NOTICE

All drawings located at the end of the document.

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Document Subject:

TRANSMITTAL OF THE "FINAL SAMPLING AND ANALYSIS PLAN FOR CHARACTERIZATION OF POTENTIAL NO FURTHER ACTION SITES (PAC NE-1408) (PAC 900-1307) (PAC 900-1309) (PAC 900-1311) (PAC 900-1313), RF/RMRS-99-339" - MCB-024-99

KH-00003NS1A June 15, 1999

Discussion and/or Comments:

Attached please find eight (8) copies of the ***"Final Sampling and Analysis Plan for Characterization of Potential No Further Action Sites (PAC NE-1408) (PAC 900-1307) (PAC 900-1309) (PAC 900-1311) (PAC 900-1313), RF/RMRS-99-339"*** for transmittal to Kaiser-Hill (3 copies), the DOE (3 copies), the EPA (1 copy), and the CDPHE All CDPHE comments were addressed on June 14, 1999

If you have any questions concerning this transmittal please contact Nick Demos at extension 4605

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Sampling and Analysis Plan for Characterization of Potential No Further Action Sites

(PAC NE-1408) (PAC 900-1307) (PAC 900-1309) (PAC 900-1311) (PAC 900-1313)

RF/RMRS-99-339

June 1999
Final

2

Sampling and Analysis Plan
for
Characterization of Potential No Further Action Sites

(PAC NE-1408) (PAC 900-1307)
(PAC 900-1309) (PAC 900-1311)
(PAC 900-1313)

Rocky Mountain Remediation Services, L.L.C.

June 14, 1999
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N S Demos, RMRS Characterization Project Manager — 6-14-99 Date

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APPENDIX

ACRONYMS

ASD	Analytical Services Division
ASTM	American Standard for Testing Materials
°C	Degrees Celsius
COC	Chain of Custody
CRZ	Contamination Reduction Zone
DOE	U S Department of Energy
DOT	Department of Transportation
DQO	Data Quality Objective
EMD	Environmental Management Department
EPA	Environmental Protection Agency
ft^2	Square feet
HASP	Health and Safety Plan
HRR	Historical Release Report
IHSS	Individual Hazardous Substance Site
IM/IRA	Interim Measures/Interim Remedial Action
mg/kg	Milligram per Kilogram
mg/L	Milligram per Liter
ml	Milliliter
NFA	No Further Action
OU	Operable Unit
PAC	Potential Area of Concern
pCi/g	Picocurie Per Gram
PCB	Polychlorinated Biphenyl
PCOC	Potential Contaminant of Concern
PPE	Personal Protective Equipment
QA	Quality Assurance
QAPD	Quality Assurance Program Description
QC	Quality Control
RFCA	Rocky Flats Cleanup Agreement
RFETS	Rocky Flats Environmental Technology Site
RIN	Report Identification Number
RMRS	Rocky Mountain Remediation Services, L L C
SAP	Sampling and Analysis Plan
SVOC	Semi-Volatile Organic Compound
SWD	Soil and Water Database
TD	Total Depth
TNT	2,4,6,-Trinitrotoluene
µg/Kg	Microgram per Kilogram
VOC	Volatile Organic Compound

1.0 INTRODUCTION

This Sampling and Analysis Plan (SAP) supports characterization of five Potential Areas of Concern (PACs) for possible designation as No Further Action (NFA) at the Rocky Flats Environmental Technology Site (RFETS) The PACs included in this characterization effort were identified based on the need for additional investigation as presented in Historical Release Report (HRR) documentation (i e , the original HRR, quarterly updates to the HRR, or annual updates to the HRR) The lack of analytical data to characterize residual contamination, if any, is the primary data gap for these sites

Results of the characterization activities described in this SAP will be evaluated with respect to the NFA process as presented in the Rocky Flats Cleanup Agreement (RFCA) Attachment 6 (DOE, 1996) Based on the outcome of this evaluation, the PACs listed below will be dispositioned as either NFA or further action required (e g , additional characterization and/or remediation) Sampling activities described in this SAP will be conducted in accordance with the Rocky Mountain Remediation Services, L L.C (RMRS) Quality Assurance Program Description (QAPD), RMRS-QAPD-001, Revision 1 (RMRS, 1998) Section 1 1 presents report organization and Section 1 2 provides general background for each PAC to be sampled PAC locations are identified on Figure 1 1

The PACs under investigation are listed below

- PAC NE-1408, Operable Unit (OU) 2 Test Well, Current Well Number 21993
- PAC 900-1307, Explosive Bonding Pit
- PAC 900-1309, OU 2, Field Treatability Unit
- PAC 900-1311, Septic Tank East of Building 991
- PAC 900-1313, Seep Area near OU 2 Influent Piping

1 1 REPORT ORGANIZATION

This document is organized into seven sections Section 1 0 is an introduction to the project and provides background information for the PACs to be characterized Section 2 0 provides the sampling objectives and data gaps identified with an overview of the environmental media of concern and Potential Contaminants of Concern (PCOCs) for each PAC Section 3 0 provides an overview of the sampling and analysis techniques that are required to fulfill the objectives identified in Section 2.0 while Section 4 0 illustrates the sample designation process Sections 5 0 and 6 0 address sampling support information and project organization, respectively Section 7 0 presents references for the document

1 2 BACKGROUND

Based upon the historical description for each PAC, the nature and extent of the release to the environment, and responses taken to clean up the soils, the PACs identified in this SAP pose little or no risk to human health or the environment As a result, these sites are good candidates for NFA recommendation However, the lack of analytical data to characterize residual contamination in soil at these sites precludes evaluation of these sites with respect to the RFCA NFA process Additionally, it is noted that several of the PACs are in the immediate area of the Mound Plume treatment system (see Fig 1 1) Two of these PACs originated from spills of contaminated groundwater that is now treated by the system Although not likely, if groundwater were impacted by the spills it would be captured by the treatment system For this reason, groundwater impacts are assumed to be minimal and outside the scope of this investigation The following subsections are descriptions of the individual PACs to be sampled

1.2.1 PAC NE-1408, OU 2 Test Well, Current Well Number 21993

On April 26, 1993, approximately 10 gallons of groundwater was spilled during installation of a well casing for a new bedrock monitoring well Groundwater was forced out of the hole and onto the ground surface An approximate two foot (ft) by eight ft area was wetted in the incident. At the time of the spill, it was assumed that analytical results from a well 20 ft upgradient (Well 3687) would be representative of the released water quality Based on results from Well 3687 the spilled groundwater was likely contaminated with carbon tetrachloride (0 87 mg/L), trichloroethene (96 mg/L) and tetrachloroethene (1 1 mg/L) Chloroform and 1,1-dichloroethylene were also identified in the water upgradient from the spill site at 1 1 mg/L and 1 04 mg/L, respectively In response to the spill, a desiccant was immediately applied to the area to absorb the groundwater and prevent it from spreading The wet desiccant, wet dirt from below the

desiccant, and a layer of dry dirt were removed, containerized, and dispositioned from the spill area in accordance with plant procedures Approximately 11 cubic ft were removed during cleanup operations and residual contamination is not likely

