Site, IHSS 108 (RMRS, 1997a); and
- Trenches and Mound Site Characterization Report (RMRS, 1996b)

The goals of this accelerated action are to (1) remove the drummed wastes, and contaminated soil and debris exceeding Rocky Flats Cleanup Action (RFCA) (DOE, 1996) Tier I action levels for radionuclides and VOCs, and (2) disposition the materials. Specifically, the T-1 remedial action will involve excavation of an estimated 250 cubic yards (yd^3) of soil and the drums of DU chips located at the west and possibly far east ends of the trench. In addition, approximately 1,000 to 1,500 yd^3 of debris, contaminated soil, and other drummed wastes are suspected to be located throughout the remaining two-thirds of the trench.

The debris and soil materials will be further tested and segregated based upon the RFCA Tier I and II action levels for radionuclides and VOCs. The contaminated soil, drummed material, and debris exceeding Tier I action levels will be segregated for either on-site treatment or direct packaging for off-site disposal. On-site treatment will consist of encapsulating radiologically contaminated drums, DU chips, soil and debris exceeding RFCA Tier I action levels with a cement grout mixture. If material volumes are sufficient to warrant the action, low temperature thermal desorption would be used to treat VOC-contaminated soil and debris on-site. After on-site processing, the treated material will be packaged for off-site disposal with the other materials that do not require treatment. Materials not requiring treatment, but needing off-site disposal could include radiological and VOC-contaminated wastes that exceed Tier II action levels but that are below Tier I action levels. Depending upon the contaminants and corresponding concentrations, materials designated for off-site disposal will be classified as hazardous, low-level, or mixed low-level waste.

Excavated soil that does not exceed Tier II action levels may be returned to the trench as backfill material. Soil that exceeds Tier II but below Tier I action levels may be either disposed off-site, or contained in a geotextile membrane, stored in the trench for potential future retrieval. Additional backfill material and topsoil meeting cleanup criteria will be placed in the trench. The entire project area will be graded and seeded to promote natural drainage and runoff control.

2.0 SAMPLING AND DATA QUALITY OBJECTIVES

The data needed to support the remediation objectives of the T-1 removal action were determined using the process established in "Guidance for Data Quality Objective Process", EPA QA/G4 (EPA, 1994). The primary objectives of this SAP are:

1) To collect the required information necessary to address hazardous or radioactive characteristics of the material encountered, and use this information to determine the most appropriate waste handling, treatment, and disposal methods: and

2) To determine when excavation activities can be concluded and when remedial goals are met; and
3) To document the condition of the trench prior to backfilling.

There will be multiple phases of decisions associated with this removal action and treatment project that depend upon the analytical data. The inputs to each decision, data gaps, study boundaries, and decision process are described in this section. It is initially assumed that all material initially encountered in T-1 will exceed Tier I radionuclide action levels and have pyrophoric characteristics. The primary sampling and analytical needs for the T-1 removal action are as follows:

- Excavated trench materials (drum contents, soil, debris) will be monitored to evaluate the potential for pyrophoricity, radioactivity, and organic vapor contamination through field screening methods. This field screening data will be used to assign material segregation and soil stockpile requirements for subsequent material handling;

- Samples will be collected from the excavated materials (drum contents, soil, and debris) to characterize the materials for appropriate treatment, if required, and/or disposition;

- Samples will be collected from the stockpiled soils and analyzed to assess the activity/concentrations of radionuclides and VOCs. These data will be used to determine the appropriate on-site treatment method (if required) or to document radioactivity and VOC concentrations in soil deemed acceptable for return to the trench as backfill material;

- Samples will be collected of the treated material and analyzed to verify that on-site treatment goals have been achieved. Samples from treated material designated for off-site disposal as hazardous, low-level, or mixed radioactive waste will be collected and laboratory tested for the specific parameters needed to support transportation and waste acceptance criteria (WAC); (SAP to be modified later to include this sample type);

- Samples will be collected from in-situ soil at the bottom and sidewalls of the open trench and analyzed to verify that excavation is sufficient and cleanup goals have been met. These data may also be used to document existing conditions in the excavation for a future RFETS Side-wide Risk Assessment and to supply information for evaluating future impacts on groundwater from the soil remaining in the trench;

- Samples will be collected from soil below the stockpile management and treatment processing areas and screened to verify that the surface soils were not contaminated from T-1 operations;

- Samples will be collected from air monitoring locations established around the site and either analyzed and/or screened with field instruments to evaluate atmospheric concentrations for radiological, organic, and particulate matter; and

- Samples will be collected during decontamination of equipment and personnel and either analyzed or screened with field instruments to verify achievement of release standards, evaluate the need for water treatment, and to establish PPE and sanitary waste disposal criteria.

After analytical results are received and tabulated, the relationship of project data to the DQOs will be evaluated. Data are considered usable without qualification, if project specific DQO criteria are met. The

comparison DQO criteria and data validation will be performed by an independent party. Data validation will involve evaluation of precision, accuracy, reproducibility, completeness and comparability (PARCC parameters) as established by EPA guidelines, DOE data management practices, and the RMRS QAPD. Additional detail regarding the comparison of project data with DQO criteria and PARCC parameters is provided in the Quality Assurance (QA) discussion in Section 6.

2.1 ENVIRONMENTAL MEDIA DATA REQUIREMENTS

Excavated Soils

Soils excavated from the trench will be monitored in the field for total organic vapor, pyrophoricity, and low-energy radiation. Soils will be segregated based on field monitoring results and stockpiled or containerized outside the trench area. The purpose of segregating soils is to prevent mixing waste streams and to minimize treatment and/or disposal costs.

Filed screening will determine the interim storage requirements of the waste material. No data exists which can be utilized for the segregation of soils generated during the remediation of T-1. Real time analyses are required in the field to prevent the mixing of waste streams during the excavation process. Decisions to be made in the field include:

1. If the soil is highly radioactive it must be isolated from the environment by placing the soil in containers.

2. If the soil is contaminated with organic vapors, and potentially require treatment, it must be segregated from other soils.

3. If the soil is potentially pryophoric, it will require special storage, handling, treatment and disposal requirements.

Inputs to the decision shall consist of measurements of low-energy radiation, total organic vapor, and temperature obtained by various field instrumentation. The study boundary shall include each bucket load of excavated soil. The decision rules include:

1. If the soils exhibit readings greater than 100,000 cpm as detected on a Field Instrument for the Detection of Low Energy Radiation (FIDLER) the soils must be isolated from the environment.

2. If the soils exhibit total organic vapor readings greater than background as detected on a photoionization detector (PID) or organic vapor meter (OVM), the soils shall be segregated from other soils.

3. If the soils exhibit temperature readings of greater than 10°F in comparison to a control container, the soils shall require special handling and storage.

Stockpiled and Containerized Soils

Stockpiled soils and soils stored in roll-off containers will be sampled to determine isotopic radioactivity and chemical concentration for dispositioning. The primary decisions to be made are to determine what

type of wastes were generated during remediation, to determine if treatment is required prior to disposal/putback, or to identify WAC for the disposal facilities. Five options are available for soil disposition including:

- Return soils to excavation if radionuclides are below Tier I action levels and organics are below Tier II action levels;
- Disposal offsite as low-level waste (LLW);
- Disposal offsite as low-level mixed waste(LLMW);
- Disposal offsite as hazardous waste; and
- Retain soils on-site for future treatment.

Table 2.1 provides RFCA and disposal requirements for each soil disposition option.

