NOTICE

All drawings located at the end of the document.

RFP-1325.02 (REV. 9/97)
Previously RF-46522

CORRES. CONTROL
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01498 RF 97

DUE DATE

ACTION

7 OCT 97 2:55

RFETS-CC-4

Department of Energy

ROCKY FLATS FIELD OFFICE
P.O. BOX 928
GOLDEN, COLORADO 80402-0928

OCT 7 1997

97-DOE-0542

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VOORHEIS, G.M.		
Sieben, A	X	

COR. CONTROL	X	X
ADMN. RECORD	X	
PATS/T130G		

Reviewed for Addressee
Corres. Control RFP

10/7/97 JK
Date By

Ref Ltr. #

DOE ORDER # 5400.1

Mr. Tim Rehder
U.S. Environmental Protection Agency, Region VIII
999 18th Street, Suite 500
Denver, Colorado 80202-2466

Mr. Steve Tarlton
Colorado Department of Public Health and Environment
4300 Cherry Creek Drive South
Denver, Colorado 80246-1530

Dear Mr. Rehder and Mr. Tarlton:

The Rocky Flats Field Office is pleased to deliver two copies of the Annual Update to the Historical Release Report. In accordance with the Rocky Flats Cleanup Agreement finalized July 19, 1996, this report presents spills, releases, or findings which require notification to the regulatory agencies. This report is intended to provide a comprehensive compilation of historical information updated to reflect present conditions and response actions at the Rocky Flats Environmental Technology Site with regard to environmental releases.

If you should have any technical questions regarding this report, please contact Norma I. Castaneda at 966-4226 or contact me at 966-4839.

Sincerely,

Steven W. Slaten
RFCA Coordinator

Enclosure

cc w/Enc:
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Administrative Record

cc w/o Enc:
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R. Tyler, ER/WM, RFFO
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OCT 1997
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ADMINISTRATIVE
RECORDS
Bldg. 116

ANNUAL UPDATE

FOR AUGUST 1, 1996 THROUGH
AUGUST 1, 1997

HISTORICAL RELEASE REPORT (HRR)

PREPARED BY

ENVIRONMENTAL RESTORATION

ROCKY MOUNTAIN REMEDIATION SERVICES, L.L.C.

RF/RMRS-97-073.UN
REVISION 0

AGENCY ACCEPTANCE FORM
HRR ANNUAL UPDATE

The recommendations of the Department of Energy (DOE) with regard to the need for future actions, or the lack of the need for future actions, are included in each PAC narrative description included in this annual update. Any IHSS or PAC for which a decision is deferred will be addressed in future HRR updates.

Exceptions to the recommended actions should be noted below or attach comments to this form as needed:

_____

_____

_____

_____

Please provide comments and/or acceptance within 30 days from receipt of annual update submittal, or the document will be considered acceptable as is.

DOE Signature	CDPHE Signature	EPA Signature
	CDPHE agrees with recommendations CDPHE disagrees with recommendations; see comments	EPA agrees with recommendations EPA disagrees with recommendations; see comments
_____ _____ DOE Concurrence	_____ _____ CDPHE Signature and Position	_____ _____ EPA Signature and Position

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Plate 4 - Potential Areas of Concern

ABBREVIATIONS, ACRONYMS, AND INITIALISMS

AAC	Additional Area of Concern
AEC	Atomic Energy Commission
ARA	Accelerated Response Action
ARARs	Applicable or Relevant and Appropriate Requirements
bgs	below ground surface
BRA	Baseline Risk Assessment
CAD/ROD	Corrective Action Decision/Record of Decision
CDPHE	Colorado Department of Public Health and Environment
CEARP	Comprehensive Environmental Assessment & Response Program
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CHWA	Colorado Hazardous Waste Act
COC	Chemicals of Concern
CPIR	Contingency Plan Implementation Report
D&D	Decontamination and Decommission
dpm	disintegrations per minute
DOE	U.S. Department of Energy
ECOC	Ecological Chemicals of Concern
EG&G	EG&G Rocky Flats, Inc.
EPA	U.S. Environmental Protection Agency
ERA	Ecological Risk Assessment
ER	Environmental Restoration
FIDLER	Field Instrument for the Detection of Low-Energy Radiation
FSP	Field Sampling Plan
HI	Hazard Index
HEAST	Health Effects Assessment Summary Tables
HEPA	High Efficiency Particulate Air
HHRA	Human Health Risk Assessment
HPGe	High Purity Germanium
HRR	Historical Release Report
HSP	Health and Safety Plan
IHSS	Individual Hazardous Substance Site
IAG	Interagency Agreement
IM/IRA	Interim Measure/Interim Remedial Actions
IRIS	Integrated Risk Information System
LTTD	Low Temperature Thermal Desorption
MRI	Midwest Research Institute
NA	No Action
nCi/g	nanocuries per gram
NCP	National Contingency Plan
NFA	No Further Action
NPDES	National Pollutant Discharge Elimination System
NTS	Nevada Test Site
OPWL	Original Process Waste Lines
OU	Operable Unit

OVM	Organic Vapor Monitor
PA	Protected Area
PAC	Potential Area of Concern
PAH	Polynuclear Aromatic Hydrocarbon
PAM	Proposed Action Memorandum
PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethene
PCOC	Potential Contaminants of Concern
pCi/g	picocuries per gram
PEL	Permissible Exposure Limit
PID	Photoionization Detector
ppb	part per billion
ppm	part per million
RBC	Risk Based Concentration
RCRA	Resource Conservation and Recovery Act
RCRA 3000u	Appendix 1, Waste Management Units RCRA Part B Permit Application
RFCA	Rocky Flats Cleanup Agreement
RFFO	Rocky Flats Field Office
RFETS	Rocky Flats Environmental Technology Site
RFI/RI	RCRA Facility Investigation/Remedial Investigation
RFP	Rocky Flats Plant
RI	Remedial Investigation
RMRS	Rocky Mountain Remediation Services, L.L.C.
SAP	Sampling and Analysis Plan
SOP	Standard Operating Procedure
STP	Sewage Treatment Plant
SVOC	Semivolatile Organic Compound
SWMU	Solid Waste Management Unit
TCA	1,1,1-trichloroethane
TCE	Trichloroethene
TCLP	Toxicity Characteristic Leaching Procedure
TM	Technical Memorandum
TRU	Transuranic
TSCA	Toxic Substances Control Act
TSS	Total Suspended Solids
UBC	Under Building Contamination
ug/kg	micrograms per kilogram
ug/l	micrograms per liter
UST	Underground Storage Tank
VOC	Volatile Organic Compound

SECTION 1.0
INTRODUCTION

1.0 INTRODUCTION

This Annual Update to the Historical Release Report (HRR) provides a variety of information pertaining to spills, releases, or findings of contaminants at the Rocky Flats Environmental Technology Site (RFETS). In accordance with the Rocky Flats Cleanup Agreement (RFCA) finalized July 19, 1996, this report presents spills, releases, or findings which require notification to the regulatory agencies. These spills, releases, or findings are identified as Potential Areas of Concern (PACs) and are described in a format consistent with the original HRR submitted in 1992. Since submittal of the original HRR, the HRR has been updated quarterly between 1992 and 1995. The transition from quarterly to annual HRR updates was initiated in 1996 with the finalization of RFCA. The first Annual Update was submitted in September of 1996.

The original intent of the HRR was to capture existing information on historical incidents involving hazardous substances at RFETS and continue the reporting process for current incidents involving the release of hazardous substances. Prior to finalization of the Interagency Agreement (IAG)(DOE, 1991), areas of known or suspected contamination were referred to as Solid Waste Management Units (SWMUs). This terminology was changed to Individual Hazardous Substance Site (IHSS) in the IAG and has been used since January 1991. An IHSS, by definition, is an individual location where hazardous substances have come to be located at a discrete area within the site. These locations were designated for the purposes of the HRR as PACs and assigned a unique release number based upon the geographic location of the PAC and/or its status as an existing IHSS. PAC locations were then arranged according to 14 geographical subdivisions illustrated on Figure 1-1. Large PAC areas (i.e, PACs which cross the geographic PAC boundaries) such as the Original Process Waste Lines (OPWL) (PAC #000-121) and Central Avenue (PAC #000-172) were assigned a 000 prefix for clarification. Operable Unit (OU) 3 (Offsite Releases) was assigned an independent non-numeric prefix for PAC designation (i.e., Offsite PAC Areas 1 - 4 or IHSSs 199, 200, 201 & 202 respectively).