At the time of the incident, cleanup verification was determined visually and samples were not collected Analytical results for groundwater from Well 21993 were not available, therefore, results from Well 3687 showing elevated levels of carbon tetrachloride, trichloroethene, tetrachloroethene, chloroform and 1,1-dichloroethylene were used to determine the PCOCs associated with PAC NE-1408 The PCOCs are Volatile Organic Compounds (VOCs)

1.2.2 PAC 900-1307, Explosive Bonding Pit

Explosive bonding experiments that used 192 grams of 40 percent (%) dynamite to bond stainless steel with uranium alloy were conducted from 1965 to 1968 in a 10 ft by 20 ft area near Building 993 Detonations were conducted on the ground as well as in sand-filled 55-gallon drums Other experiments were also conducted at this location, however, no documentation could be found describing the nature of the experiments An undetermined amount of soil was excavated from PAC 900-1307 in March of 1968 (DOE, 1992)

Based on the available information, PCOCs for PAC 900-1307 include isotopic radionuclides, metals, and 2,4,6-trinitrotoluene (TNT) However, because constituents involved in other experiments conducted at the site are not well defined, characterization will include a full suite of parameters including VOCs, semivolatile organics (SVOCs), and pesticides/polychlorinated biphenyls (PCBs)

1.2.3 PAC 900-1309, OU-2, Field Treatability Unit

As part of Interim Measures/Interim Remedial Action (IM/IRA) activities initiated in 1991, surface water was collected and pumped from surface water stations SW-59, SW-61 and SW-132 for treatment at the OU-2 treatment facility Approximately 97% of the water diverted to the treatment system was collected from SW-61 On December 4, 1993, an estimated 10 gallons of potentially contaminated water from the pumping influent near Walnut Creek was released to the environment The source of the leak was a separation in the primary pipeline that resulted from cold weather expansion of two pipes that made up the secondary containment pipe The secondary containment pipe also leaked The 10-gallon release estimate was based on visual observation of the wetted soil area An area of approximately six to seven ft^2

(i e , two ft by three ft) was potentially impacted by the release The results for samples of treatment system influent analyzed on November 30, 1994, and December 9, 1994, were evaluated to assess the potential for soil contamination as a result of the leak. The data indicated concentrations of trichloroethene (0 064 mg/L), carbon tetrachloride (0 140 mg/L), tetrachloroethene (0 054 mg/L), cis-1,2-dichloroethene (0 060 mg/L), and 1,1-dichloroethane (0 002 mg/L) were present in the influent water These VOCs are considered the PCOCs for PAC 900-1309

1.2.4 PAC 900-1311, Septic Tank East of Building 991

The HRR (DOE, 1992) indicates that in 1952, a 60 ft by 60 ft wooden flume was utilized as a temporary waste disposal bed while construction of the Sewage Treatment Plant (Building 995) was completed The flume transported sewage effluent from the waste disposal plant septic tank to a ditch that discharged to Pond B-2 Based on the HRR, it is expected that the sewage released had typical characteristics of sewage and was not contaminated with radionuclides However, analytical data to assess the validity of this assumption or to disposition the PAC are not available No records could be found indicating exactly where the flume was located or when the system was removed from use A review of aerial photographs from the operational time period was also inconclusive Due to limited information and the nature of sanitary wastes, PCOCs for PAC 900-1311 will be VOCs, SVOCs, pesticides/PCBs metals, and isotopic radionuclides

During preparation of this SAP, it became apparent that the location of PAC 900-1311 as identified in the HRR Seventh Quarterly Update (DOE, 1994) is not accurate Based upon the original PAC description, the flume was located within a drainage area immediately below the Sewage Treatment Plant. The location as described in the HRR Seventh Quarterly Update (DOE, 1994) shows PAC 900-1311 across South Walnut Creek and up-gradient by several hundred feet. This location is not consistent or logical with the original description Based upon this finding, PAC 900-1311 has been relocated to its probable location Relocation will be documented in the September, 1999, HRR Annual Report. Though the exact location cannot be positively identified, the area chosen for sampling lies within a topographical low This may have been the actual location of the flume, but if not, the selected area will show any elevated contamination as all surficial contamination would migrate through this area before leaving the topographic depression through a culvert

1 2.5 PAC 900-1313, Seep Area Near OU-2 Influent Piping

In the spring of 1994, two to three gallons of a glossy liquid substance was noticed collecting in a stagnant pool along the south bank of South Walnut creek approximately 10 ft downstream from the OU-2 water treatment system intake Upon discovery, the water was sampled for VOCs and pumped to the OU-2 treatment system Samples were collected on March 18, March 24, and April 7, 1994 The maximum concentrations for contaminants detected from the sampling events referenced above are shown in Table 1-1 along with the RFCA Surface Water Action Levels

Table 1-1 Data Summary for PAC 900-1313 (1994 Data).

Analytes Detected	Surface Water Action Levels (mg/L)	Maximum Concentration (mg/L) water
1,1-Dichloroethane	1 01	24
Vinyl chloride	0 002	84
1,2-Dichloroethene	0 07	2
Benzene	0 005	0 2
Trichloroethene	0 005	0 3
Tetrachloroethene	0 005	0 3

Because of the proximity to the other surface water locations affected by the Mound Area in OU-2 (i e , SW-59, SW-61, and SW-132), the source of contamination for the seep was assumed to be contaminated groundwater seepage from the Mound Site (IHSS 113) Although vinyl chloride is not a contaminant of concern identified in the influent waters pumped to the OU-2 water treatment facility, it is a degradation product of the PCOCs Based upon available release information, the PCOCs for PAC 900-1313 are VOCs Because radiological waste was once stored at the Mound location, sampling for radionuclides will be collected at this location The glossy liquid substance has not been observed since it was pumped and no additional samples in the area have been collected since 1994

1.2.6 Mound Site (IHSS 113) Groundwater Plume and Treatment System

This section briefly describes a recent remedial treatment system installed near several of the investigation areas proposed in this SAP It is included to familiarize and inform the reader of recent developments in the area and is not to be confused with a PAC area requiring investigation

As stated in Section 1 2, several of the PACs (see Fig 1 1) are in the immediate area of the Mound Plume treatment system Two of the PACs originated from spills of contaminated groundwater which are now treated by a flow-through reactive iron treatment system The Mound Plume resulted from

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disposal of contaminated combustible wastes from Building 444 The Mound Site (IHSS 113) was developed in April, 1954, by excavating a shallow trench, aligning drums in rows, and covering them with soil (DOE, 1992) Approximately 900 drums were removed from the Mound Site in 1970, however, residual contamination from leaking drums was not addressed until a removal action removed source contaminants in 1997 (RMRS, 1997) The drum burial activity resulted in a small VOC plume originating from the Mound Site extending northward In 1998, a passive groundwater treatment system was constructed to remediate the Mound Site Plume This system utilizes reactive iron to remove the chlorinated organic compounds and other contaminants present in the groundwater at this location The collection system is composed of a subsurface impermeable plastic membrane barrier and a collection line immediately upgradient of the barrier A porous filter pack was placed from the top of the confining layer to a level above the horizontal collection line to facilitate groundwater flow to the collection line The trench was then backfilled and excess fill was spread over the top of the collection system The treated groundwater meets RFCA action levels and is discharged through an infiltration gallery into South Walnut Creek