TABLE 2. 1 EXCAVATED SOIL DISPOSITION/DISPOSAL OPTIONS

Disposition	RFCA Requirements	Disposal Requirements	Comments
Return Soils to Excavation	< Tier I Action Level[1] -Rads < Tier II Action Level - VOCs		
Dispose as LLW	> Tier I Action Level	< TCLP	Utah Certified Lab
Dispose as LLMW	>Tier I Action Level > Tier II Action Level - VOCs	> TCLP, <LDRs	Utah Certified Lab
Dispose as Hazardous Waste	<95% UCL (DOE radionuclides)	> TCLP, <LDRs	Radiological Engineering Procedure 4-U50_REP-1006[2]
Retain Soils For Treatment	NA	> TCLP, >LDRs	Required treatment prior to disposal

1 RFCA (July 19, 1996) ALF Tier I & II Action Levels
2 Radiological Characterization of Bulk or Volume Materials

Inputs to the decision include waste characterization data, sufficient data to perform RFCA Tier I and Tier II action level comparisons, Resource Conservation and Recovery Act (RCRA) Toxicity Characteristic Leaching Procedure (TCLP) and land disposal restrictions (LDR) comparisons, and a background activity comparison. The study boundaries shall be a waste stockpile or waste container volume. Decision rules will include:

1. If soils exceed background activity for DOE radionuclides they will be considered low level waste.

2. If soils exceed Tier I action levels for radionuclides they will be disposed of offsite.

3. If soils exceed Tier II action levels for radionuclides but are below Tier I action levels the soils may be returned to the excavation.

4. If the soils exceed TCLP contaminant thresholds they will be managed according to RCRA requirements.

5. If the soils exceed LDRs they will require treatment prior to disposal.

Incidental Waters

Incidental waters generated during the remediation of T-1 are assumed to be contaminated by radionuclides and VOCs which will prevent release to the environment. Presently, no analytical data exists for the incidental waters to determine treatment process requirements. Treatment processes at the CWTF, may be adjusted to adequately treat the waters for subsequent release. Data requirements for incidental waters include determination of treatment parameters for the CWTF. These parameters have been identified as radionuclides including plutonium-239/240, americium-241, uranium isotopes, VOCs, semi-VOCs, PCBs, metals, cyanide, and standard water quality parameters.

Trench Boundary Soils

Soil samples will be collected on the bottom and sidewalls of the excavated trench to confirm that contaminated soils have been removed to the activity/concentration as agreed to in the T-1 PAM. The problem is to determine if the soils remaining in the trench after the initial excavation activity, require additional excavation to meet the action limits agreed to in the PAM. The decision is to determine if soils exceed the Tier I or Tier II soil action levels identified in the PAM. Inputs to the decision include soil characterization data. This decision can be made after the data has been evaluated for usability as required for data used to make critical decisions.

Treatment Area and Stockpile Subgrade

Following the completion of the disposition of waste materials, stockpile and treatment areas, surface soils shall be screened/sampled to confirm all contaminated soils above action levels have been removed. The problem is that contaminated stockpile soils in these areas may have impacted surface soils in the area. The action required to solve this problem is to compare pre- and post-project FIDLER surveys for radionuclide contamination impacts and post-project VOC analytical results. The study area will include the foot print of the stockpile and treatment areas. The decision rule will include; 1) if concentrations greater than the Tier I action levels are encountered additional surface soils will be required to be removed, and 2) if post-project FIDLER readings exceed pre-project reading additional surface soils will be required to be removed.

Air

Air samples will be collected for three distinct purposes; for worker and co-worker health and safety; for actual T-1 field operations and management issues; and for RAAMP requirements. Air sampling for worker and co-worker health and safety shall be conducted for chemical constituents utilizing personal air sampling equipment, high volume air samplers will be used for the determination of airborne radiological contaminants. The personal air monitoring program is implemented through the T-1 HASP.

Field operations and management air sampling activities shall be conducted for chemical constituents and radiological contaminants. Sampling for chemical constituents shall be addressed in the T-1 HASP. Airborne radiological contaminant monitoring shall be implemented through the activity-specific radiation work permit (RWP) issued through the Site's Radiological Operations Group. Ambient air is currently being monitored through the Site's Radioactive Ambient Air Monitoring Program (RAAMP). The site is currently monitoring for airborne radionuclide at numerous air monitoring stations on-site.

Modification to the Site's RAAMP have been made by the RFETS Air Monitoring Program Group and will be implemented in the FIP.

2.2 WASTE MATERIAL DATA REQUIREMENTS

Wastes generated from the trench are unknown with respect to chemical and radiological composition. Trench wastes shall be sampled to provide characterization data for WAC requirements at disposal facilities. Because the nature of the waste material is unknown, the initial analytical program for characterization will be comprehensive and designed to meet RFETS's contracted waste disposal facilities' WACs.

Debris

Debris may include empty drums and drum fragments, sanitary waste, PPE, wood, metal rubber, plastic, paper, and glass. Debris shall be assumed to be radioactive waste and managed accordingly. Debris will be segregated from soils in the trench and further segregated into like waste forms adjacent to the excavation. Presently, no characterization data exists for debris for waste handing and disposal. Decisions to be made include determining what type of waste is encountered and disposal requirements. Inputs to the decision include characterization data to determine waste type. These decisions include:

1. If the debris exhibit readings greater than 100,000 cpm as detected on a FIDLER the debris shall be isolated from the environment.

2. If the debris exhibit readings greater than background as detected on a PID or OVM the debris shall be segregated from other debris.

3. If the debris exhibit temperature readings of greater than 10°F in comparison to a control container, the debris shall require special handling and storage.

Inputs to the decision include characterization data. This characterization data will be acquired by field measurements for low-energy radiation, total organic vapor, and temperature. Debris shall be monitored for low-energy radiation by the FIDLER, organic vapors using the PID or OVM, and pyrophoricity using a heat gun. Documented screening results may be used to support WAC requirements of the disposal facility.

Bulk Liquids

There is a possibility that bulk liquids will be generated during the excavation of T-1. Presently, no characterization data is available for this waste form. The decision is to determine what type of waste was generated and how it is to be disposed. Inputs to the decision include characterization data, these data shall consist of field screening and laboratory data. The bulk liquids will be monitored in the field for low-energy radiation, total organic vapor, and pyrophoricity, to gain a preliminary characterization of the waste form for waste handling and storage. Additional data will be required for waste characterization

purposes and WAC for the selected disposal facility. Because the waste form is relatively unknown a complete analytical program for waste characterization will be performed. It is anticipated that this characterization will acquire the necessary WAC parameters for the options of waste disposal facilities.

The study boundary for field screens shall be one drum, study boundaries for the analytical program may include a number of drums, depending on the number encountered in the field.
The decision rules will include:

1. If the bulk liquid contains radionuclides it will be regulated as a radioactive waste material.

2. If the bulk liquid contains hazardous constituents based on RCRA, it will require handling and disposal as a hazardous waste.

3. If the bulk liquid contain both hazardous constituents and DOE radionuclides, it will require handling as a mixed waste.

Artifacts

Artifacts may be uncovered during the excavation process at T-1 Data requirements for artifacts include survey data to determine interim storage, handling and transportation. Artifacts are to be turned over to the RFETS's Classification Office. Presently, no data is available to determine handling and transportation requirements. Artifacts are to be field surveyed for pryophoricity, total organic vapors, and low-energy radiation. Artifacts will not be physically sampled Inputs into the decision include measurements obtained during the field screening process. Alpha/beta contamination will be assessed by monitoring the artifact prior to packaging. The study boundary shall include each artifact encountered in the field.

Sludges/Still Bottoms

Sludge and/or still bottoms may be encountered during the remediation process. Problems associated with this activity include the lack of characterization data for storage and disposal. The decision required includes the determination of the waste form; low-level, mixed, or hazardous. Inputs to the decision include field screening for interim storage requirements and sampling for disposal options. The study boundary for field screens shall be one drum, study boundaries for the analytical program may include a number of drums, depending on the number encountered in the field.