In addition to the 14 geographic areas, potential Under Building Contamination (UBC) sites were also designated in the original HRR (DOE, 1992). This was necessary due to the potential contamination of soil and/or groundwater identified or suspected under specific buildings. Plate #4, Potential Areas of Concern, illustrates the UBC locations at RFETS.

PAC narratives include Department of Energy, Rocky Flats Field Office (DOE, RFFO) recommendations for further action or no further action. These recommendations are based on process knowledge, analytical data, conservative risk-based screens, or formally conducted personal interviews. The Agency Acceptance Form, included as the second page of this document, will continue to be incorporated into the annual reporting process. Signatures on this form document regulatory agency concurrence or non-concurrence with DOE, RFFO recommendations.

Information for this second Annual Update Report to the HRR is structured as follows:

- Section 2 presents new PACs identified due to releases or spills to the environment during the reporting period from August 1, 1996, through August 1, 1997. New PACs are defined as newly identified or suspected releases for which DOE, RFFO has notified the Environmental Protection Agency (EPA) and Colorado Department of Public Health and the Environment (CDPHE).

- Section 3 presents PAC revisions incorporating new information regarding previously designated IHSSs and/or PACs. The revised narratives include information on new releases and or findings within previously designated PACs, or proposed No Further Action (NFA) status based upon final Corrective Action Decision/Record Of Decision (CAD/ROD) acceptance, conservative risk based screening, or source removal of contaminants in accordance with Agency approved Proposed Action Memorandums (PAMs), or other authorizing documentation. Section 3 also presents a separate discussion related to OU 3 (Offsite Releases) and includes a map illustrating the offiste areas (Figure 3-1).

- Section 4 is a brief narrative describing the progress made and accelerated actions taken within the Environmental Restoration framework of field activities. Recent implementation of Agency approved PAMs have enabled CERCLA cleanup activities to proceed in an expedited manner. Activities include "hot spot" and source removals which have significantly reduced the risk to human health and the environment.

- Other significant events such as detonations of unstable waste(s) and large volume soil movements occurring at RFETS during the reporting period are described in Section 5.

- Maps included in this update have been thoroughly reviewed for accuracy and compared to information compiled and documented during the investigation processes as well as new flyover survey data. A new approach, integrating the RFCA Consolidated OU designation with the HRR format, was applied as illustrated on Plate #1. The new RFCA Consolidated OU and IHSS location map (Plate #1) <u>only</u> illustrates IHSSs for which further investigation or action is warranted. No Further Action and Proposed No Further Action IHSSs and PACs are illustrated on a separate coverage (Plate #2) thereby easily delineating between the IHSSs which require further action and progress made toward site cleanup. In addition, due to the complex nature of the Original Process Waste Lines(OPWL) and associated IHSSs, an additional map (Plate #3) illustrating the OPWL system as a stand-alone area requiring further investigation is presented. The PAC map (Plate #4) is consistent with past HRR Update Reports and shows PACs which require further action.

- Several tables comprising select information are incorporated into the update. Table 1 provides a list of all PACs identified since the original HRR (June, 1992). It also provides a cross-reference with the former OU designation, IHSS numbers for spills occurring within an IHSS boundary, Resource Conservation and Recovery Act (RCRA) Contingency Plan Implementation Report (CPIR) cross-reference numbers, and the number of the quarterly or annual update in which the PAC was originally identified. Table 2 provides a listing of all PACs referenced in the original HRR. Table 3 identifies new PACs and PAC or IHSS revisions which are inclusive to this annual report.

In summary, this report is intended to provide a comprehensive compilation of historical information updated to reflect present conditions and response actions at the RFETS with regard to environmental releases. It is not the intention for this annual update or past quarterly updates to change or amend researched information in the original HRR but rather to provide facts for specific areas as they become available. Prior to initiating work within PACs or IHSSs, more specific information such as regulatory agreements, analytical data, Work Plans, Technical Memorandums, Data Summary Reports, PAMs, Accelerated Action Completion Reports, etc., should be reviewed.

SECTION 2.0

NEW PAC NARRATIVES

(PACS IDENTIFIED FROM AUGUST 1, 1996 THROUGH AUGUST 1, 1997)

PAC REFERENCE NUMBER: 300-715

IHSS Reference Number: Not Applicable

Unit Name: Battery Acid Spill

Occurrence Report #: 97-435-371OPS, (Internally Reportable)

Approximate Location: N751,000; E2,082,500

Date(s) of Operation or Occurrence

June 11, 1997

Description of Operation or Occurrence

On June 11, 1997, while moving a wooden pallet loaded with lead acid batteries north of Building 371 (near dock 18T) , a forklift operator reported that eight of the batteries shifted and fell off the pallet resulting in a spill of sulfuric acid. Five of the eight batteries cracked releasing their contents while the other three leaked from their portholes. An estimated three gallons of acid was neutralized using sodium bicarbonate by the RFETS HAZMAT response team. Samples were collected from the spill area and then the soil was excavated. The cracked batteries were placed into a large plastic tray and further neutralization was performed.

Physical/Chemical Description of Constituents Released

Initial soil screening for pH confirmed that the spilled liquid was sulfuric acid from the batteries. Additional sampling for Total CLP Metals was conducted due to the possibility of elevated lead from the batteries. The results were typical of background levels with the exception of elevated sodium (due to the use of sodium bicarbonate). All areas affected by the sulfuric acid were remediated.

Response to Operation or Occurrence

The forklift operator immediately notified supervision, the Shift Manager, and the RFETS Fire Department. The HAZMAT Team and Shift Superintendent responded to the spill site and an Incident Command was established. Initial radiological screening was performed and soil/liquid pH samples were collected confirming the presence of sulfuric acid at dilute levels. Sodium bicarbonate was used to neutralize the acid prior to containerization. The damaged batteries were placed in secondary containment where further neutralization could take place. Gravel and soil from the spill site were containerized per plant procedure and soil samples were collected for Total CLP Metals. The soil analysis later revealed no metal contamination. The batteries were transported to their original destination for recycling.

Fate of Constituents Released to the Environment

Sampling and analysis confirmed that the 3 gallons of spilled liquid was dilute sulfuric acid which was neutralized immediately by the RFETS HAZMAT Team. During the cleanup, it was discovered that an asphalt pad existed at approximately a 6 inch soil depth which prevented further migration of the spill. There were no other contaminants associated with the release and the spill was verified to be adequately removed. The fate of constituents and associated risks to environment from this release are considered minimal.

Action/No Further Action Recommendation

No further action is proposed for this release due to the amount of sulfuric acid spilled and immediate neutralization and containerization procedures followed. Further, samples show that the spilled material was dilute, and the site was remediated.

Comments

The release did not result in any injury or potential hazard to human health or the environment. No RCRA or other wastes were generated.

References

SSOC, 1997, *Internal Occurrence Report* #97-435-371OPS, Rocky Flats Environmental Technology Site, Golden, CO, June.

RMRS, 1997, *Environmental Operations CERCLA History Files*, Rocky Flats Environmental Technology Site, Golden, CO, July.

PAC REFERENCE NUMBER: 700-1114

IHSS Reference Number: Not Applicable

Unit Name: Release During Liquid Transfer Operations from Bldg. 774

Occurrence Report #: RFO-KHLL-LIQWASTE-1996-0004

Approximate Location: N751126; E2,084,189

Date(s) of Operation or Occurrence

October 10 & 11, 1996

Description of Operation or Occurrence

On October 10 and 11, 1996, liquid transfer of a waste oil (contaminated with polychlorinated biphenyls [PCBs] and RCRA constituents) from Building 774 to a tanker truck from Oak Ridge, Tennessee resulting in two reportable/incidental releases. During the first transfer incident, the tanker was staged temporarily near Building 765 when personnel observed liquid dripping from the vacuum pumping apparatus through the exhaust/demister unit and onto the pavement. Personnel immediately walked down the area near Building 774 where the pumping operation took place earlier and found that approximately the same amount of liquid was released to soil at that location. The liquid was believed to be condensate from the vacuum pump and an estimated one cup was released at each location. A second release to the soil occurred at the Building 774 location the following day (October 11, 1996) involving approximately one gallon of the same type of liquid. The second release was attributed to the failure of a plastic bag affixed under the exhaust condensate line after the previous days experience with the apparatus.