2.0 DATA QUALITY OBJECTIVES

As stated in Section 1 0, results of the characterization activities described in this SAP will be evaluated with respect to the NFA process as presented in RFCA (DOE, 1996) Based on the outcome of this evaluation, the PACs will be dispositioned as either NFA or further action required (e g , additional characterization and/or remediation) Data Quality Objectives (DQOs) were developed for each PAC using the Guidance for the DQO Process, EPA QA/G-4 (EPA, 1994) The problems or data gaps, decisions, decision inputs, PAC boundaries, decision rules, limitations about the decision (i e , decision error), and sampling design to support the decisions associated with each of the PACs are discussed in the following sections

2 1 PROBLEMS

The PACs included in this SAP lack analytical data to characterize residual contamination levels, if any, attributable to the releases described in Section 1 2 The lack of analytical data precludes evaluation of the PACs with respect to the RFCA NFA process

2.2 DECISIONS

Characterization data collected for each PAC will be used to make the following decisions

- Are PCOCs present at concentrations in excess of background?
- If present above background, what is the nature and extent of contamination?
- Does contamination within the PAC exceed RFCA action levels?
- Based on the characterization data, can the PAC be proposed for NFA or is further action (i e , characterization or remediation) required?

Decisions will be made on a PAC-specific basis To accomplish this objective, samples of each medium or media of concern will be collected and analyzed for the target contaminants (i e , PCOCs) as identified in Section 2 6 of this plan

2.3 DECISION INPUTS

The following inputs are needed for the decisions

- Data regarding the nature of the release so that environmental medium or media of concern and PCOCs can be selected (Sections 1 2 and 2 6)
- Characterization data, by PAC, for the PCOCs for each medium of concern
- Background concentrations, as appropriate, from the Background Geochemical Characterization Report (DOE, 1993) and/or Geochemical Characterization of Background Surface Soils Background Geochemical Characterization Program (EG&G, 1995)
- RFCA action levels (DOE, 1996)

2.4 BOUNDARIES

The boundary of each PAC is defined by the available historical release information (i e , the original HRR, quarterly updates to the HRR, or annual updates to the HRR) If soils are determined to be radiologically elevated during radiological prescreening for offsite shipment (see Section 3 4) then additional soils will be sampled for characterization purposes Samples may also be collected based on professional judgement in the field Additionally, if evaluation of analytical data indicate concentrations in excess of background or RFCA action levels, "step-out" sampling grids will be added to further characterize the extent of contamination The placement and rationale for "step-out" locations,

as well as any other samples collected based on professional judgement, will be recorded in the field records

2.5 DECISION RULES

Because the decisions for the project are quantified in terms of background and RFCA action level exceedances, the rules governing the decision are the same as the decisions themselves As stated in Section 2 2, characterization data collected for each PAC will be used to make the following decisions

- Are PCOCs present at concentrations in excess of background?
- If present above background, what is the nature and extent of contamination?
- Does contamination within the PAC exceed RFCA action levels?
- Based on the characterization data, can the PAC be proposed for NFA or is further action required (i e , characterization or remediation)?

Background concentrations for surface soil will be taken from the Geochemical Characterization Report of Background Surface Soils Background Soils Characterization Program (EG&G, 1995) For subsurface soils and sediment, background concentrations will be taken from the Background Geochemical Characterization Report (DOE, 1993) RFCA action levels are published in the Rocky Flats Cleanup Agreement (DOE 1996) Concentrations of contaminants not influenced by laboratory contamination (i e , the 5x and 10x rules) will be compared to the appropriate background and RFCA action levels depending on the medium of interest (i e , surface soil, subsurface soil) Based on the findings from this investigation and the outcome of the comparison of PCOC results to the RFCA action levels, PACs will be proposed as NFA or recommended for further action

2.6 SAMPLING DESIGN AND ASSOCIATED DECISION ERROR

Section 1 2, Background, and the following sections identify the PCOCs for each site based on the available information for each release and the released constituents Additionally, based on the knowledge of the release, the potentially affected environmental media are identified The sampling scheme proposed for each PAC is subsequently developed to fulfill the data needs and PCOCs for the media of concern The sampling locations are illustrated on Figures 2 2 and 2 3

With the exception of PAC 900-1313, the sampling scheme for each PAC was designed using an approach to estimate grid spacing (G) from Gilbert (1987), at a pre-defined statistical confidence The output of the application is the estimated number of samples required for each PAC to achieve this confidence To estimate G using this approach the following assumptions and estimates are made

- The required statistical confidence for the sampling is assumed to be 0 95 (i e , 95% confidence that a "hot spot" will be detected)
- The size of the "hot spot" is assumed to be equal to the size of the PAC
- L is estimated to be equal to half the length of the longest axis of the PAC
- G, the grid spacing, is calculated using the L/G ratio of 0 60 Note the ratio value is estimated from Figure 10 3 (Gilbert, 1987)
- Solving for G using G = L/0 60
- Orienting the sampling grid over the PAC area
- Counting the number of samples required

Because the seep location of PAC 900-1313 is known, two biased samples will be collected at that location

2 6.1 NE-1408, OU-2 Test Well, Current Well Number 21993

As described in Section 1 1 1, the boundary of NE-1408 is an approximate two ft by eight ft area wetted by contaminated groundwater during installation of a groundwater monitoring well The release was immediately contained with a desiccant and the soil was removed from the area until dry soil was encountered Samples to verify the adequacy of the response action were not collected resulting in a data gap Because the response action was implemented immediately after the release, the potential for vertical migration of contaminants is small As a result, it is assumed that any residual contamination associated with the release is limited to surface soil (i e , the top six inches) Additionally, because of the small area affected and the nature of the release, any residual contamination is assumed to be uniformly distributed over the area of the site

The PCOCs associated with PAC NE-1408 are VOCs consistent with observations of the contaminated groundwater plume associated with the area Two surface soil samples will be collected in the area affected by the release and analyzed for VOCs (see Figure 2 1) The sample depth will be just below the

surface from a four-inch depth to a six-inch depth (VOC samples will not be composited) The grid spacing and number of samples were estimated as described in Section 2 6

2.6.2 900-1307, Explosive Bonding Pit

As described in Section 1 2 2, the 10 ft by 20 ft area near Building 993 was utilized for detonations associated with explosive bonding experiments The PCOCs for PAC 900-1307 are based on the explosive bonding experiments and include isotopic radionuclides (e g uranium), metals, and TNT from the dynamite used in the experiments However, because constituents involved in other experiments conducted at the site are not well defined, characterization will include a full suite of parameters including VOCs, SVOCs, and pesticides/PCBs The potential for surficial contamination is possible due to the dispersion resulting from the experiments, however, because of uncertainties associated with the experiments, the potential for vertical migration of contaminants is not known To investigate the possibility of contaminant dispersion, the area to be sampled will be 36 ft by 36 ft

The grid spacing and number of samples were estimated as described in Section 2 6 The corresponding grid spacing is approximately 30 ft and 2 sample locations will be sampled Two boreholes will be installed using hand augering techniques and surface and subsurface soil samples will be collected from each borehole (Figure 2 2) Surface soil samples will be collected from the top six inches at each location (including VOC collection from the four to six-inch interval) From the remaining core, 2 subsurface intervals will be sampled and composited as follows 6 inches to 24 inches and 24 inches to the total depth (TD) obtained (48 inches) A VOC sample will also be collected from the TD at each location Additional judgmental sample locations may be selected at this site near the center of the PAC and downgradient to suppliment the investigation Any field changes or additions will be documented in the field logbook