The decision rules include:

1. If the sludge/still bottoms contain radionuclides it will be managed as a radioactive waste material.

2. If the sludge/still bottoms contain hazardous constituents based on RCRA, they will require handling and disposal as a hazardous waste.

3. If the sludge/still bottoms contain both hazardous constituents and DOE radionuclides, they will require handling as a mixed waste.

Cemented Cyanide

Cemented cyanide may be encountered during the remediation process. Presently, there is a lack of characterization data for storage and disposal. The data required to make the decision includes the determination of the waste form, low-level, mixed, or hazardous. Inputs to the decision include field

screening for interim storage requirements and sampling for disposal options. The study boundary for field screens shall be one drum, study boundaries for the analytical program may include a number of drums, depending on the number encountered in the field.

The decision rules include:

1. If the cemented cyanide contain radionuclides it will be managed as a radioactive waste material.

2. If the cemented cyanide contain hazardous constituents based on RCRA, they will require handling and disposal as a hazardous waste.

3. If the cemented cyanide contain both hazardous constituents and DOE radionuclides, they will require handling as a mixed waste.

4. If the WAC parameters for the waste disposal facility are not met, collect deficient samples to determine parameters.

Treated Waste

Treated waste are not included in this SAP, the SAP will be modified to include treated waste forms.

3.0 SAMPLE COLLECTION AND ANALYSIS

The sample collection and analysis methods that will be performed under this SAP are outlined in the following sections. Each sampling event is described according to the anticipated sequence of field operations and the constituents of concern. Tables have been prepared for each sampling event to describe, as completely as possible, analytical methods, containers, and preservation criteria. Standard operating procedures (SOPs), specifically L-6245-F, Sampling Procedure for Waste Characterization.

In general, analysis and/or screening of environmental media and waste samples will be conducted for the following determinations:

1. Segregation of excavated soil materials;
2. Delineating the boundaries of the excavation;
3. Documenting soil stockpile area conditions (baseline and post-job);
4. Characterization of incidental waters;
5. Characterization of trench bottom and sidewalls following excavation;
6. Determining WAC parameters for waste disposal options;
7. Identifying secondary waste generation and WAC parameters;
8. Compliance with site air quality standards;
9. Air monitoring activities for worker health and safety; and
10. Meeting field quality controls (QC).

3.1 TRENCH MATERIAL SCREENING AND SAMPLING

As materials are excavated from T-1, visual inspection and field screening will be performed by qualified health and safety specialists (HSSs) and/or radiation control technicians (RCTs). Field screening will be used to assess pyrophoric characteristics, low-energy radiation, and total organic vapor. The primary purpose of the screening effort is to assign the necessary segregation and handling techniques to material as it is removed from the trench. This will minimize the mixing of waste streams and associated waste disposal costs. After materials are segregated into manageable stockpiles or containerized, samples will be collected for laboratory analysis to assess the contaminant concentrations/activities and to determine the necessary treatment and/or disposal methods. It is expected that material screening will be conducted on all environmental media and waste materials excavated from the trench.

Drums of material and soil/debris observed to contain DU turnings will be placed in a closed-lid steel container (hopper) adjacent to the open trench as excavation is conducted. The hopper is intended to safely containerize the potentially pyrophoric materials by reducing exposure to the open atmosphere and protect workers from possible flaring. The hopper will be transported to the treatment area for stabilization. Field screening will be conducted of materials while contained in the hopper.

3.1.1 Sample Screening

Because of the hazards associated with entry into steep-sided, unsupported excavations, field personnel will not be permitted to enter the excavation to screen materials or obtain samples. In general, screening will be conducted from a distance for unknown materials, such as sealed drums, or by using grab samples collected from the excavator bucket. The excavated material (soil or debris) contained in the bucket will be elevated from inside the trench to the ground surface for access by the field personnel. Loose soil and debris will be collected from the central portion of the bucket, avoiding contact with the sides or blade, and transferred to the appropriate sample containers using a stainless steel spoon, or similar device. Each sample container will be filled as completely as possible to assure a sufficient quantity of material for analysis. The primary screening methods and contaminants of concern are briefly described below.

Pyrophoric Screening

The flammability potential will be evaluated by visual inspection and screening the material with a heat gun. The heat gun is designed with a handle in excess of 10 feet long which will allow the technician to screen materials in the trench while located a safe distance away at the trench edge.

In order to reduce personnel exposure to unknowns, sealed drums will be heat tested as much as possible while in the trench. In some cases, drums may be overpacked and will first require opening prior to heat testing. Drums will be opened or pierced within the trench with a non-sparking spike fitted to the excavator, or the non-sparking teeth of the trackhoe bucket, in order to release potential hydrogen buildup. Hydrogen gas is a byproduct of the DU oxidation process and may have developed in the drum containers and/or overpack over time. Once the drummed material has been exposed, it will be either heat tested while in the trench or placed in a closed lid hopper adjacent to the trench and heat tested. A control container of similar media (i.e. soil, water) will be prepared and used as a standard to compare temperature readings of waste materials.

Loose materials, such as uncontained chips or turnings mixed with soil or debris, open drums, or partially spilled drums, will be assumed to be pyrophoric in nature and will be heat tested to the extent practical. Careful handling techniques will be implemented with all excavated materials that are suspected to or known to present a pyrophoric reaction. This will involve reduced stages of material handling, limited jostling or dumping of material, and prolonged exposure to oxygen.

Radiological Screening

Trench materials, including drums and contents, soil, and debris will be screened for low energy radiation using a Bicron FIDLER in accordance with Radiological Operating Instructions (ROI) Procedure 6.06. Like the heat gun, the FIDLER may be fitted with a long handle to allow safe screening from a distance. FIDLER screening can also be conducted on buckets of loose material (soil, debris) at the exposed surface as each bucket is removed from the excavation. Drummed material will be screened with the FIDLER instrument while contained in the hopper.

VOC Screening

Excavated material (drum contents, soils, and debris) will also be screened with a PID/OVM for detectable organic vapor concentrations. The immediate space in and around opened drums will be screened from the hopper to evaluate organic vapor concentrations. Loose soil material and debris will be screened from the track hoe bucket to collect PID/OVM readings for an estimation of VOCs. PID and/or OVM instruments will be operated in accordance with procedure FO.15, Photoionization Detectors and Flame Ionization Detectors. Table 2.2 lists the criteria that will be applied for the initial field screening of excavated trench materials.

TABLE 2.2 TRENCH MATERIAL SCREENING SAMPLES

Parameter/Waste Type	Analysis Method	Estimated Number of Samples	Action Level
Pyrophoricity / Drum contents	Heat gun	125 +	10°F greater temperature than control container
Radiation / Soil, Drums, Debris & Artifacts	FIDLER Teletector	125 + 200 +	100,000 cpm, gamma (γ) 100 mrem/hr
VOC/ Soil, Debris, & Artifacts	PID/OVM	300 +	Above Background

3.1.2 Stockpile Sampling and Segregation

It is important to note that drums and soil/debris mixed with DU materials will not be stockpiled, but rather segregated from the other wastes and immediately transferred inside a container to the treatment area for stabilization. The remaining T-1 contents will be stockpiled and sampled for waste determination, with one possible exception. Should soil or debris be field screened and determined to have excessively high radiological activity, it will be immediately placed in an adjacent roll-off container for subsequent sampling, analyses, and packaging as low-level radioactive waste. This process will eliminate later, unnecessary material handling steps and worker exposure.

After stockpiles have been generated, based on field screening for each anticipated waste handling method, grab samples will be collected from the waste soil to determine constituent concentrations to compare with RFCA ALF soil action levels, background levels, and RCRA LDRs. The samples will be collected according to procedure L-6245, Sampling Procedure for Waste Characterization. Based on these results, the appropriate treatment method, if warranted, and disposal or disposition, will be assigned.