Physical/Chemical Description of Constituents Released

Laboratory analysis of the liquid (shown below) indicate that both F001 and F002 waste codes were applicable and therefore, listed hazardous materials were generated during cleanup. Analysis for polychlorinated biphenyls showed less than 2 ppm PCBs, indicating that no PCBs were present within the liquid released. The following compounds were identified in the analysis of the released liquid:

Compound	Units (ppm)
Trichloroethene	250
Methylene Chloride	33
1,1,1-Trichloroethane	930

Response to Operation or Occurrence

After the first incident on October 10, 1996, a plastic bag was placed under and around the exhaust condensate line to collect any residual release. In both instances, the Rocky Flats Fire Department was contacted immediately upon discovery of the liquid leaking onto the paved surfaces below the tanker truck. Fire Department personnel performed a thorough cleanup of the liquid using rags (for the asphalt surfaces) and filled less than one 55 gallon drum of soil during the October 11, 1996 release. A fact finding meeting was held to further evaluate the design problem encountered with the tanker and sampling was conducted. The release was categorized and reported as an "incidental release", per 29 CFR 1910.120, Incidental Response. All associated wastes were containerized and managed in accordance with site requirements.

Fate of Constituents Released to the Environment

Less than one 55 gallon drum of soil and associated cleanup waste assumed to be contaminated with EPA Waste Codes F001 and F002 was removed and transported to a RCRA Hazardous Waste Management Unit. No radiological contamination was found in the area of the release.

Action/No Further Action Recommendation

This PAC does not warrant further investigation due to the small amounts of liquid released to the environment and the immediate cleanup response.

Comments

The incident did not result in any injury or potential hazard to human health or the environment.

References

DOE, 1996, *Occurrence Report (RFO-KHLL-LIQWASTE-1996-0004)*, Rocky Flats Environmental Technology Site, Golden, CO, October.

RMRS, 1997, *Environmental Operations CERCLA History Files*, Rocky Flats Environmental Technology Site, Golden, CO, July.

PAC REFERENCE NUMBER: 700-1115

IHSS Reference Number: Not Applicable

Unit Name: Identification of Diesel Fuel in Subsurface Soils

Occurrence Report #: None

Approximate Location: N749,720; E2,083,882

Date(s) of Operation or Occurrence

May 31, 1997

Description of Operation or Occurrence

On May 31, 1997, while excavating a shallow trench on the northeast corner of Building 708, workers noted a strong diesel fuel odor and oil staining adjacent to the building at approximately a two foot depth. The shallow trench was required to support a new diesel fuel supply line and other associated utilities as part of the Above Ground Diesel Storage Tank project. The project was halted until environmental and safety professionals could evaluate the discovery and schedule appropriate sampling. During the pre-job safety evolution and utility locate, several diesel fuel feed and return lines were identified approximately 20 feet to the north of the excavation and one unknown utility (or linear object) in the immediate area of the trench. Sampling of the suspect soil was conducted the week of June 2, 1997. Upon receipt of analytical data, the project was allowed to proceed. The source of the diesel fuel has not been determined however, ancillary piping from a nearby Underground Storage Tank (UST #16) is confirmed to be located approximately 20 feet to the north of the trench (UST #16 is located approximately 75 feet immediately to the east). Further research of the area confirmed that an incident involving a diesel fuel spill to the asphalt occurred in the general area on January 29, 1993 while refueling the Building 708 emergency generator. Occurrence Report RFFO-EGGR-PUFAB-1993-0020) states that between 10 and 15 gallons of fuel was spilled onto the asphalt surface and that no migration into the soil occurred. The spill was immediately cleaned up by the Rocky Flats Fire Department. No other documentation of past occurrences in the area could be found.

Physical/Chemical Description of Constituents Released

Laboratory analysis of the soil (see next page) indicate that the staining was diesel fuel and radiological isotopes were comparable to background levels. There were no other contaminants associated with the finding.

EPA Method	Compound	Result
8260	Toluene	8.9 ppb (TCLP/water)
8260	Ethylbenzene	29 ppb (TCLP/water)
8260	m,p-Xylene	76 ppb (TCLP/water)
8260	o-Xylene	41 ppb (TCLP/water)
8260	Toluene	390 ppb (Soil)
8260	Ethylbenzene	1800 ppb (Soil)
8260	m,p-Xylene	4600 ppb (Soil)
8260	o-Xylene	2300 ppb (Soil)
418.1	TRPH*	2435.9 ppm

* Total Recoverable Petroleum Hydrocarbon (TRPH) analysis.

Response to Operation or Occurrence

Upon discovery of the diesel fuel odor and discolored soil, workers immediately stopped working and reported the finding to the project manager and shift superintendant. Environmental evaluations, safety inspections, and a thorough walkdown of Building 708 and the surrounding area were conducted on Monday, June 2, 1997. Samples were collected that day to confirm the presence of diesel fuel and/or other volatile organic compounds and specific radiological isotopes. Upon review of the Rocky Flats Cleanup Agreement (RFCA), Attachment 13, UST Closure Letter Agreement, and consideration of the analysis received, the project was allowed to continue on June 25, 1997.

Fate of Constituents Released to the Environment

The source and age of the diesel fuel contaminated soil was not determined; however, analysis show that the TRPH was below RFCA UST cleanup thresholds and no elevated radiological isotopes identified. Diesel fuel usage logs and volume readings collected daily since 1991 were reviewed for the nearby UST #16 and substantiate that there is no leakage coming from the tank. There were no other contaminants associated with the finding and associated risk to environment from the diesel fuel are considered minimal.

Action/No Further Action Recommendation

It is recommended that this PAC undergo further investigation as part of the Industrial Area Operable Unit due to the lack of analytical data showing vertical and horizontal migration extent.

Comments

The incident was a CERCLA discovery of potentially contaminated soil and not addressed as a current spill or release. The finding did not result in any injury or potential hazard to human health or the environment. No RCRA or other wastes were generated.

References

DOE, 1993, *Occurrence Report (RFFO-EGGR-PUFAB-1993-0020)*, Rocky Flats Environmental Technology Site, Golden, CO, January.

RMRS, 1997, *Environmental Operations CERCLA History Files*, Rocky Flats Environmental Technology Site, Golden, CO, July.

PAC REFERENCE NUMBER: 900-1307

IHSS Reference Number: Not Applicable

Unit Name: Release of F001 Listed Waste Water to Soil

Occurrence Report #: RFO-KHLL-ENVOPS-1996-0011

Approximate Location: N749,995; E2,086,231

Date(s) of Operation or Occurrence

October 7, 1996

Description of Operation or Occurrence

On October 7, 1996 at approximately 10:00 a.m., workers discovered a small amount of waste water leaking from a level-indicating valve associated with the SW-59 collection tank. The valve is positioned on the north side of the tank and the estimated volume of water (which contains F001 listed RCRA constituents) reaching the soil was about one pint. The fitting was tightened immediately which stopped the leak and the area was monitored for Volatile Organic Compounds (VOCs) during cleanup of the soil.

Physical/Chemical Description of Constituents Released

Contaminants identified in the SW-59 Collection Seep are as follows:

Compound
Carbon Tetrachloride
Chloroform
Tetrachloroethene
Trichloroethene

Response to Operation or Occurrence

Upon discovery of the waste water leaking from the level-indicating valve, workers tightened a fitting which immediately stopped the leak. The spill area was contained after the area was monitored for VOCs. The affected soil and rock were containerized. Approximately one 55 gallon drum of soil was removed and transported to a RCRA Hazardous Waste Management Unit after radiological screening was performed. Cleanup verification samples were collected to verify that the site was remediated and the RCRA Contingency Plan Implementation Report (CPIR) was filed.

Fate of Constituents Released to the Environment

One 55 gallon drum of soil and rock potentially contaminated with EPA Waste Code F001 was removed and transported to a RCRA Hazardous Waste Management Unit. No radiological contamination was found in the area of the release. Analytical data later confirmed that the contaminated soil had been removed.