2.6.3 900-1309, OU-2, Field Treatability Unit

As indicated in Section 1 2 3, the 10-gallon release wetted an area of approximately 6 to 7 ft^2 The PCOCs associated with 900-1309 are VOCs The grid spacing and number of samples were estimated as described in Section 2 6 The corresponding grid spacing is approximately two and one-half ft and two locations will be sampled At each location, a surface soil sample for VOCs will be collected from a four inch to six inch depth followed by shallow subsurface borehole sampling to a depth of approximately two feet. The second VOC sample will be collected at a 24 inch depth (at each location) The collection of VOCs will not be composited

2.6 4 900-1311, Septic Tank East of Building 991

As described in Section 1 2 4, a 60 ft by 60 ft wooden flume served as a temporary waste disposal bed or septic tank The flume transported sewage effluent from the waste disposal plant septic tank to a ditch that discharged to Pond B-2 (DOE 1994) Based on disposal records from 1952, it is expected that the sewage released had typical characteristics of sewage, however, no evidence could be found that the sludge or the affected area was sampled It is believed that the flume apparatus was removed when the treatment plant became operational in 1953 As discussed in section 1 2 4, the PAC location will be corrected and documented in the September 1999, HRR Annual Report.

The grid spacing and number of samples were estimated as described in Section 2 6 The corresponding grid spacing is approximately 50 ft and 2 locations will be sampled (see Figure 2 2) Surface composite samples will be collected from a depth of zero to six inches and analyzed for SVOCs, pesticides/PCBs, metals and isotopic radionuclides Shallow subsurface composite samples will be collected from a depth of six inches to a depth of two ft to evaluate the potential vertical distribution of these contaminants Depth samples will be collected using hand-augering techniques VOC samples will be collected from the 4-inch to 6-inch interval and at TD (24 inches) VOC samples will not be composited. Additional judgmental sample locations may be selected at this site near the center of the PAC and downgradient to suppliment the investigation Any field changes or additions will be documented in the field logbook

2.6.5 900-1313, Seep Area Near OU-2 Influent Piping

As described in Section 1 2 6, VOCs were detected in the water accumulated in a stagnant pool within the creek bed approximately 10 ft downstream from the OU-2 water treatment system intake In response to this observation, the suspect water was pumped to the OU-2 treatment facility Prior to pumping, surface water samples were collected from the stagnant pool (see Table 1-1) Two sediment samples will be collected at the location of the seep (see Figure 2 2) to verify the adequacy of the previous response action and to further characterize the potential for residual contaminants The samples will be analyzed for VOCs and radionuclides (see Table 2-1) The sample intervals at each location will be from the surface to four inches (radionuclides), four to six inches for VOCs, and a final grab for VOCs at TD (approximately twenty inches) Because the location of the seep is known (i e , N750,172, E2,086,127), the sampling will be biased at that location Contamination at this PAC is not likely to be encountered because the area is immediately downgradient from the Mound Plume collection trench recently installed to collect contaminated groundwater (see Section 1 2 6 and Figure 2 2)

2.7 SUMMARY OF ENVIRONMENTAL MEDIA OF CONCERN AND PCOCS

Environmental media of concern and the PCOCs are based on the compilation of background information, available historical data (presented in Section 1 2), and an assessment of the sampling objectives and data needs The environmental media of concern potentially affected for each PAC is identified in Table 2-1 as well as the corresponding PCOCs

Table 2-1 Summary of Data Needs by PAC.

PAC	Media of Concern	Analytes					
		VOCs	SVOCs	Pesticides/ PCBs	Metals	Radiological	Other
NE-1408	Surface Soil	X					
900-1307	Surface/Subsurface Soil	X	X	X	X	X	TNT
900-1309	Surface/Subsurface Soil	X					
900-1311	Surface/Subsurface Soil	X	X	X	X	X	
900-1313	Sediment	X				X	

3.0 SAMPLE COLLECTION AND ANALYSIS

The sampling requirements referenced in Table 2-1 are further described in the following sections and Table 3-1 If conditions are encountered in the field that make the use of a procedure unsafe or inappropriate for the task at hand, the specified procedure may be modified or replaced as long as the modification or replacement procedure is justified and detailed in the field logbook and the resulting data is comparable and adequate to meet the objectives of the project Sample bottles specified in Tables 3-1, 3-2, and 3-3 are approximate Several analyses may be performed from the same sample container if acceptable to the laboratory All changes will be identified in the Final Completion Report

3.1 SOIL SAMPLING

Surface soil and subsurface soil samples will be collected in accordance with the specified sections of procedure 4-E42-ER-OPS-GT 08, Rev 3, Surface Soil Sampling and KH501098EP3 000005, Sampling for Waste Characterization, General Sampling Activities at Rocky Flats, and the details specified in Section 3 1 2 of this SAP as appropriate Table 3-1 summarizes the sampling and analysis program

3.1.1 Surface Soils

Surface soil samples will be collected within the following PACs

- NE-1408, OU-2 Test Well, Current Well Number 21993
- 900-1307, Explosive Bonding Pit
- 900-1309, OU-2, Field Treatability Unit
- 900-1311, Septic Tank East of Building 991

Soil sample collection from all of the investigation areas will utilize a systematic approach whereby individual sampling locations are assigned within a pre-designated grid system Figures 2 1 and 2 2 illustrate the sampling locations for each PAC and the corresponding grid system Surface soil samples will be considered grab and will characterize the soil from zero to six inches. VOC samples will not be composited and at surface intervals, will be collected from four inches to six inches

3.1.2 Subsurface Soils

Subsurface soil samples will be collected within PACs 900-1307, 900-1309, and 900-1311 in addition to the surface soil samples (see Figure 2 2) The purpose of the subsurface soil sampling is to characterize any potential vertical migration of contaminants that may have occurred from the release Sampling depth for subsurface soil will be from six inches (i e , starting just below the surface soil sample) to two ft (or four ft) depending on the PAC location

Sampling methodology will consist of hand augering (or using a slide hammer) to the desired sample interval as described in Table 3-1 and collecting the sample(s) as follows

- Four inches to six inches - Grab sample for VOCs (not composited)
- Remaining core to specified depth (i e , two ft or four ft) - Composite samples (mixed) for metals, SVOCs, pesticides/PCBs, isotopic radionuclides, radiological screen, etc, as appropriate
- TD (PAC depending) - Grab sample for VOCs (not composited)

3 2 SEDIMENT SAMPLING

Sediment samples from PAC 900-1313 will be collected consistent with the requirements specified in Section 3 1 2 Table 3-2 summarizes the sample and analysis requirements

3 3 QUALITY CONTROL SAMPLES

The following types of Quality Control (QC) samples will be collected at the frequency specified in Table 3-3

Duplicates Duplicate (collocated) samples will be collected in the same manner and analyzed by the same analytical methods, in the same laboratory as the regular samples described in Sections 3 1 and 3 2 These samples will be submitted blind to the laboratory All duplicate samples will be collected using the same sampling equipment used for collection of the regular samples Sampling equipment will be decontaminated before collecting regular and QC samples from the same location

Equipment rinsate blanks Rinsates will be prepared by pouring deionized water over decontaminated sampling equipment, between collection of regular samples and collected only when reusable sampling equipment is used These blanks will be submitted with the regular samples These samples will be preserved as indicated on Table 3-3

Trip blanks A trip blank sample will be shipped offsite with each cooler containing samples destined for VOC analysis The trip blank will be prepared in advance using ASTM Type II (or equivalent) water and preserved to a pH<2 with HCl

Table 3-1 Surface and Subsurface Soil Sampling and Analysis Program.