The entire stockpile area will be located in an open, flat section near the T-1 area. This will minimize transport distance and simplify organization of waste types. Each stockpile will be continuously built up as excavated material is assigned and dumped. The dimensions of each waste pile will be continuously tracked to permit volume estimates.

Stockpile sampling is being conducted to estimate total activity/concentration of radionuclides/contaminants in the waste stockpile for transportation and disposal requirements. Disposal facilities require that a 90% confidence level be obtained to ensure that the sample results represents the waste. To design a statistically-based sampling program, some information is required of the population (stockpiled soil). Simple random sampling is the simplest sampling plan to estimate the population mean and will be utilized to determine data needs for stockpile sampling. To determine the number of measurements required to characterize a population, the sample variance (σ^2) is required. Variance can only be determined by obtaining analytical results through a preliminary sampling effort. A primary sampling activity shall be performed on each waste form to determine the sample variance. The variance will be determined from these results and will be utilized to determine the number of samples required to characterize the waste with a 90% confidence level. In the event the number of original samples do not meet the number of samples required to meet the 90% confidence level additional samples will be required.

Initially, a minimum of 7 samples will be randomly collected from each waste stockpile generated from the excavation of T-1. Samples will be submitted as individual samples to determine the variance in sample results. The variance is required to determine the number of grab samples required to estimate the total inventory of contaminants in the waste with a 90% confidence level.

Grab samples representing soil stockpiles will be transported to laboratories for analysis. Table 3.1 lists the sampling program, analyses, container type, preservation, and holding times for the segregated stockpiles samples.

Total analysis will be performed to compare the results to TCLP thresholds. A waste that is to be analyzed by the TCLP must first be subjected to a preliminary evaluation in the laboratory. During this evaluation, the analysis's determines two types of percent solids: the percent dry solids and the percent wet solids. The percent wet solids content is used to calculate the mass of extraction fluid to be used in the TCLP. The mass ratio of extraction fluid is 20 to one by weight. A sample which yields no free liquid when subjected to the filtration step is considered to consist of 100 percent wet solids for the purpose of the analysis. Therefore the entire sample is extracted with the appropriate extraction fluid. The sample result may be divided by 20 (mass ratio of extraction fluid to sample) to determine if it is theoretically possible to exceed the TCLP limits. The stockpile sampling strategy will be reevaluated following the receipt of analytical data to ensure that the sampling program represents the stockpile's total inventory of contaminants with a 90% confidence level.

TABLE 3.1 SEGREGATED STOCKPILE/WASTE CHARACTERIZATION SAMPLES

Analytical Method	Analytes	Container	Preservative	Holding Time
Gamma Spectroscopy	Plutonium, Americium	500-mL wide mouth glass or poly jar	None	6 months
Uranium and Thorium Isotopic	Uranium, Thorium	Combine with Gamma Spectroscopy	None	6 months
SW-846 Method 6010A, and 7000 Series	8 RCRA Metals + Cu, Zn, Sb, Be, Ni, Ti, and V Hg	1 x 8 oz. wide-mouth glass jar, Teflon lined closure	Cool, 4° C	180 days to extraction, except Hg: 28 days from extraction to analysis.
TCLP	% Dry Solids % Wet Solids	Combine with total analysis sample container.		
SW-846 Method 8240B/8260A	Volatile Organic Compounds	120-mL capped core, 4 or 8-oz. wide mouth glass jar. Teflon lined closure.	Cool, 4° C	14 days
SW-846 Method 8270B	Semi-Volatile Organic Compounds	1 x 8 oz. wide-mouth glass jar, Teflon lined closure	Cool, 4° C	14 days until extraction, 40 days after extraction
SW-846 Method 8240B/8260A (Trip Blanks)	Volatile Organic Compounds	3 x 40-mL glass, Teflon lined septa cap.	Cool, 4° C HCl pH<2	14 days
SW-846 Method 9045B	Soil pH	1 x 8 oz. wide-mouth glass jar, Teflon lined closure	Cool, 4° C	ASAP (up to 14 days)
ASTM 1557	Bulk Density	5-gallon bucket	None	6 months
SW-846 Chapter 7	Reactivity (HCN, H_2S)	1x 8 oz. wide-mouth glass jar	Cool, 4° C	7-14 days

SW-846 EPA Test Methods for Evaluation Solid Waste Physical /Chemical Methods

Utah Certified Laboratory required for analyses if waste is to be disposed at Envirocare.

HCN Hydrogen Cyanide

H_2S Hydrogen Sulfide

ASTM American Society of Testing and Materials

3.1.2 Debris Sampling

Miscellaneous debris (wood, rubber, plastic, paper, glass, etc.) will be field screened for radiological and organic vapor concentrations for segregation purposes. Numerous analytical data are required for waste profiling to meet disposal facilities' WACs. The following analyses shall provide the required data to properly dispose of debris generated during the remediation of T-1. RFETS procedures for waste debris sampling, classification, packaging, and disposal will be followed.

Sampling Strategy

One goal of debris sampling is to estimate total activity of radionuclides in the waste container for transportation and disposal requirements. Disposal facilities require that a 90% confidence level be obtained to ensure that the sample results represents the material in the waste container. To design a statistically-based sampling program, some information is required of the population.

Initially, a minimum of 7 samples will be randomly collected from each waste form generated from the excavation of T-1. Samples will be submitted as individual samples to determine the variance in sample results. The variance is required to determine the number of grab samples required to estimate the total inventory of contaminants in the waste with a 90% confidence level. In the event the number of original samples do not meet the number of samples required to meet the 90% confidence level additional samples will be required. This strategy has previously been discussed in detail in stockpile sampling.

Radionuclides

Isotopic analysis for radioactivity will be performed utilizing on-site gamma spectroscopy and alpha spectroscopy facilities for the determination/calculation of plutonium-238, -239/240, -241, -242, americium-241, and uranium-234, -235, and -238. A representative sample of each debris type will be collected for analysis. The results of the sample will be assumed to be representative of the debris and extrapolated to estimate the total activity of the debris type for waste disposal purposes.

RCRA-Regulated Compounds

Debris samples will be collected to identify RCRA hazardous waste. Total analyses will be perform as a replacement for the TCLP in an effort to minimize analytical costs. Debris is expected to be 100% wet solids. Therefore, the sample results may be divided by 20 to determine if it is theoretically possible to exceed the TCLP limits.

Debris samples will be analyzed for 8 RCRA metals in addition to Cu, Zn, Sb, Be, Ni, Ti, and V by EPA's Test Methods for Evaluation Soil Waste Physical/Chemical Methods (SW-846) Method 6010A with the exception of Hg which will be performed by Method 7471, or equivalent. Semivolatile analyses shall be performed utilizing Method 8270B. Volatiles analyses shall be performed according to Methods 8240B/8260A. Reactive cyanide and reactive sulfide will also be performed as specified in Chapter 7 of SW -846. Table 3.2 provides the analytical program for debris samples.