Action/No Further Action Recommendation

This PAC does not warrant further investigation due to the small amount of material released to the environment, the immediate cleanup response, and the cleanup verification samples showing that the release was adequately remediated.

Comments

The minimal release was directly attributable to a 24 hour tank and pipe inspection conducted at the facility. The incident did not result in any injury or potential hazard to human health or the environment.

References

DOE, 1996, *Occurrence Report (RFO-KHLL-ENVOPS-1996-0011)*, Rocky Flats Environmental Technology Site, Golden, CO, October.

RMRS, 1997, *Consolidated Water Treatment Facility Quarterly Operating Report, Fourth Quarter,* Rocky Flats Environmental Technology Site, Golden, CO, January.

RMRS, 1997, *Environmental Operations CERCLA History Files*, Rocky Flats Environmental Technology Site, Golden, CO, July.

SECTION 3.0

REVISED PAC NARRATIVES

PAC REFERENCE NUMBER: NE-110

IHSS Reference Number: 110, Buffer Zone Operable Unit

Unit Name: Trench T-3

Approximate Location: N750,000; E2,087,000

Date(s) of Operation or Occurrence

1964 - 1965

Description of Operation or Occurrence

Trench T-3 was used primarily for the disposal of sanitary waste-water and sewage treatment plant sludge. The sludge removed from the waste-water treatment plant was placed on sludge drying beds. Dried material removed from the sludge drying beds was placed in the disposal trenches (also referred to as the East Trenches) until August 1968. The sanitary sludge disposal trenches are reported to be approximately 10 feet deep with two feet of soil cover (DOE, 1992). In addition, miscellaneous waste was also disposed in Trench T-3 including crushed drums, asphalt planking, and construction debris (DOE, 1996a).

Physical/Chemical Description of Constituents Released

Some uranium and plutonium contamination was present in sludge during this time-frame. It is reported that the older sludge had primarily uranium contamination with newer sludge having an increasing amount of plutonium contamination. Total long-lived alpha activity present in the sludge in the East Trenches (not specifically T-3) was reported between a minimum of 382 pCi/g in August 1964, and a maximum of 3,591 pCi/g in June 1960. Uranium contamination may also be present in flattened drums that were disposed in this trench (DOE, 1992). Flattened drums, estimated to be more than 300 in total number are known to exist in Trench T-3 (DOE, 1996c).

Approximately 2,400 gallons of water and lathe coolant generated in Building 444 was also disposed of in one of the East Trenches (not specifically T-3). This waste had an average activity of 150,000 dpm/l (believed to be total alpha activity). The activity of this material was reported as 1.35×10^8 dpm with approximately 1.3 kg of depleted uranium present in the waste. It is unknown whether or not this material was in drums (DOE, 1992).

Responses to Operation or Occurrence

A source removal action was performed in the summer of 1996 to excavate and treat contaminated material using low-temperature thermal desorption. This action was authorized by a Proposed Action Memorandum (PAM) for the Source Removal at Trenches T-3 and T-4 IHSSs 110 and 111.1, Revision 2, dated March 28, 1996 (DOE, 1996b). Approximately 1,706

cubic yards of volatile organic compound contaminated material was removed from Trench T-3 (PAC NE-110) and treated. Excavation was completed July 3, 1996 and treatment of Trench T-3 material was completed by July 11, 1996. The completion report for the project details the treatment process, contaminants removed, the condition of the trench following the removal action, and analytical results (DOE, 1996c).

Approximately 200 cubic yards of debris, primarily crushed drums, was also removed from the trench, treated if contaminated with volatile organics, and packaged for off-site disposal. During packaging, one to two pounds of a black material was released from a drum and spread over a small work area. The material was radioactive and the area was remediated. Two roll-off containers and two waste-crates were used to contain the soil contaminated with this material (DOE, 1996c).

Fate of Constituents Released to Environment

The soils treated as part of the source removal action were returned to the trench. Debris excavated from the trench was treated, size reduced, containerized and characterized. The containerized debris was shipped to the Nevada Test Site (NTS) in September 1997. Analytical data from this removal action indicate that disposal of the 2,400 gallons of water and lathe coolant from Building 444 occurred in another trench and not T-3. Analytical data for this project is documented in the Completion Report for the Source Removal at Trenches T-3 and T-4, IHSS 110 and 111.1 (DOE, 1996c). The source removal action for Trench T-3 removed contamination sources above the cleanup values stipulated in the PAM. It is believed that no further groundwater contamination will be generated from Trench T-3 as a result of this source removal (DOE, 1996a).

Action/No Further Action Recommendation

The post-treatment levels of volatile organic compounds in the treated soils returned to Trench T-3 (PAC NE-110) were less than the thermal desorption unit performance standards specified in the PAM (DOE, 1996b) as documented in the completion report (DOE 1996c). Additionally, the excavation verification sample results for the contaminants of concern from Trench T-3 were below the cleanup values stipulated in the PAM (DOE, 1996c). These cleanup values are also consistent with the RFCA Tier I Subsurface Soil Action Levels (DOE, 1996d). The detectable volatile organic compounds observed in the excavation verification samples for Trench T-3 included carbon tetrachloride in one sample at a concentration of 1.8 ppm and tetrachloroethene in three samples with concentrations ranging from 0.74 ppm to 6.3 ppm. The cleanup value for carbon tetrachloride is 11 ppm and the cleanup value for tetrachloroethene is 11.5 ppm (DOE, 1996c).

Trench T-3 (PAC NE-110) is proposed as no further action because the source removal and treatment goals specified in the PAM (DOE, 1996b) were achieved and are consistent with the action levels in RFCA (DOE, 1996d).

Comments

Trenches T-3 through T-11 are also reffered to as the East Trenches (DOE, 1992).

Trench T-3 (PAC NE-110) had few operational differences from Trenches T-4 through T-11. All of these trenches were used primarily for the disposal of sanitary waste-water treatment plant sludge (DOE, 1992).

No documentation was found regarding the exact dates of operation of individual trenches. Interviewees were unaware of operating dates and could provide no additional information (DOE, 1992).

References

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1996a, *Annual Update for the Historical Release Report, August 1, 1995 through August 1, 1996*. RF/ER-96-0046. September.

DOE, 1996b, *Proposed Action Memorandum for the Source Removal at Trenches T-3 and T-4 IHSSs 110 and 111.1, Revision 2,* RF/ER-95-111.UN, March.

DOE, 1996c, *Completion Report for the Source Removal at Trenches T-3 and T-4 IHSS 110 and 111.1*, RF/ER-96-0051, Revision 2, September.

DOE, 1996d, *Final Rocky Flats Cleanup Agreement*, Department of Energy, Rocky Flats Environmental Technology Site, Golden, CO, July.

PAC REFERENCE NUMBER: NE-111.1

IHSS Reference Number: 111.1, Buffer Zone Operable Unit

Unit Name: Trench T-4

Approximate Location: N750,000; E2,087,500

Date(s) of Operation or Occurrence

1965 - 1967

Description of Operation or Occurrence

Trench T-4 (PAC NE-111.1) was used primarily for the disposal of sanitary waste-water and sewage treatment plant sludge. The sludge removed from the waste-water treatment plant was placed on sludge drying beds. Dried material removed from the sludge drying beds was placed in the disposal trenches (also referred to as the East Trenches) until August 1968. The sanitary sludge disposal trenches are reported to be approximately 10 feet deep with two feet of soil cover (DOE, 1992). In addition, miscellaneous waste was also disposed in Trench T-4 including crushed drums, asphalt planking, and construction debris (DOE, 1996a).

The numbering system for the trenches was slightly modified over time. A 1983 document describes a trench that had previously been referred to as Trench T-4 renumbered as T-11. This 1983 document placed Trench T-4 essentially as an addition to Trench T-3 (DOE, 1992).

Physical/Chemical Description of Constituents Released

Some uranium and plutonium contamination was present in the sludge during this time-frame. It is reported that the older sludge had primarily uranium contamination with newer sludge (post 1958) having an increasing amount of plutonium contamination. Total long-lived alpha activity present in the sludge deposited in the East Trenches (not specifically T-4) was reported between a minimum of 382 pCi/g in August 1964, to a maximum of 3,591 pCi/g in June 1960. Uranium contamination may also be present in flattened drums that may have been disposed in any of trenches T-2 through T-11 following burning of the contaminated oils that had been held in the drum. Flattened drums, were identified in Trench T-4 (DOE, 1996c). It was estimated in a 1973 document that Trench T-4 may contain up to 16.2 grams of uranium-235 (DOE, 1992).