Analytical Method	PCOC	Estimated Number of Samples by PAC			Container	Preservative	Holding Time
			Surface 0 to 6 inches	Borehole TD			
SW-846 Method 8260A	Volatile Organic Compounds	NE-1408	2	NA	125-ml wide mouth amber glass jar, Teflon lined septa cap	Cool, 4° C, zero head space	14 days
		900-1307	2	2			
		900-1309	2	2			
		900-1311	2	2			
		Total	14				
			Surface 0 to 6 inches	6 inches to 24 inches	24 inches to 48 inches		
SW-846 8270/8270A	Semivolatile Organic Compounds	900-1307	2	2	2	125-ml wide mouth amber glass jar, Teflon lined septa cap	Cool, 4° C	14 days until extraction, 40 days until analysis of extract
		900-1311	2	2	NA		
		Total	10				
			Surface 0 to 6 inches	6 inches to 24 inches	24 inches to 48 inches		
SW-846 8080	Pesticides/PCBs	900-1307	2	2	2	125-ml wide mouth amber glass jar, Teflon lined closure	Cool, 4° C	14 days until extraction, 40 days until analysis of extract
		900-1311	2	2	NA		
		Total	10				
			Surface 0 to 6 inches	6 inches to 24 inches	24 inches to 48 inches		
SW-846 Method 6010A SW-846 Method 7471A (Hg – solid)	TAL Metals, total	900-1307	2	2	2	125-ml wide mouth glass or poly jar	Cool, 4° C	6 months, 28 days for Hg
		900-1311	2	2	NA		
		Total	10				
			Surface 0 to 6 inches	6 inches to 24 inches	24 inches to 48 inches		
Isotopic Analysis	Plutonium-239/240, Americium-241, Uranium Isotopes	900-1307	2	2	2	125-ml wide mouth glass or poly jar	None	6 months
		900-1311	2	2	NA		
		Total	10				
			Surface 0 to 6 inches	6 inches to 24 inches	24 inches to 48 inches		
SW-846 Method 8330	Nitroaromatics and Nitroamines by HPLC (TNT)	900-1307	2	2	2	125-ml wide mouth amber glass jar, Teflon lined closure	Cool, 4° C	14 days until extraction, 40 days until analysis of extract
		Total	6				
DOT Radiological Screen		NE-1408	0			60 or 125-ml wide mouth glass or poly	None	6 months
		900-1307	2					
		900-1309	0					
		900-1311	2					
		Total	4					

SW-846 (EPA, 1992), Test Methods for Evaluating Solid Waste RMRS/OPS-PRO 069, Containing, Preserving, Handling, and Shipping Soil and Water Samples

Table 3-2 Sediment Sampling and Analysis Program for PAC 900-1313

Environmental Medium	Analytical Method	PCOC	Estimated Number of Samples	Container	Preservative	Holding Time
Sediment	SW-846 Method 8260A	Volatile Organic Compounds	4	125-ml wide mouth amber glass jar, Teflon lined septa cap	Cool, 4° C, zero head space	14 days
	Isotopic Analysis	Plutonium-239/240, Americium-241, Uranium Isotopes	2	125-ml wide mouth glass or poly	None	6 months

SW-846 (EPA, 1992), Test Methods for Evaluating Solid Waste RMRS/OPS-PRO 069, Containing, Preserving, Handling, and Shipping Soil and Water Samples

Table 3-3 QC Sampling and Analysis Program.

Environmental Media	Analytical Method	QC Samples	Container	Preservative	Holding Time
Surface Soil and Subsurface Soil	SW-846 Method 8260A (VOCs)	2 Duplicates (1 per 20 samples) 1 Trip Blank/ shipment 2 Rinsates (1per 20 samples)	Duplicate 125-ml wide mouth amber glass jar, Teflon lined septa cap Trip Blank: 40-ml amber glass, Teflon lined septa cap Rinsate 40-ml amber glass, Teflon lined septa cap	Cool, 4° C for soil, Cool, 4° C HCl, pH<2 for water zero head space	14 days
	SW-846 8270/8270A (SVOCs)	1 Duplicate (1 per 20 samples) 1 Rinsate (1per 20 samples)	Duplicate 125-ml wide mouth amber glass jar, Teflon lined septa cap Rinsate 1 x 1-L amber glass for water	Cool, 4° C	14 days until extraction for soil, 7 days until extraction for water 40 days until analysis of extract for both
	SW-846 8080 (Pesticides/ PCBs)	1 Duplicate (1 per 20 samples) 1 Rinsate (1per 20 samples)	Duplicate 125-ml wide mouth amber glass jar, Teflon lined septa cap Rinsate 1 x 1-L amber glass for water	Cool, 4° C	14 days until extraction, 7 days until extraction for water 40 days until analysis of extract
	SW-846 Method 6010A (Metals) SW-846 Method 7470 A (Hg – liquid) SW-846 Method 7471A (Hg – solid)	2 Duplicates (1 per 20 samples) 2 Rinsates (1per 20 samples)	Duplicate 125-ml wide mouth glass or poly jar Rinsate 1 x 1-L poly	Cool, 4° C for soil, Cool, 4° C HNO_3 pH<2 for water	6 months, 28 days for Hg
	Alpha Spectroscopy (Isotopic)	1 Duplicate (1 per 20 samples) 1 Rinsate (1per 20 samples)	Duplicate 125-ml wide mouth glass or poly jar Rinsate 1 x 1-L poly	None for soil, HNO_3 for water	6 months
	SW-846 Method 8330 – (TNT)	1 Duplicate (1 per 20 samples) 1 Rinsate (1per 20 samples)	Duplicate 125-ml wide mouth amber glass jar, Teflon lined septa cap Rinsate 1 x 1-L amber glass for water	Cool, 4° C	14 days until extraction, 7 days until extraction for water 40 days until analysis of extract

Table 3-3 (continued)

Environmental Media	Analytical Method	QC Samples	Container	Preservative	Holding Time
Sediment	SW-846 Method 8260A (VOCs)	1 Duplicate (1 per 20 samples) 1 Trip Blank (1 per shipment) 1 Rinsate (1per 20 samples)	Duplicate 125-ml wide mouth amber glass jar, Teflon lined septa cap Trip Blank: 2 x 40-ml amber glass, Teflon lined septa cap Rinsate 2 x 40-ml amber glass, Teflon lined septa cap	Cool, 4° C sediment, Cool, 4° C HCl, pH<2 for water zero head space	14 days
	SW-846 Method 6010A (Metals) SW-846 Method 7470 A (Hg – liquid) SW-846 Method 7471A (Hg – solid)	1 Duplicate (1 per 20 samples) 1 Rinsate (1per 20 samples)	Duplicate 125-ml wide mouth glass jar for soil Rinsate 1 x 1-L poly	Cool, 4° C for soil, Cool, 4° C HNO_3 pH < 2 for water	6 months, 28 day Hg