TABLE 3.2 DEBRIS CHARACTERIZATION ANALYTICAL PROGRAM

Analytical Method	Analytes	Utah Certified Laboratory	Container	Preservative	Holding Time
Gamma Spectroscopy	Plutonium, Americium	Not Applicable	500-mL wide mouth glass or poly jar	None	6 months
Uranium and Thorium Isotopic	Uranium, Thorium	Not Applicable	Combine with Gamma Spectroscopy	None	6 months
SW-846 Method 6010A, and 7000 Series	8 RCRA Metals + Cu, Zn, Sb, Be, Ni, Ti, and V Hg	Yes	1x 8 oz. wide-mouth glass jar, Teflon lined closure	Cool, 4° C	180 days to extraction, except Hg: 28 days from extraction to analysis.
SW-846 Method 8240B/8260A	Volatile Organic Compounds	Yes	120-mL capped core, 4 or 8-oz. wide mouth glass jar, Teflon lined closure.	Cool, 4° C	14 days
SW-846 Method 8270B	Semi-Volatile Organic Compounds	Yes	1x 8 oz. wide-mouth glass jar, Teflon lined closure	Cool, 4° C	14 days until extraction, 40 days after extraction
SW-846 Method 8240B/8260A (Trip Blanks)	Volatile Organic Compounds	Yes	3 x 40-mL glass, Teflon lined septa cap.	Cool, 4° C HCl pH<2	14 days
SW-846 Chapter 7	Reactivity (HCN, H_2S)	Yes	1x 8 oz. wide-mouth glass jar	Cool, 4° C	7-14 days

Note: Chlorinated Herbicides and Organochlorine Pesticides deleted from analytical program due to process knowledge.

3.2 EXCAVATION BOUNDARY SAMPLING

The purpose of the excavation boundary samples is to verify attainment of remediation goals identified in the PAM and to document the final condition of soil in the trench sidewalls and bottom. It is important to collect a sufficient number of soil samples to be statistically confident that analytical results do not exceed specified limits of the cleanup goals. In the case of the T-1 remedial action, the selected number of samples, and hence sampling grid dimensions, should attain a 90% confidence level that soil remaining inside of the excavated trench is not contaminated with radionuclides, VOCs, and cyanide in excess of the remediation goals identified in the PAM.

Excavation will be initially directed on a visual basis within the T-1 boundaries to remove the stained soil, debris, trash, and drummed materials, or until obvious waste material is removed from within the trench boundaries. Should wastes or visibly contaminated soil extend beyond the original excavation boundaries, removal will be conducted and verified by visual examination. Prior to waste excavation outside the trench boundaries, the potential disturbance to existing structures or constraints will be evaluated. All modifications to the original trench boundaries will be noted in the project logs.

After the obvious waste material and visually contaminated soil has been removed and loose slough has been scraped from the area, samples from the open trench floor and sidewalls will be collected. Sidewall samples will be collected separately from the trench bottom samples in order to distinguish areas that require further excavation or that are acceptable for closure. Each sample will be collected from the lower one foot of *in situ* soil by excavator in the same manner as the trench material screening samples. Personnel will not enter the open excavation to collect verification samples, but will receive the material at the trench embankments. The samples will be collected from the excavator bucket utilizing the grab sampling method as outlined in procedure GT.08, Surface Soil Sampling.

The samples will first be screened for radionuclides and total organic vapors. Samples exceeding the field screening levels shown in Table 2.1 will require continued excavation within the immediate area at the direction of the field supervisor and will then be resampled. Should field screening results indicate acceptable levels, verification confirmation samples will be collected in the appropriate containers

A systematic grid to locate any remaining VOC and radiological contamination will be used. To determine the number of samples required and grid spacing, a statistical evaluation was performed. The evaluation is in accordance with Gilbert (1987) for locating hot spots. The evaluation revealed that sampling a 25 by 25 foot grid would locate a circular hot spot 28 feet in diameter with a 90% confidence level. This will require the collection of 32 soil samples, excluding QA samples Figure 3.1 presents the proposed excavation boundary sampling grid. Each sample will consist of a single grab collected from soil located at the center-most portion of the corresponding grid. The sample will be analyzed for radiological isotopes, VOCs, and cyanide.

In the case of a grid with sample results that exceed cleanup goals and require re-excavation, a more detailed re-sampling routine will be followed. The re-excavated grid area will be divided into four equal quadrants with the initial sample that failed as the grids center point. One grab sample will be collected from the lower one foot of soil located at the center of each quadrant, thereby totaling four samples for that re-sampled grid. Should any of the sample results of the grid again exceed cleanup goals, that particular quadrant will be excavated again and a single sample will be collected from the center of the

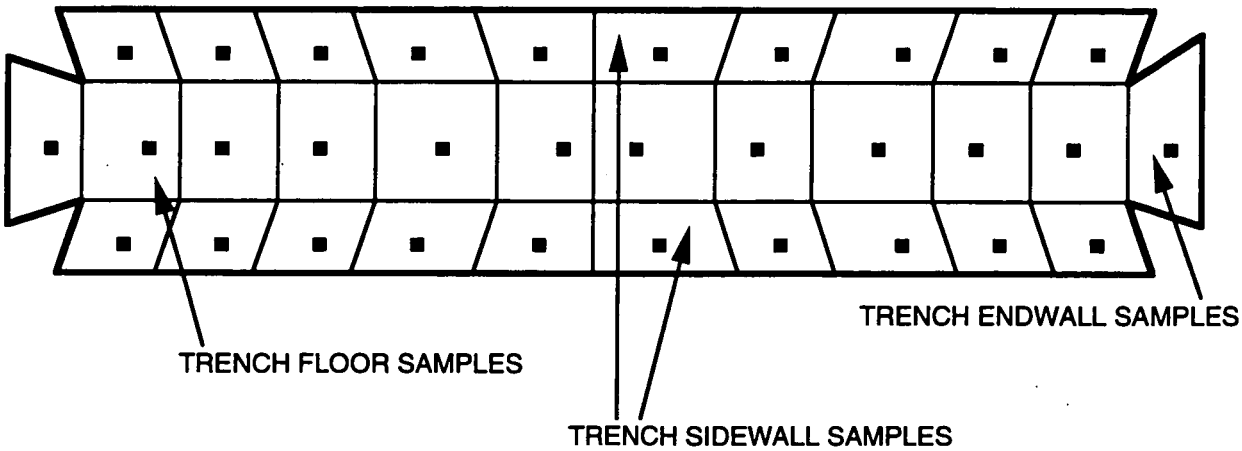
Figure 3.1

Proposed Excavation Boundary Sampling
Trench T-1 Remediation

ESTIMATED OPEN TRENCH DIMENSIONS:

- Length = 250 feet
- Width = 25 feet
- Depth = 12 feet

Using 25 x 25 ft. grid (maximum) so that no greater than 625 ft.^{2} is represented by a single sample.



TOTAL TRENCH SAMPLES TO DEFINE EXCAVATION BOUNDARY:

- Trench Floor = 10
- Trench Sidewalls
  - North = 10
  - South = 10
- Trench Endwalls
  - East = 1
  - West = 1

32 Samples (not including QC samples)

grid. This process will continue until all sample results are less than the action levels for VOCs, radionuclides, and cyanide as defined in the T-1 PAM, or remediation objectives are obtained.

Table 3.3 lists the analytical methods, and container/preservation criteria for the excavation boundary samples. Locations of samples will be marked with pin flags along the trench edges and mapped in the field logs. Prior to placement of backfill material in the trench, the coordinates and elevation of the final excavation area will be surveyed and tied to existing control points to document the location and volume of material removed.

3.3 TREATMENT PROCESS SAMPLING

The primary treatment method proposed will involve encapsulation of potentially pyrophoric radiological wastes (DU chips, drums, associated soil and debris) with a grout-based reagent. Several encapsulation processes are currently being evaluated for the T-1 radiological wastes. The anticipated treatment products must be compared with transportation and off-site disposal options to select a method that provides minimal waste handling, complete stabilization, and safe shipment and disposal. An addendum to this SAP will be prepared after the encapsulation, transportation, and off-site disposal methods are selected.

3.3.1 Stabilization by Encapsulation

Numerous encapsulation techniques are to be proposed for the treatment of the T-1 DU. Based on the fact that many of the processes are proprietary, and batch volumes are not known, RMRS will require the subcontractor to propose the DU cyanide treatment sampling program. The contractor shall be required to propose the number and frequency for sample collection and analytical methods required to obtain a 90% confidence level that the sample results represent the treated waste form The contractor shall assume a total of 40 yd^3 will require treatment. The data shall be collected to ensure the encapsulation process is effective, and to fulfill DOT requirements for shipping and WAC requirements for the waste disposal facility.