Approximately 2,400 gallons of water and lathe coolant generated in Building 444 was also disposed in one of the East Trenches (not specifically T-4). This waste had an average activity of 150,000 dpm/l (believed to be total alpha activity). The activity of this material was reported as 1.35×10^8 dpm with approximately 1.3 kilograms (kg) of depleted uranium present in the waste. It is unknown whether this material was in drums (DOE, 1992).

Responses to Operation or Occurrence

A source removal action was performed in the summer of 1996 to excavate and treat contaminated material using low-temperature thermal desorption. This action was authorized by the Proposed Action Memorandum (PAM) for the Source Removal at Trenches T-3 and T-4, IHSSs 110 and 111.1, Revision 2, dated March 28, 1996 (DOE, 1996a). Approximately 2,094 cubic yards of volatile organic compound (VOC) contaminated material was removed from Trench T-4 (PAC NE-111.1) and treated. Excavation of Trench T-4 was completed on August 14,1996 and treatment of the Trench T-4 material was completed August 19, 1996. The completion report for the project details the treatment process, contaminants removed, the condition of the trench following the removal action, and includes sample analytical results (DOE, 1996c).

Approximately 150 cubic yards of debris, primarily crushed drums and miscellaneous construction debris, was also removed from Trench T-4, treated by low-temperature thermal desorption if contaminated with VOCs, and packaged for off-site disposal.

Fate of Constituents Released to Environment

The soils treated as part of the source removal action were returned to the trench. Debris excavated from the trench were also treated, size reduced, containerized and characterized. The containerized debris was shipped to the Nevada Test Site (NTS) in September 1997.

The source removal action for Trench T-4 (PAC NE-111.1) removed contamination sources above the cleanup values stipulated in the PAM with the exception of one area. As detailed in the PAM, excavation at Trench T-4 would stop if bedrock was encountered (DOE, 1996b). Bedrock was encountered in the excavation at approximately 20 feet below ground surface (bgs). With concurrence from DOE, EPA, and CDPHE, excavation ceased and verification samples were collected. The results for these samples indicated that the cleanup levels specified in the PAM (DOE, 1996b) were achieved in all but 1 of the 16 sampling grids. A level of 22 ppm of trichloroethene was detected in the sample from primary grid 32 (DOE, 1996c).

It is believed that groundwater contamination levels resulting from leaching of waste disposed of in Trench T-4 will decrease as a result of the source removal (DOE, 1996a). Approximately 250 cubic yards of soil from Trenches T-3 and T-4 with radiological activity greater than RFCA Tier II radiological action levels (DOE, 1996d) were placed in Trench T-4 (DOE, 1996c). Trench T-3 soils that were placed in Trench T-4 as well as the Trench T-4 soils with activity above Tier II were done so after an agreement among the Agencies had been reached (DOE, 1996c). A letter from the EPA explaining the decision and expressing concurrence among the agencies is included in the pages that follow.

Action/No Further Action Recommendation

The post-treatment levels of volatile organic compounds in the treated soils returned to Trench T-4 (PAC NE-111.1) were less than the thermal desorption unit performance standards specified in the PAM (DOE, 1996b) as documented in the completion report (DOE 1996c). Additionally, the excavation verification sample results for the contaminants of concern from Trench T-4 (PAC NE 111.1) were below the cleanup values stipulated in the PAM (DOE, 1996c) with the exception of one sample within the trench. The cleanup values stipulated in the PAM (DOE, 1996c) are also consistent with the RFCA Tier I Subsurface Soil Action Levels (DOE, 1996d). The detectable volatile organic compounds observed in the excavation verification samples for Trench T-4 and the associated concentrations included tetrachloroethene in four samples with concentrations ranging from 0.66 ppm to 10 ppm; and trichloroethene in four samples with concentrations ranging from 1.1 ppm to 22 ppm. All concentrations meet the cleanup levels with the exception of 22 ppm trichlorethene in primary grid 32. The cleanup values for tetrachloroethene, and trichloroethene are 11.5 and 9.27 ppm, respectively (DOE, 1996c).

As discussed above and detailed in the Record of Teleconference that follows, excavation at Trench T-4 was stopped with the concurrence of the agencies in accordance with the PAM. The replacement of soil above the RFCA Tier II radiological action levels in Trench T-4 was also agreed upon by the agencies. It is understood that the soils replaced contain somewhat higher levels of radionuclides than other soils returned to the excavation; however their radioloigcal levels are below the proposed Tier I values for office worker and future residential exposure (DOE, 1996c). Because of this, no further action is proposed for Trench T-4 (PAC NE-111.1).

Comments

Soil identified from Trench T-3 and T-4 with radiological activity greater than RFCA Tier II radiological action levels (DOE, 1996d) were segregated and marked in Trench T-4. This represents about 250 cubic yards of soil (DOE, 1996c).

Trench T-4 is part of the East Trenches (DOE, 1992). The sludge disposed of in these trenches should consist primarily of concentrated organic matter typically present in sanitary waste-water treatment plant sludge (DOE, 1992).

Analytical data from this removal action indicate that disposal of the 2,400 gallons of water and lathe coolant from Building 444 occurred in another trench and not T-4.

Trenches T-3 through T-11 had few operational differences, (DOE, 1992).

To date, no documentation other than aerial photographs have been found that records the time-frame during which any particular trench was receiving waste. Similarly, none of the HRR interviewees were knowledgeable on dates of operation of individual trenches (DOE, 1992). Aerial photographs of the east trenches were reviewed in preparation for the HRR (DOE, 1992) and document what sequence and general time frame that trenching operations took place.

References

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1996a, *Annual Update for the Historical Release Report, August 1, 1995 through August 1, 1996*. RF/ER-96-0046. September.

DOE, 1996b, *Proposed Action Memorandum for the Source Removal at Trenches T-3 and T-4 IHSSs 110 and 111.1, Revision 2,* RF/ER-95-111.UN, March.

DOE, 1996c, *Completion Report for the Source Removal at Trenches T-3 and T-4 IHSS 110 and 111.1*, RF/ER-96-0051, September.

DOE, 1996d, *Final Rocky Flats Cleanup Agreement*, Department of Energy, Rocky Flats Environmental Technology Site, Golden, CO, July.

Department of Energy

ROCKY FLATS FIELD OFFICE
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FILE COPY

96-DOE-07980

SEP 10 1996

Mr. Tim Rehder
U.S. Environmental Protection Agency, Region VIII
ATTN: Rocky Flats Project Manager, 8HWM-RI
999 18th Street, Suite 500, 8WM-C
Denver, Colorado 80202-2405

Dear Mr. Rehder:

The purpose of this letter is to confirm agreements reached regarding disposition of soils excavated from Ryan's Pit and from Trenches T-3 and T-4 at the Rocky Flats Environmental Technology Site (RFETS). As you recall, these agreements were reached during a meeting held on August 28, 1996, during a conference call on the morning of September 4, 1996, and during subsequent conversations between yourself and Mr. Carl Spreng of the Colorado Department of Public Health and Environment (CDPHE).

Regarding the Ryan's Pit soils, data were presented at the August 28 meeting demonstrating that these soils, now stored in eleven roll-off containers at RFETS, contained levels of radionuclides below the proposed Tier II soil action levels. These data are the results of a statistically valid soil sampling program and a summary is enclosed. Based upon these data, parties at the August 28 meeting agreed that the Ryan's Pit soils would be returned to the excavation; Kaiser-Hill and RMRS plan to accomplish this in mid-September.

Kaiser-Hill and RMRS presented radiological sampling data for the majority of the soils excavated from T-4 (that is, those soils that did not show radiological levels above background when surveyed with field instruments) during the September 4 conference call. These data (enclosed) showed levels of radiological constituents that were below the proposed Tier II soil action levels. As per the Ryan's Pit soil, all parties agree that these soils could be returned to the excavation; Kaiser-Hill and RMRS plan to have this accomplished by September 9, 1996.