SW-846 (EPA, 1986), Test Methods for Evaluating Solid Waste RMRS/OPS-PRO 069, Containing, Preserving, Handling, and Shipping Soil and Water Samples

3 4 RADIOLOGICAL SCREENING

Samples sent offsite for analysis will require evaluation under 49 CFR 173, the U S Department of Transportation's (DOT) radioactive materials criteria of 2,000 pCi/g, total radioactivity DOT Radiological Screening samples will have unique sample designation as described in Section 4 0 In addition, requirements for the offsite laboratory's radioactive materials license will be complied with Radiological field screening samples collected in support of this SAP will be sufficient to support the DOT shipping and offsite laboratory license requirements However, if radiological screening indicates higher than anticipated levels of radioactivity, samples may be analyzed on-site Radiological engineering personnel will make this determination Radiological Engineering has made the determination that no radiological controls are required to perform the field tasks Tables 3-1 and 3-2 include the requirements for collecting radiological screening samples

3.5 PERSONAL PROTECTIVE EQUIPMENT EVALUATION

Personal Protective Equipment (PPE) generated from this project will be evaluated with respect to potential chemical and radiological contamination It is anticipated that PPE generated during the project will be disposed of at an offsite landfill as non-hazardous, non-radioactive solid waste Gross decontamination of PPE by field personnel will be required as necessary prior to disposal All used PPE will be surveyed prior to removal from the Contamination Reduction Zone (CRZ) If radiological contamination is detected above release requirements or if the PPE appears to be stained and/or heavily soiled, the PPE will be decontaminated so that it no longer contains significant soiling, staining, or contamination Decontamination will take place within the CRZ or at the main decontamination facility in accordance with 5-21000-OPS-FO 03, Field Decontamination Procedures or RMRS/OPS-PRO 141, Decontamination Facility Operations.

To meet the conditions of unrestricted release, the PPE must

- Be free of appreciable staining and/or heavy soiling to address chemical concerns,
- Meet the requirements for unrestricted release in Radiological Safety Practices for Radiological Requirements for Unrestricted Release and the evaluation criteria specified in procedure 4-Q97-REP-1003, Radiological Evaluation for Unrestricted Release of Property/Waste, HSP 18 10 and 1-PRO-573-SWODP, Sanitary Waste Offsite Disposal Procedure

PPE that cannot meet these requirements will be evaluated on a case-by-case basis, including the probable disposition (offsite), and the collection of appropriate samples to support disposition All PPE evaluations will be documented in the field logbook

4.0 SAMPLE DESIGNATION

Each sample from each PAC will be assigned a unique sample number in accordance with RFETS, Analytical Services Division (ASD) requirements The unique sample number will be broken down into three parts

- Report Identification Number (RIN)
- Event Number
- Bottle Number

The RIN, which is assigned by ASD, is used by ASD to track/file analytical data Unique RINs will be assigned to each PAC The RIN will be a seven-digit alphanumeric code starting with 99 for 1999 The RIN will be followed by a dash "-" and then the event number The event number is a sequential three-digit code, starting with "001" following the RIN and number Each typical sample location within each PAC will have a unique event number under the RIN QC samples (e g , duplicates) will have a unique event number to support a "blind" submittal to the analytical laboratories The event number will be followed by a period " " and then the sequential bottle number The bottle number will be a three-digit code starting with "001" and will be sequential under each event number The bottle number will be used to track individual sample bottles collected at the same location (same event number)

In addition to the sample numbering scheme described above, each sample will require the following information recorded on the sample log sheet

- Sample type
- Location Code
- QC Code
  - REAL Regular Sample
  - DUP Duplicate Sample
  - RNS Rinsate Sample
  - TB Trip Blank Sample

5.0 SAMPLING SUPPORT INFORMATION

This section describes the sample handling, documentation, and Quality Assurance (QA) requirements necessary to support the successful completion of this project

5.1 SAMPLE HANDLING PROCEDURES

Samples collected for laboratory analysis will follow RMRS/OPS-PRO-069, Containerization, Preserving, Handling, and Shipping of Soil and Water Samples When reusable sampling equipment is used, the equipment will be decontaminated in accordance with 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 documented on the forms developed for this project and in accordance with 2-S47-ER-ADM-05 14, Use of Field Logbooks and Forms, and the following requirements The originator will authenticate (legibly sign and date) each completed hardcopy of the data A peer reviewer, someone other than the originator, will perform a peer review on each hardcopy of data The peer reviewer will authenticate (legibly sign and date) each hardcopy completed by the originator Any modifications will be lined through, initialed, and dated by the reviewer (in ink) Analytical data and coordinates (i e x-y locations) acquired from the investigation of PACs referenced in this SAP will be entered into the Soil and Water Database (SWD) in accordance with current ASD and Field Cap, requirements

The QA Records for the project include the field log sheet and chain-of-custody (COC) records (Appendix A) Each QA Record is subject to the applicable QA records management procedures, 1-V41-RM-001 and 1-F78-ER-ARP, CERCLA Administrative Records Program

5.3 QUALITY ASSURANCE

Verification of 100% of the data generated from this project will meet QA objectives for the final report and NFA Justification Documentation At least 25% of all data gathered under this SAP will be validated by Kaiser-Hill Analytical Services Division Guidelines Data validation will be performed in accordance with the ASD, Data Assessment Guidelines (DAGR01), but may be performed after data are used for their intended purpose If preliminary data is used, validated data will be evaluated and any changes will be reflected in the Report

Analytical data collected in support of the site characterization will be evaluated using the guidance established by the Rocky Flats Administrative Procedure RF/RMRS-98-200, Evaluation of Data for Usability in Final Reports This procedure establishes the guidelines for evaluating analytical data with respect to precision, accuracy, representativeness, completeness, and comparability parameters Completeness goals have been established at 90% for the project (all matrices and all methods) Field precision for non-radiological contaminants is ≤ 40% relative percent difference for soils For radionuclides, the duplicate error ratio must be between +/- 1 96