3.4 TREATMENT AREA AND STOCKPILE AREA SAMPLING

After stockpiling and on-site treatment activities are completed, residual contamination will be removed by scraping the upper zone of slough soil from within the stockpile area and treatment area. The footprint of the stockpile area and treatment area will each be evenly divided into a 25 by 25 foot grid. This grid will ensure that a 28-foot diameter circular hot spot will be detected with a 90% confidence level. Low-energy radiation measurements will be recorded utilizing a FIDLER for each node of the grid. Areas showing measurements greater than the pre-project survey will be excavated further until the measurement is at or near the pre-project survey results.

VOC soil contamination shall also be assessed for the treatment and stockpile subgrade areas. Following removal of the stockpiled soils and surface soils suspected to have been impacted from remedial operations, the stockpile will be divided into equal area grid of 25 feet by 25 feet. One grab sample will be collected from the center of each grid from 0-2 inches below the surface using the RFP method described in procedure GT.08, Surface Soil Sampling. The samples will be analyzed for VOCs as identified in Table 3.1.

TABLE 3.3 EXCAVATION BOUNDRY SAMPLES

Analytical Method	Analytes	Number of Samples (estimated)	Container	Preservative	Holding Time
Uranium and Thorium Isotopic	Uranium, Thorium	32	500-mL wide mouth glass jar	None	6 months
SW-846 Method 8240B/8260A	Volatile Organic Compounds	32	120-mL capped core, 4 or 8-oz. wide mouth glass jar. Teflon lined closure.	Cool, 4° C	14 days
SW-846 Method 9010A/9012	Total and Amenable Cyanide	32	1 x 8 oz. wide mouth glass jar	Cool, 4° C	14 days
SW-846 Method 8240B/8260A (Trip Blanks)	Volatile Organic Compounds	1 per shipping container	3-40-mL glass, Teflon lined septa cap.	Cool, 4° C HCl pH<2	14 days

3.5 SECONDARY WASTE SAMPLING

Secondary waste streams will be generated during the removal action and treatment processes. The major types of secondary wastes are expected to include:

- Liquids, incidental waters, and aqueous phase condensate;
- Spent air filters (HEPA & HEAF from segregation/treatment enclosure);
- Operational wastes (such as PPE, disposable sampling equipment, etc.)

3.5.1 Liquids, Incidental Waters, and Aqueous Phase Condensate

Various liquids are anticipated during field operations that will be developed through process operations or naturally. Incidental water, such as groundwater seepage, precipitation, and runoff may be collected in the trench. Personnel and equipment decontamination water will also be generated. Finally, aqueous phase condensate will occur as a result of the waste treatment activities, either as preparation and use of the stabilization grout, or TDU treatment of the gas stream (if utilized).

In all cases, these liquids will be sampled to determine the need for treatment at the on-site Consolidated Water Treatment Facility (CWTF). Samples will be collected according to procedure L-6245, Sampling Procedure for Waste Characterization. Samples may be collected directly from the containing device, such as the open trench, tanks, or sump areas. The sampling frequency will depend on the amount of liquids generated and volume of storage container. Quality control samples are not required by the CWTF for on-site treatment. Table 3.4 lists the sampling and analytical requirements needed to support the on-site treatment of liquid wastes at the CWTF.

3.5.2 Spent Air Filters

Spent air filters (HEPA and HEAF) will be generated during the treatment enclosure operations and would be expected as part of TDU operations, if conducted. These spent filters are expected to be slightly radioactive and may contain trace levels of VOCs. According to the RCRA "derived-from" rule, 6 CCR 1007-3, 261.3(2)(i), the spent filters would be considered hazardous remediation waste. Although, hazardous, the filters are expected to meet RCRA LDR criteria, and should, therefore, require no treatment prior to disposal. The filters would be disposed as LDR-compliant low level mixed waste at the selected off-site facility. Samples of the HEPA and HEAF filters would be collected by cutting small filter sections, or "coupons" with conventional scissors or snippers. The coupons will be placed directly in the sample containers for analysis. Samples will be collected using simple random sampling methods. The number of samples to be collected will be dependent on the number of filters generated. The SAP will be modified to include the number of samples required to adequately characterize the filters. Table 3.2 provides the debris analytical program which includes HEPA and HEAP filters generated in support of the T-1 remediation.

3.5.3 Operational Wastes

Throughout the removal action and treatment activities, various other operational wastes will be generated. These wastes are likely to include used PPE, liners/tarps, debris and trash from equipment maintenance, and office/sanitary wastes.

TABLE 3.4 LIQUIDS AND INCIDENTAL WATERS SAMPLING

Analytical Methods	Analyte	Container	Preservative	Holding Time	Comment
Gas proportional counting	Radiological Screen (gross a & b)	1-125 ml poly	HNO_3 to pH<2	N/A	
Uranium and Thorium Isotopic	Uranium-, Thorium-isotopes	2-4 L poly	HNO_3 to pH<2	6 months	
Gamma Spectrometry	Plutonium , Americium	Combine with U, T Isotopic	HNO_3 to pH<2	6 months	
SW-846 Method 8240A/8260A	Volatile Organic Compounds	3-40 ml glass vials	HCl to pH<2, Cool, 4°C	14 days	
SW-846 Method 8270B	Semi-Volatile Organic Compounds	3-1 L amber glass	Cool, 4°C	7 days until extraction, 40 days after extraction	
SW-846 Method 8080/8081	PCBs	2-1 L amber glass	Cool, 4°C	7 days until extraction, 40 days after extraction	
SW-846 Method 6010A and 7000 series	Total Target Analyte List (TAL) metals	1-1 L poly	HNO_3 to pH<2, Cool, 4°C	6 months, except mercury - 28 days	CLP-TAL DL required
335 Series Methods, or SW-846 Method 9010A/9012	Total Cyanide	1-1 L poly	NaOH to pH>12, Cool, 4°C	14 days	DL of 0.005 mg/L required
SW-846 Method 9060 or 415 Series Methods	Total Organic Carbon	500 mL poly or glass	H_2SO_4 to pH<2, Cool, 4°C	28 days	
SW-846 353 Series Method	Nitrate & Nitrite - N	Combine with TOC	H_2SO_4 to pH<2, Cool, 4°C	28 days	
SW-846 300 Series or 9000 Series Methods	Sulfate	1-L poly or glass	Cool, 4°C	28 days	
SW-846 300 Series or 9000 Series Methods	Fluoride	Combine with Sulfate	None	28 days	

Analytical Methods	Analyte	Container	Preservative	Holding Time	Comment
SW-846 300 Series or 9000 Series Methods	Chloride	Combine with Sulfate	None	28 days	
SW-846 160 Series Methods	Solids (Total and Susp.)	Combine with Sulfate	Cool, 4°C	7 days	

PPE generated during this project will be evaluated for its potential chemical and radiological impacts. It is expected that PPE can be disposed as non-hazardous, non-radioactive waste. Spent PPE will be stored in appropriate containers located at the Contaminant Reduction Zone (CRZ) and surveyed for radiological contamination prior to removal. If radiological levels are detected above the acceptable release levels, or if the PPE appears to be heavily soiled or stained, or if process knowledge indicates the PPE to be radioactively contaminated, it will be placed in containers located at the CRZ and designated as low-level radioactive waste, not requiring treatment, and will be disposed off-site.