Considerable discussion took place both on August 28 and September 4 regarding the appropriate disposition of T-3 and T-4 soils that exhibited radiological concentrations above background (when surveyed with field instruments during the excavation), and which were segregated from other excavated soils. Sampling results indicate that about 250 cubic yards of this soil, has radiological concentrations that exceed the proposed Tier II soil action level, but which does not exceed the proposed Tier I soil action level. The parties have agreed to the following course of action for these soils:

- those soils that exhibit radionuclides below the proposed Tier II action level will be segregated and returned to the excavation per the Ryan's Pit and T-4 soils discussed above; and,

• those soils that exhibit radionuclides above the proposed Tier II action level will also be returned to the excavation. They will be deposited in a specific area of the trench and will be underlain, and overlain, by a geotextile fabric or similar material for the purpose of demarcating these soils should re-excavation be deemed necessary at some point. The soils will be covered with topsoil and their location will be recorded, again to facilitate re-excavation if necessary.

In taking this action, RFFO recognizes, per the May 30, 1996, letter agreement governing this project, that use of the Tier I action level as a "putback" level is temporary, pending final resolution of the soil action level framework. RFFO also recognizes that if lower values are eventually agreed to as soil action levels, these soils may need to be removed and addressed in future remedial actions, consistent with the final soil action levels.

Consistent with our letter agreement of May 30, RFFO believes that this action is reasonable based upon the following:

• volatile organic contaminants, and not radionuclides, were the focus of this remedial action, and they have been successfully removed from the soils in question (these soils would not have been removed on the basis of radiological content alone);

• all soils proposed for return to the excavation conform to the proposed Tier I soil action limit;

• some immediate action is required to place the soils in a more stable configuration in order to minimize the need for ongoing management and to minimize the possibility of dispersal of the material;

• this action is cost effective as compared to on-site storage (estimated at $13,000 per month, primarily for rental of roll-off storage containers) and off-site disposal (estimated at $130,000, plus interim storage costs while awaiting shipment);

• this action poses no substantial environmental risk. Placing these soils back in the excavation and covering them with soil minimizes the likelihood of contaminant migration, and we regard this as an environmentally beneficial action as compared with storing the soil in a stockpile; and,

• should the decision ultimately be made to allow these soils to remain in the excavation, this will be consistent with anticipated land use. While the soils do contain somewhat higher levels of radionuclides than the other soils returned to the excavation, their radiological levels are below the proposed Tier I values for office worker and future residential exposure. Additionally, these soils contain lower radionuclide levels than are anticipated to remain following remediation at the nearby 903 Pad and Lip area.

The agreement of the Dispute Resolution Committee of August 22, 1996, was that put-back level decisions should be project specific, and made and explained within the decision documents associated with those actions. The agreement also specified that Decision factors to be considered include protectiveness and effectiveness, anticipated future land uses, contaminant levels in surrounding soils, and costs. Although agreement on specific put-back levels was agreed on May 30, we believe that we are also meeting the spirit of the August 22nd agreement.

I acknowledge your belief that due to the site specific conditions at Trench T3, that the contaminants being replaced above the Tier II levels may need to be revisited in the future. We are confident that the manner in which the soils are being replaced will not preclude such an action.

Thank you for your assistance in resolving this issue. Please call me at 966-4839 if you have any questions.

Sincerely,

Steve Slaten
RFCA Project Coordinator

Enclosures

cc w/o enc:
H. Roitman, CDPHE
C. Spreng, CDPHE
S. Tarlton, CDPHE
M. Dodson, USEPA Region VIII
L. Johnson, USEPA Region VIII
K. Korkia, Citizens' Advisory Board
D. Butterfield, RFLII
K. Schnoor, City of Broomfield
R. Lightner, EM-40, HQ
C. Gesalman, EM-40, HQ
J. Roberson, OOM, RFFO
K. Klein, OOM, RFFO
J. Legare, AMEC, RFFO
S. Olinger, PPI, RFFO
J. Rampe, PLD, RFFO
D. Lindsay, OCC, RFFO

14 August 1996

TELECOPY TRANSMITTAL

TO: Ann Sieben, fax x6406

FROM: Ann Tyson

SUBJECT: **Teleconference Minutes on Trench T-4 Remediation; 13 August 1996; 9:00 am**

Teleconference Members: Ann Sieben, Shaun Garner, Laura Brooks, John Rampe, Steve Slaten, Carl Spreng, Ann Tyson

The teleconference was conducted to discuss the status of the remediation of Trench T-4. Excavation had reached depths of approximately 20 to 21 feet in areas of the trench which was directed at removing a plume of trichloroethylene and tetrachlorethylene. On Monday, 12 August, two geologists confirmed excavation had encountered bedrock. In some areas of the trench, up three to five feet in depth of the bedrock had been excavated in an effort to remove the volatile organic contamination to the action levels stipulated in the PAM. To direct the excavation, the field crew had begun using head space analysis on excavated soils to determine whether sufficient contaminated soils had been excavated.

Two weeks ago when the limits of the former trench boundary had been encountered, the project manager expected that the volatile organic contaminated soils had been completely removed. However, when the confirmation samples were collected from the base of the trench, three areas within the trench failed to meet the cleanup values identified in the PAM. Excavation continued in the trench. When samples were collected again on the 7 August, the three sample grids failed for either trichloroethylene (TCE) and tetrachloroethylene (PCE). The results indicated concentrations at 100 ppm PCE and 30 ppm TCE. (A map of the trench and failed grids is attached.) Additional soils were excavated Thursday and Monday until it was confirmed that the depth of excavation had reached bedrock.

Due to safety concerns and limitations of the excavation equipment, the KH team expressed their decision to curtail the excavation as the PAM (March 28, 1996, Rev. 2) allows. On page 19, section 3.2, "excavation will continue until soil concentrations are below cleanup standards or excavation encounters bedrock or groundwater."

All parties (including DOE, EPA, and CDPHE) agreed with the curtailment of the trench excavation due to the circumstances. It was believed that the source material had been captured during the removal process. Although unavailable for the teleconference, Mr. Tim Rehder, EPA, had contacted Mr. John Rampe earlier in the morning to convey his

agreement to curtail excavation of Trench T-4 based on the circumstances. He concurred that the majority of the source material had been captured.

Samples were agreed to be collected of the targeted grids following the telephone conversation and analysis results would be transmitted to the conversation members as soon as the data was available. It was also agreed that the grid that exceeded the action level along the vertical wall of the trench would be excavated further to remove the contaminated material above the action level. Treated soils from Trench T-3 would be used to backfill Trench T-4 to achieve a safe configuration.

Analytical results from samples collected 13 and 14 August showed only one failed sample at 22 ppm TCE, and it was collected from the base of the trench. The cleanup value is 9.27 ppm.

If you have any questions regarding these minutes, please call me.

PAC REFERENCE NUMBER: NE-142.1 - NE-142.4

IHSS Reference Number: 142.1 - 142.4, Operable Unit 6

Unit Name: A-Series Drainage and Ponds (Ponds A-1, A-2, A-3, and A-4).

Approximate Location: N752,000; E2,088,000

Date(s) of Operation or Occurrence

From January 1954 to the present. Pond A-1 (designated Pond 1 until the early 1970s) was built in January 1954. The first release from Pond A-1 occurred on March 10, 1954. Pond A-2 was built in 1973, Pond A-3 in 1974, and Pond A-4 in 1979 (DOE, 1992).

Description of Operation or Occurrence

The use of the A-Series drainage has varied over the history of the RFP. The highlights of pond usage as summarized in the Historical Release Report (DOE, 1992) are given below.

- From at least July 1953, until 1957, discharges of Building 771 (PAC 700-143, Building 771 outfall) wastewater with low levels of radioactivity were routinely made to the A-Series drainage (above Pond A-1).

- In 1957 a pipeline was completed which allowed an option of releasing the Building 771 liquids to the Building 774 outfall south of Building 995 (the sanitary wastewater treatment plant) on the B-Series drainage (PAC NE-142.5 - NE-142.9). Due to equipment problems, periodic releases of Building 771 wastewater to the A-Series drainage were still made until 1965.

- The use of water passing through the A-Series drainage was modified from irrigation only to both irrigation and drinking water supply for Broomfield Heights in approximately late 1955.