5.4 WASTE HANDLING

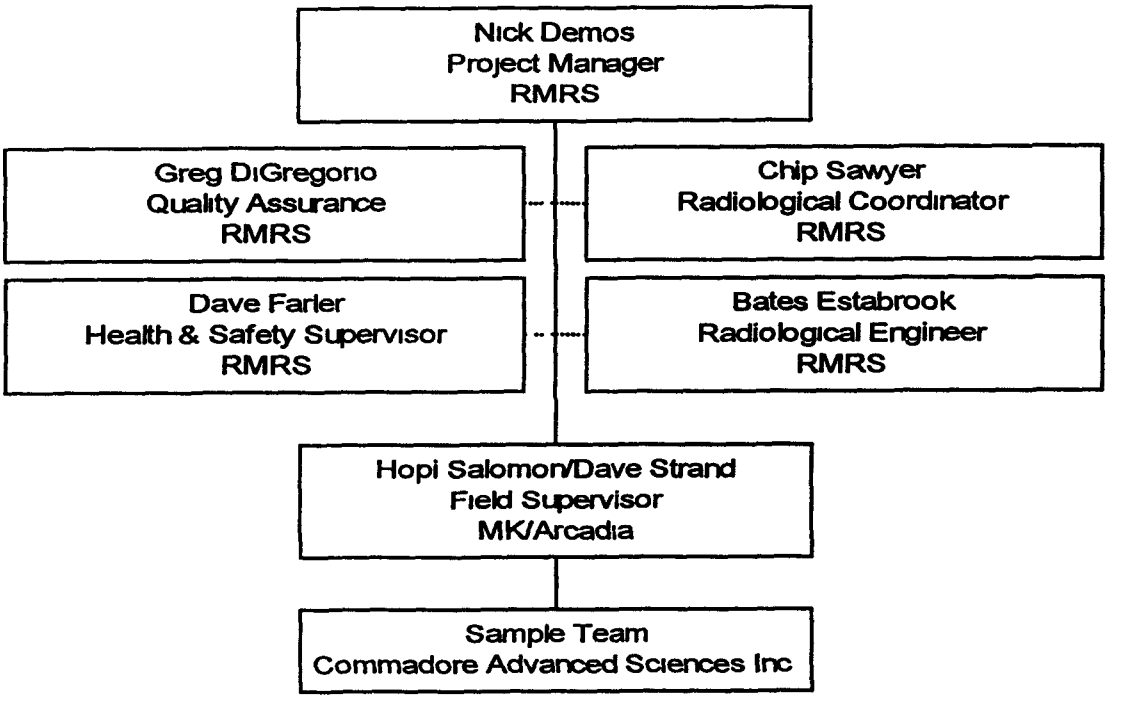
This project will not generate residual soils associated in the past with returned samples from the selected laboratories Only the specified amount of sample will be collected Personal protective equipment shall be disposed according to procedure FO 06, Handling of Personal Protective Equipment. In the unlikely event that hazardous, low level, or mixed wastes are generated, the project waste generator will be responsible for insuring that all waste containers are properly filled, labeled, and have the waste residue traveler documentation in accordance with plant procedures (1-C88-WP1027-NONRAD, Non-Radioactive Waste Packaging; 1-M12-WO4034, Radioactive Waste Packaging Requirements, 4-099-WO-1100, Solid Radioactive Waste Packaging, 1-C80-WO-1102-WRT, Waste/Residue Traveler Instructions, 1-PRO-079-WGI-001, Waste Characterization, Generation, and Packaging, and the WSRIC for Operable Unit Operations, Version 6 0, Section No 1, PADC-96-00003)

6.0 PROJECT ORGANIZATION

The organizational structure for the project is illustrated in Figure 6-1 All personnel performing tasks under this SAP will be trained in accordance with the requirements stipulated in the Health and Safety Plan (HASP) and the RMRS Training Scheduling and Records Database The Project Manager is responsible for ensuring that all data are collected, verified, transmitted and stored in a manner consistent with relevant operating procedures The Sample Coordinator, or designee, will obtain sample numbers (i e , RINs) from ASD and will ensure that the appropriate location codes are used The sample crew personnel will be responsible for field data collection Data management tasks will include completing all appropriate data management forms (e g , log sheets) and completing the COC forms

The sample crew will coordinate sample shipment with ASD personnel The Sample Coordinator is responsible for verifying that the COCs are complete and accurate before the samples are shipped to the laboratory

Figure 6.1 Project Organization



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APPENDIX A
FIELD FORMS

Comm[redacted]dvanced Sciences, Inc

CHAIN OF CUSTOD[redacted]AMPLE ANALYSIS REQUEST

COC[redacted]

Page of

Collector	Contact/Requester	Telephone No MSIN FAX
RIN 99A6697	Sampling Origin	Purchase Order/Charge Code
Project Title	Logbook No	Ice Chest No Temp
To (Lab)	Method of Shipment	Bill of Lading/Air Bill No
Protocol		Offsite Property No

POSSIBLE SAMPLE HAZARDS/REMARKS

SPECIAL INSTRUCTIONS Hold Time Total Activity Exemption Yes ☐ No ☐

Bottle No	Customer Number	Matrix	Date	Time	Location	No/Type Container	Sample Analysis	Preservative Packing

Relinquished By	Date/Time	Received By	Date/Time	Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time	Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time	Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time	Relinquished By	Date/Time	Received By	Date/Time

FINAL SAMPLE DISPOSITION	Disposal Method (e.g. Return to customer per lab procedure used in process)	Disposed By	Date/Time

NFA CHARACTERIZATION PROJECT SAMPLE CORRELATION FORM LOGBOOK ASB-99-431(B)

DATE ________________ INVESTIGATION AREA ________________

RIN# 99A______________ SAMPLERS ______________________ QC/PEER REVIEW ________________________
Print/Sign/Date

Time	Event	Bottle	Analysis	Location Code	QC	Assoc RadS Event/Bottle	Assoc QC Event/Bottle	Total Activity
			VOA Rad RadS SVOCs Met PCB		Real TB Rns DUP			
			VOA Rad RadS SVOCs Met PCB		Real TB Rns DUP			
			VOA Rad RadS SVOCs Met PCB		Real TB Rns DUP			
			VOA Rad RadS SVOCs Met PCB		Real TB Rns DUP			
			VOA Rad RadS SVOCs Met PCB		Real TB Rns DUP			
			VOA Rad RadS SVOCs Met PCB		Real TB Rns DUP			
			VOA Rad RadS SVOCs Met PCB		Real TB Rns DUP			
			VOA Rad RadS SVOCs Met PCB		Real TB Rns DUP			
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			VOA Rad RadS SVOCs Met PCB		Real TB Rns DUP			
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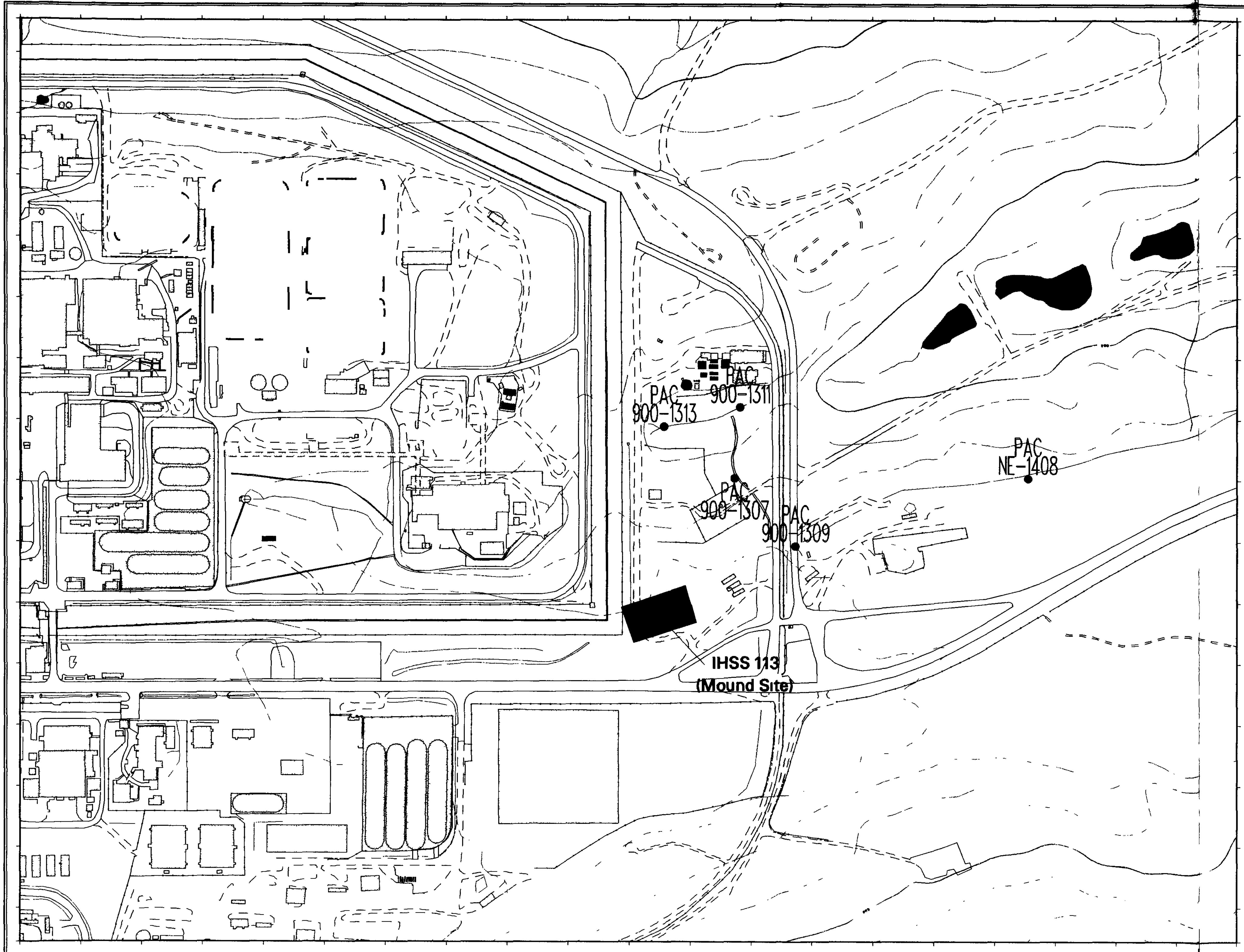