Plastic liners or tarps may be used to cover stockpiled wastes, equipment, or supplies to protect it from the elements. Some equipment components that will likely require replacement during routine operations and maintenance (such as belts, filters, and other disposables) may come in direct contact with the waste materials. In some cases, chemical or radiological contamination could be expected on the liners, tarps, or equipment components. All of these items will be placed in a container that is separate from other sanitary site wastes and surveyed for radiological impact. If action levels for release are exceeded, or if the items appear to be heavily soiled and/or stained, the items will be included with low level radioactive waste not requiring treatment but designated for off-site disposal. The same restrictions for unrestricted releases used for PPE will be applied to the other types of operational wastes.

Office trash and other sanitary wastes generated in the Support Zone (SZ) will be separated from the operational wastes into designated dumpsters or roll-offs. The sanitary waste containers will be labeled, secured, and undergo field radiological screening for acceptable disposal at a local sanitary landfill.

3.6 Site Air and Emissions Samples

Air sampling specific to the T-1 project will monitor the constituents of particulate dust, VOCs, and airborne radionuclide activity in regard to three main issues: (1) health and safety of the site workers and co-located workers, (2) control T-1 field operations, and (3) sitewide perimeter monitoring conditions.

Atmospheric conditions will be continuously monitored to assess the health, safety, and environmental criteria of the site throughout all phases of the T-1 remediation. Site procedure FO.01 outlines general guidelines for monitoring wind speed and total suspended particulates. Worker health and safety air monitoring shall also be implemented by the T-1 Site Health and Safety Plan (HASP). Organic vapors will be monitored with PIDs or similar instruments to assess concentrated areas that may require PPE modifications. Additional details regarding personnel health and safety monitoring, instrument locations, sample types, and frequency of analysis will be detailed in the HASP. Radiological contaminants shall be monitored according to the activity-specific radiological work permit (RWP).

Site ambient air emissions of radionuclides are monitored by the RAAMP. The RAAMP will be enhanced for the duration of the T-1 field effort. Enhancements are documented in the Trench 1 Source Removal Air monitoring Plan, July 1997, which has been incorporated in the appendices of the Field Implementation Plan (RMRS, 1997b).

All monitoring instruments will be calibrated according to manufacturer's recommendations and data will be recorded in project field logs. Background measurements and non-working condition measurements will be used as the baseline assessments for operating conditions. Readings of the various monitoring instruments will be taken continuously or at intermittent times, depending upon the appropriate operating procedures

3.7 QUALITY CONTROL SAMPLING

Quality control (QC) samples will be required for particular sampling described in this SAP, primarily for the segregated stockpile samples, excavation boundary samples, portions of the treatment process verification, and samples of the soil underlying stockpile and treatment areas. The details regarding QC sampling for treatment by encapsulation and disposal WAC will be provided upon final process selection. Overall, QC samples will be collected at the rate of 1 per 20 regular samples for those requiring quality control criteria. The three main types of QC samples are described below. These sample types will be collected for specific sampling events.

Duplicates

Duplicate (collocated) samples will be collected in the same manner and analyzed by the same methods, in the same laboratory as the regular grab samples. These samples will be submitted blind to the laboratory. All duplicate samples will be collected at the rate of 1 per 20 regular samples, with the same type of sampling equipment used for collection of the regular samples. Non-disposal sampling equipment will be thoroughly decontaminated with soapy water and clean rinse water prior to collecting each and every sample including duplicates.

Equipment Rinsate Blanks

Equipment rinsate blanks, if required, will be prepared by collecting distilled water, provided by the laboratory, which has been poured over decontaminated sampling equipment. Rinsate blanks will be collected at routine intervals between regular samples at the rate of 1 in 20. The rinsate blanks will be submitted with regular samples and will be analyzed for VOCs, and cyanide as appropriate.

Trip Blanks

A trip blank will accompany each cooler of samples shipped off-site for analysis of VOC constituents. Trip blanks will be provided by the laboratory performing the VOC analyses. The trip blank will be prepared using carbon-filtered water and preserved to a pH<2 with HCl. Trip blank results will be evaluated by the QA manager and may be reduced in frequency to 1 per 20 regular VOC samples.

All samples transmitted to the selected off-site analytical laboratory will be analyzed according to U.S. EPA SW-846 methodology, or equivalent for applicable VOCs, inorganics, metals, and other constituents as requested.

4.0 SAMPLE DESIGNATION

Each sample will be assigned a unique nine digit number, provided from the APO, for data tracking purposes. The first two characters will identify the sample type. The following five digits will be sequentially assigned to represent the individual sample. The upper ranges are provided as estimates only. The last two characters will represent the company responsible for the sample collection. There will be additional specific information to the sample's area of origin, whether it is derived from process verification, and possibly, the pre-treatment samples used for either encapsulation or TDU. This added information will be documented on the log sheets. For the encapsulation process, it could designate

material batch, mix container, or treatment recipe. Because the encapsulation design is currently being developed, additional location codes will be assigned at a later time.

5.0 SAMPLING EQUIPMENT AND PROCEDURES

The expected procedures that will be used to conduct the sampling program for this SAP are listed at the front of the document. Each of the SOPs list the necessary sampling equipment and methods. If site conditions are encountered during operations that make the listed procedure unsafe or inappropriate, that particular task will be stopped and the procedure will be modified or replaced to allow work to continue.

The modifications and justification for change will be documented in the field logs and will be approved by project management, including the project manager, and the project quality control officer.

5.1 Sample Handling Procedures

Samples collected for laboratory analysis will follow the Environmental Management Department (EMD) Operating Procedures Volume I Field Operations 5-21000-OPS-FO.13, Containerization, Preserving, Handling, and Shipping of Soil and Water Samples. When reusable sampling equipment is used, the equipment will be decontaminated according to EMD Operating Procedure 5-21000-OPS-FO.03, General Equipment Decontamination, Section 5.3, Cleaning Procedures for Stainless Steel or Metal Sampling Equipment.

5.2 Documentation

Field data shall be acquired, manually or automatically, and documented in the forms developed for the T-1 project. The originator shall authenticate (legibly sign and date) in ink each completed hardcopy of the data. A peer reviewer, someone other than the originator, shall perform a peer review of each hardcopy of data. The peer reviewer shall authenticate (legibly sign and date) each hardcopy completed by the originator. Any modifications shall be lined-through, initialed and dated by the reviewer in indelible ink. Data planned for computerized reduction and analysis shall be entered into an electronic form according to the procedure 4-B29-ER-OPS-FO.14, Field Data Management.

6.0 QUALITY ASSURANCE

Throughout the T-1 project, Quality Assurance (QA) objectives standards to RMRS programs, DOE data management practices, and EPA guidelines will be applied. The project manager will be in direct contact with the QA officer to identify and correct issues with quality affecting potential. Since a large number of personnel and equipment will be mobilized to the T-1 remediation site, efforts must be made to conduct operations in an effective and timely manner. Decisions regarding project operations and material handling will be based on analytical data as received by the laboratory. Data validation will be performed according to the Rocky Flats Analytical Projects Office (APO), Analytical Services Performance Assurance Group procedures. Analytical laboratories supporting the T-1 remediation will have undergone and passed the regular laboratory audits by the Rocky Flats APO.

It is important for the T-1 project to be consistent with DQO objectives in order to continue efficient field operations and reduce unnecessary delays through mid-project data qualification. If the project DQO

criteria are met, data may usually be considered usable without qualification, or with a simplified qualification process. Analytical data that is collected in support of the T-1 remedial action will be

evaluated using the guidance developed by the Rocky Flats Administrative Procedure 2-G32-ER-ADM-08.02, Evaluation of ERM Data for Usability in Final Reports. This procedure establishes the guidelines for evaluating analytical data with respect to precision, accuracy, representativeness, completeness, and comparability (PARCC) parameters. Quantitative values for PARCC parameters for the T-1 project are provide in Table 6.1. A definition of PARCC parameters and the specific applications to the T-1 remediation are as follows:

Precision

A quantitative measure of data quality that refers to the reproducibility or degree of agreement among replicate or duplicate measurements of a parameter. The closer the numerical values of the measurements are to each other, the lower the relative percent difference and the greater the precision.