- In 1970, two intercept trenches and pumps were installed between the Solar Ponds and the A-Series drainage to collect high nitrate seepage. During the 1970s, additional trenches, sumps, and pumps were added until a total of six trenches and two sumps were in existence.

- In the early 1970s, Pond A-1 and Pond A-2 were isolated from the rest of the A-Series drainage and became available for spill control and other waste management activities.

- In early 1971, remediation of contaminated soil at the Building 771 Outfall was underway. This activity is more fully discussed in PAC 700-143.

- From December 21, 1973, until the early 1980s, a pipeline allowed transfer of the water directly to Pond A-2 from Pond B-2. Untreated decontamination laundry wastewater was discharged to Pond B-2 and transferred to Pond A-2 during this period.

- On May 15, 1975, a fog evaporation system was placed in service on Pond A-2. The intent of this fog evaporation system was to increase the evaporative loss of water and thereby reduce the process wastewater inventory. At this same time, the only direct discharge to the A-drainage was steam condensate from the Building 774 Evaporator. Treated process waste could also be transferred to Pond A-2 from Pond B-2.

- The RFP received a National Pollutant Discharge Elimination System (NPDES) Permit on September 6, 1974. Pond A-3 discharges were included in this permit.

- The McKay Ditch routed water through the A-Series drainage until the fall of 1974. In the fall of 1974, a bypass was constructed, allowing the water to be transferred around the portion of the A-Series drainage that is immediately adjacent to the RFP. This bypass routed the ditch around the locations of the A-Series Ponds. This change decreased the possibility of contaminating McKay Ditch flow with nitrate or other RFP contaminants.

- The system of six trenches and two sumps near the solar ponds was replaced with a more extensive groundwater and seepage collection system in 1981. At this time, the six previously constructed trenches, sumps, and related pumps were abandoned in place.

Physical/Chemical Description of Constituents Released

The general types of materials that have been directly or indirectly released to the A-series drainage (these are non-emergency and non-spill related) during the history of the RFP include: untreated wastewater from Building 771, cooling tower and roof drain water from Building 774, Building 774 evaporator condensate water, and footing drain flows. The Building 771 wastewater was primarily composed of decontamination laundry wastewater, but it also contained water from the analytical laboratory, radiography operations, personnel decontamination room, and runoff. Building 771 waste discharged to a storm drain north (PAC 700-143) and west of Building 771 which flowed to the A-Series drainage. In 1971, it was stated that the Building 774 evaporator condensate drain typically released 20,000 gallons per day of water at 100 dpm/l, with 5 parts per million (milligrams per liter) of nitrate (DOE, 1992). The following table presents information on operational problems and NPDES Permit exceedances experienced in the A-Series drainage. The typical response to these problems was appropriate action to prevent the recurrence of the problem. In 1973, it was estimated that 14 microcuries (mCi) of plutonium was present in Pond A-1 sediment (DOE, 1992).

OPERATIONAL PROBLEMS OR NPDES PERMIT EXCEEDANCES A-SERIES DRAINAGE AND PONDS (excerpt from DOE, 1992)

Date	Problem	Cause
1970/1971	High nitrate concentrations in Walnut Creek from Pond A-1	Nitrate seepage from solar pond area
1972/1973	Contamination in Pond A-1 sediment to at least 975 dpm/g	Discharges of waste into the A-Series drainage
April 1973	6 - 10 tons of nitrate leached to drainage	High water flows leaching nitrate from soil north of the solar ponds
April/May 1974	Release of Building 774 footing drain water to drainage. Analyses of this water indicate elevated nitrate and tritium concentrations[22,23]	Construction and corrosion of a drain that was supposed to be out of service
June 1979	Rhodamine WT dye colored water red in Ponds A-1, A-2, and A-3	Rhodamine WT dye was introduced into Building 371 footing drains
May 1981	Water flowing to A-3 at 120 mg/l of nitrate	Overflow pipe in new ITPH* system discharging water direct to drainage
June 1981	Nitrate concentrations above the 10 mg/l limit in Pond A-3	Heavy rainfall (1.3") causing runoff of nitrate contamination
June 1981	Cooling tower cleaning from Building 373 leaked into drainage. Phosphate compounds were added to cooling tower but were not detected in cooling tower water or in water from Pond A-3	Leakage through a soil dike
July 1981	Nitrate concentrations up to 21 mg/l were identified in drainage water	The new ITPH system was not sufficiently effective
October 1984	Runoff from West Spray Field entered McKay Ditch and bypassed the RFP NPDES discharge points	Excessive application of liquids to West Spray Field
September 1989	Leakage from a pump into Pond A-4 - no other details given	Pump leakage

* ITPH is the Interceptor Trench Pump House System which consists of french drains, a sump, and an interceptor trench that collects groundwater, footing drain flow, and surface water runoff.
See PAC 000-101(the Solar Evaporation Ponds) for a more complete discussion of the ITPH System (DOE, 1992).

Responses to Operation or Occurrence

The recurring problem with the A-Series drainage has been high nitrate concentrations in the water leaving the plant. In response to this problem, a series of trenches and pumps to collect contaminated groundwater and seepage was constructed between the Solar Ponds (PAC 000-101) and the A-Series Drainage (DOE, 1992).

Other response actions to contamination in the A-Series drainage included the removal of contamination near the Building 771 outfall (PAC 700-143), the re-routing of discharges to other facilities, and the elimination of flows from Building 774 (DOE, 1992).

Fate of Constituents Released to Environment

No documentation was found which detailed the fate of the constituents released to the environment (DOE, 1992). This IHSS was studied as part of OU6, Walnut Creek Priority Drainage (DOE, 1996a).

Action/No Further Action Recommendation

As documented in the Phase I RFI/RI Report for OU6 (DOE, 1996a), IHSS 142.4 (i.e., Pond A-4) (PAC NE-142.4) was removed from further evaluation in the HHRA because concentrations did not exceed criteria established in the CDPHE screen. Based on this conclusion, IHSS 142.4 (PAC NE-142.4) is recommended for no further action. IHSSs 142.1, 142.2, and 142.3 (i.e., Ponds A-1, A-2, and A-3) were evaluated in the HHRA for OU6 as Area of Concern (AOC) Number 3. The AOC was defined because these ponds all have similar chemical constituents in the pond sediment and are all in the North Walnut Creek Drainage. Further, these ponds are hydrologically connected and form a logical AOC. The results of the HHRA for the AOC showed that for all current and future onsite receptors the cumulative hazard indices for noncarcinogenic health effects are 0.03 or less therefore no adverse noncancer health effects are expected under the exposure conditions evaluated. For all current and future onsite receptors the excess lifetime cancer risk was estimated at 1E-06 or less, indicating negligible risk to these receptors (DOE, 1996a).

IHSSs 142.1, 142.2, 142.3 and 142.4 (A-Ponds) were considered a source area in the Ecological Risk Assessment (ERA) for the Walnut Creek Watershed (DOE, 1996a). The results of the ERA indicate the following:

- Metals and organics (primarily polynuclear aromatic hydrocarbons) in A-Pond sediments is noted with respect to the aquatic life receptor group. However, conclusions state that risks are primarily due to PAHs in the sediments, no toxicity was detected in the sediment toxicity tests with *Hyalella azteca.*.

- Aroclor-1254 in pond sediments is noted with respect to the aquatic-feeding birds receptor group. However, conclusions indicate that Aroclor-1254 concentrations in A-Pond sediments did not exceed the risk-based criteria developed for sediment at RFETS.

- Mercury in A-Pond sediments is noted with respect to the aquatic-feeding birds receptor group. However, conclusions do not indicate that mercury in A-Pond sediments is an ecological risk factor.

- Di-n-butyl phthalate is noted with respect to the aquatic-feeding birds receptor group. However, conclusions indicate that all detectable concentrations of this contaminant were estimated values; only one sample corresponded to a hazard quotient of greater than 1 (i.e., HQ = 2); and that di-n-butyl phthalate does not appear to represent risk to herons or

mallards.

- Chromium, lead, mercury, and vanadium are noted with respect to the terrestrial-feeding raptors receptor group. The conclusions noted that the source of chromium and lead is unclear; however, risks are possible to individual birds feeding in the area but are minimal with respect to the population at RFETS. The conclusions also noted that mercury and vanadium detections were at a low frequency and the associated risk appeared minimal.