General Location Map
Potential Areas of Concern
Figure 1 1

EXPLANATION

- Potential Area of Concern (PAC)
- Individual Hazardou Substance Site

Standard Map Features

- Building and other structures
- Sola evaporation ponds
- Lake nd ponds
- Streams, ditches, o other drainage feature
- Fence d other barriers
- Contou (20-Foot)
- Paved roads
- Dirt road

Scale = 1 3900
1 inch represent 325 feet

Stat Plane Coordi ate Projectio
Colorado Cent al Zone
Datum NAD27

U S Department of Energy
Rocky Flats Environmental Technology Site

Prepared by

RMRS Rocky Mountain Remediation Services, L.L.C

MAP ID 99-0206

May 25, 1999

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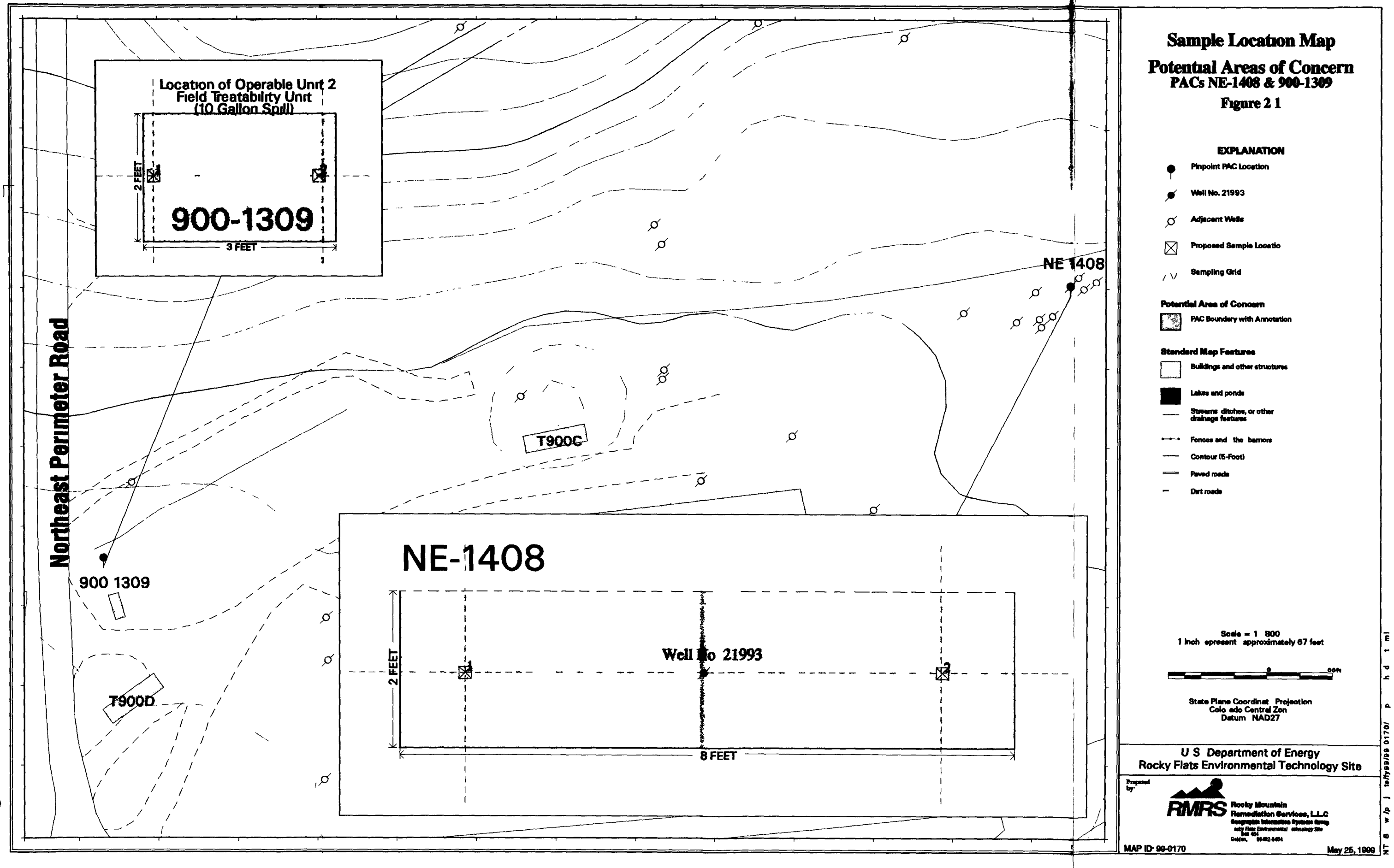

Sample Location Map

Potential Areas of Concern
PACs NE-1408 & 900-1309

Figure 2 1

EXPLANATION

- Pinpoint PAC Location
- Well No. 21993
- Adjacent Wells
- Proposed Sample Locatio
- Sampling Grid

Potential Area of Concern

- PAC Boundary with Annotation

Standard Map Features

- Buildings and other structures
- Lakes and ponds
- Streams ditches, or other drainage features
- Fences and the barriers
- Contour (5-Foot)
- Paved roads
- Dirt roads

Scale = 1 800
1 inch epresent approximately 67 feet

0 60ft

State Plane Coordinat Projection
Colo ado Central Zon
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
Golden, 80402-8494

MAP ID: 99-0170 May 25, 1999

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