The relative percent difference (RPD) for results of duplicate and replicate samples will be tabulated according to matrix and analytical suites to compare for compliance with established precision DQOs. A 30% or less RPD is the goals for organic analyses A 40% or less RPD is the goal for non-orrganics. Deficiencies will be noted, and if necessary, additional sampling and analysis may be conducted.

Accuracy

A quantitative measure of data quality that refers to the degree of difference between measured or calculated values and the true value of a parameter. The closer the measurement to the true value, the more accurate the measurement.

The actual analytical method and detection limits will be compared with the required analytical method and detection limits for VOCs and radiochemicals to assess the DQO compliance for accuracy. If necessary, additional sampling and analysis will be conducted.

Representativeness

A qualitative characteristic of data quality defined by the degree to which the data absolutely and exactly represent the characteristics of a population. Reproducibility is accomplished by obtaining an adequate number of samples from appropriate spatial locations within the medium of interest.

The actual sample types and quantities will be compared with those stated in the SAP, FIP, or other related documents and organized by media type and analytical suite. Deviation from the required and actual parameters will be justified, and if necessary, additional samples will be collected and analyzed.

Completeness

A quantitative measure of data quality expressed as the percentage of valid or acceptable data obtained from a measurement system. A completeness goal of 90% has been set for the T-1 Source Removal Project.

TABLE 6.1 PARCC PARAMETER SUMMARY

PARCC	Radionuclides	Non-Radionuclides
Precision	Precision per APO Laboratory SOW	RPD* $\leq$ 30% for Organics RPD $\leq$ 40% for Non-organics
Accuracy	Detection Limits per APO Laboratory SOW	Comparison of Laboratory Control Sample Results with Real Sample Results
Representativeness	Based on use of SOPs and Work Plans	Based on use of SOPs and Work Plans
Comparability	Based on use of SOPs and Work Plans	Based on use of SOPs and Work Plans
Completeness	90% Useable	90% Useable

* Relative Percent Difference

Real samples and QC samples will be reviewed for the data usability and achievement of internal DQO usability goals. If sample data cannot be used, the non-compliance will be justified, and if necessary, additional sample collection and analysis will be performed.

Comparability

A qualitative measure defined by the confidence with which one data set can be compared to another. Statistical tests may be used for quantitative comparison between sample sets (populations).
At minimum, the project data sets will be compared against other real data sets (as appropriate) and background data. This is necessary to demonstrate compliance with DQO specifications and identify deficiencies. Deficiencies will be justified, and if necessary, additional sample collection and analysis will be conducted.

Laboratory validation shall be performed on 25% of the characterization data collected in support of this project. Laboratory validation shall be performed on 100% of confirmation samples collected from the sidewalls and bottom of the excavated trench.

7.0 PROJECT ORGANIZATION

Figure 7.1 illustrates the project organizational structure for the T-1 removal action and treatment. With regard to this SAP, the project manager will be the primary point of responsibility for maintaining data collection and management methods that are consistent with site operations. This will involve data collection, verification, transmittal, and archiving of sample information. The project manager, or appropriate design, will coordinate the necessary RFEDS criteria, sample number methodology, and location codes for all samples collected during the T-1 remediation.

The sampling crew personnel will be responsible for field data collection, documentation, and transfer of samples for analysis. Field data collections will include sampling and obtaining screening results. Documentation will require detailed field logs and completing appropriate forms for data management and chain-of-custody shipment. The sampling crew will coordinate sample shipment for on-site and off-site analyses through the APO personnel. The sampling manager is responsible for verifying that chain-of-custody documents are complete and accurate before the samples are shipped to the analytical laboratories.

8.0 REFERENCES

DOE, 1992. Historical Release Report for the Rocky Flats Plant. Rocky Flats Environmental Technology Site.

DOE, 1995. Phase II RFI/RI Report for Operable Unit No.2 - 903 Pad, Mound, and East Trenches Area, Rocky Flats Environmental Technology Site.

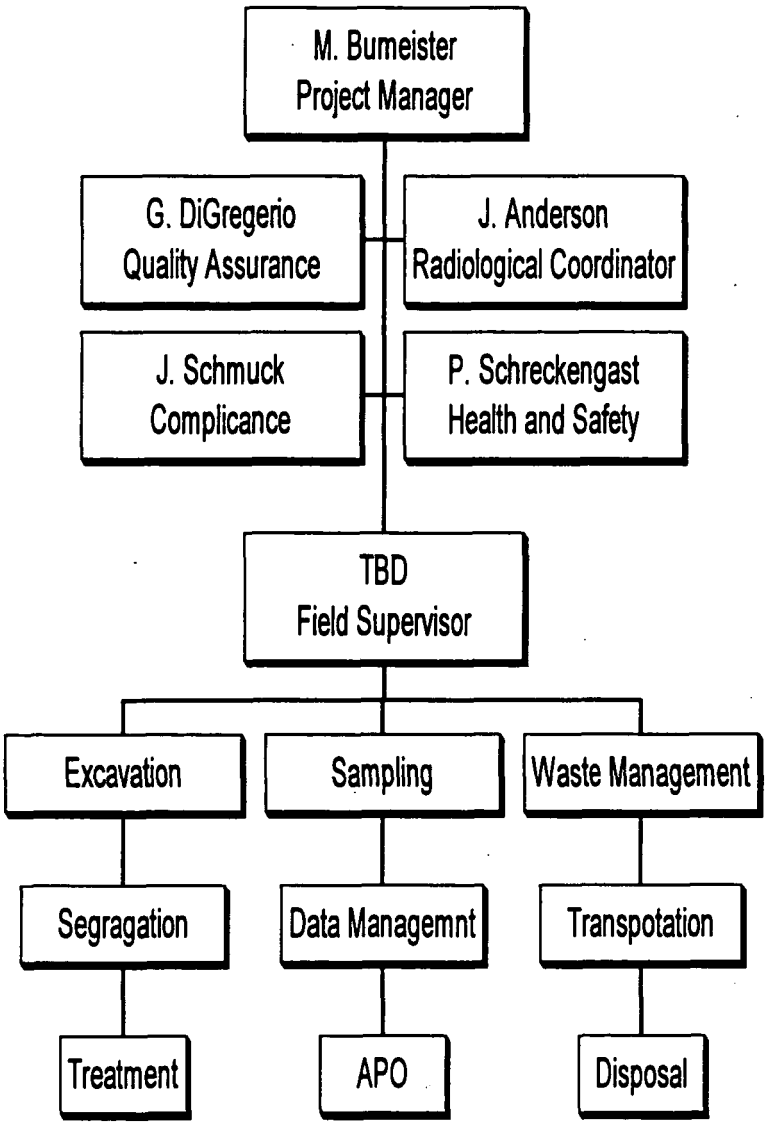
DOE, 1996. Final Rocky Flats Cleanup Agreement.

EG&G, 1994. Soil Vapor Survey Report for the Operable Unit 2 Subsurface Interim Remedial Action.

EPA, 1994. Guidance for Data Quality Objective Process.

Gilbert, R.O., 1987. Statistical Methods for Environmental Pollution Monitoring, Van Nostrand Reinhold, New York.

FIGURE 7.1
TRENCH 1 REMOVAL ACTION ORGANIZATIONAL CHART



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RMRS, 1996b. Trenches and Mound Site Characterization Report.

RMRS, 1997a. Proposed Action Memorandum for the Source Removal at the Trench T-1 Site, IHSS 108.

RMRS, 1997b Final Field Implementation Plan for the Source Removal at Trench T-1 IHSS 108.