The human health estimates support the recommendation for no further action and are consistent with the criteria for recommending no further action decisions presented in RFCA (DOE, 1996b). The results of the ERA do not indicate a substantial and definitive risk to ecologic receptors. IHSSs 142.1, 142.2, 142.3 and 142.4 are proposed for no further action. The OU6 Corrective Action Decision/Record of Decision, which is presently being prepared, is expected to be consistent with this recommendation.

Comments

This PAC is indicated on the maps as only the drainage ponds, but it is considered to include the drainages upstream and downstream of the ponds. Downstream of the ponds, the PAC continues to the RFP boundary. Beyond the RFP boundary the drainage becomes IHSS 200 (Offsite Releases), (DOE, 1992).

Studies have shown that the A-Series ponds have performed their design function, i.e., to provide residence time and holding capacity for spills and sedimentation of suspended material. However, some of the stream and pond sediments have become contaminated in the process. Data are primarily available regarding radioactive contamination of the sediments.

A considerable amount of analytical data has been generated for the A-Series Drainage. These data primarily address radioactivity and nitrate concentrations in the terminal pond on the A-Series Drainage (which has varied with time), but other limited data are available. These data are found in the monthly reports, highlights, and laboratory analytical reports of the RFP groups responsible for operation of the A-Series Drainage (DOE, 1992).

References

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1996a, *Final Phase I RFI/RI Report Walnut Creek Priority Drainage, Operable Unit 6*, RF/ER-95-0119.UN, Rev 0. Rocky Flats Environmental Technology Site, Golden, CO, February.

DOE, 1996b, *Final Rocky Flats Cleanup Agreement*, Department of Energy, Rocky Flats Environmental Technology Site, Golden, CO, July.

PAC REFERENCE NUMBER: NE-142.5 - NE-142.9

IHSS Reference Number: 142.5 - 142.9, Operable Unit 6

Unit Name: B-Series Drainage Ponds (Ponds B-1, B-2, B-3, B-4, and B-5).

Approximate Location: N750,500; E2,087,000

Date(s) of Operation or Occurrence

The RFP began use of the B-Series drainage immediately upon opening of the plant. Until the early 1970s, most drainage ponds at the RFP were identified by strictly numeric designations. In the early 1970s, an alphanumeric identification system was implemented. The following table lists the current pond designations, the earlier numeric designations and dates of pond construction (DOE, 1992).

TABLE NE-142.5/142/9-1
B-SERIES POND CONSTRUCTION DATE AND DESIGNATIONS (excerpt from DOE, 1992)

Original Pond Number	Current Designation	Date of Construction
2	Pond B-1	November 1962
3	Pond B-2	July 1953
4	Pond B-3	July 1953
5	Pond B-4	Before July 1953
Not Applicable	Pond B-5	1979

Description of Operation or Occurrence

The following details the highlights and major changes in B-series pond use as summarized in the Historical Release Report (DOE, 1992).

- The original pond on the B-series drainage (Pond B-4) operated as a flow-through detention pond. Building 995 (RFP sanitary wastewater treatment plant) discharged to South Walnut Creek upstream from the pond.

- After July 1953, the three detention ponds (Pond B-2, Pond B-3, and Pond B-4) operated as a series of flow-through detention ponds. Building 995, the sanitary wastewater treatment plant, discharged upstream of Pond B-2.

- After November 1962, the four detention ponds (Ponds B-1 through B-4) operated as a series of flow-through detention ponds. Building 995 discharged water upstream of Pond B-1.

- An evaporator with a nominal capacity of 150 gallons per hour was installed in Building 774 in 1966. This evaporator was to process all high nitrate wastes. Use of this evaporator decreased the quantities of treated process effluent requiring discharge to the B-Series Drainage. The Building 774 Evaporator operated only a short time after Building 374 began operations in the late 1970s.

- In 1968, a ten-inch bypass line was installed around Pond B-1, Pond B-2 and Pond B-3 providing the ability to divert flows into or around selected B-series ponds. This pipe normally discharges its flows into Pond B-4.

- From 1971 to 1973, pond reconstruction activities took place upstream of Pond B-1. The dams of Pond B-1, Pond B-2, Pond B-3 and Pond C-1 were upgraded during this general time-frame.

- From December 21, 1973, until the early 1980s, laundry water was discharged to Pond B-2 which was no longer operated as a flow-through pond. A pipeline allowed transfer of the water directly to Pond A-2 from Pond B-2. Pond A-2 was also isolated from the remainder of the A-Series drainage.

- In December 1978, Ponds B-1 and B-2 were isolated from the South Walnut Creek drainage. These ponds were no longer flow-through ponds, and could be used for spill control. Building 995 now discharged water to Pond B-3.

- In 1979, Pond B-5 was completed on the South Walnut Creek Drainage to provide adequate capacity for storm-water control.

- From 1979 to 1983, there were no discharges from the B-Series Drainage to off-site areas because excess waters were eliminated through spray evaporation.

- From 1983 to 1989, there were intermittent discharges from the B-Series drainage. These discharges from the B-series drainage passed through Pond B-5, with Building 995 discharges flowing through Pond B-3, Pond B-4, and Pond B-5.

- From 1979 to the present, storm-water flow was diverted around Pond B-1, Pond B-2 and Pond B-3. Storm-water flowed to Pond B-4 which discharged to Pond B-5.

- In 1990, a new pipeline was built to allow transfer of water from Pond B-5 to Pond A-4 for treatment and subsequent discharge.

Physical/Chemical Description of Constituents Released

The major component of RFP discharges to the B-series drainage throughout the history of the plant has been treated sanitary effluent discharged from the sanitary wastewater treatment plant

(Building 995). However, at various times, other materials have been released directly to the B-Series drainage or B-Series ponds (DOE, 1992).

The general types of materials that have been routinely released to the B-Series drainage during the history of the RFP include: treated sanitary effluent, treated and untreated process waste, treated and untreated decontamination laundry wastewater, cooling tower blowdown, footing drain flows and storm-water runoff (DOE, 1992). The time-frames for discharge of each of these materials as summarized in the Historical Release Report (DOE, 1992) are given below.

- Sanitary wastewater treatment plant effluent has been discharged from plant inception to present. This water has been discharged to various B-series ponds. From 1979 until 1983, there were no discharges offsite from the B-Series Drainage. Since 1989, water from the B-Series Drainage has been transferred to Pond A-4, and released to the Upper Church Ditch or to Broomfield Diversion Ditch. These ditches route the water around Great Western Reservoir.

- Process waste:

  - Treated process waste from Building 774 was discharged to Pond B-2 from an outlet below Building 995 from at least July 1953 until the early 1980s. These flows included treated decontamination laundry wastewater.

  - Untreated process waste from Building 774 was discharged to Pond B-2 from an outlet below Building 995 from at least July 1953 until January 1954. It is believed that this untreated water was primarily decontamination laundry wastewater.

- Decontamination laundry wastewater was discharged to the B-Series Ponds from a number of buildings:

  - Untreated laundry wastewater from Building 771 was discharged from at least July 1953 until 1965. This water was discharged to Pond B-2 from an outlet below Building 995 and may have included waste from the Building 771 analytical laboratory, radiography sinks, personnel decontamination room, and runoff.

  - Untreated laundry wastewater was discharged to Pond B-2 from Building 778 from December 21, 1973 until 1980. This pond was isolated from the remainder of the B-series drainage. A pipeline allowed transfer of the water directly to Pond A-2 from B-2.

  - Untreated laundry wastewater from the Building 442 laundry.

  - Untreated laundry wastewater from the Building 881 laundry.

- Footing drains have discharged water to the B-Series drainage from plant inception to the present.

- Storm-water flows have discharged to the B-series drainage from the inception of the plant to the present. The storm-water flows that enter the B-Series drainage are from the central portion of the plant. These storm-water flows are normally routed to Pond B-4 and then to Pond B-5 where the water is impounded prior to controlled off-site discharge.

A sediment study conducted by Colorado State University (CSU) resulted in data that indicated radioactive contamination of sediments in the B-Series drainage. Pond reconstruction activities in 1971 to 1973 were found to cause re-suspension and downstream migration of contaminated sediment. This caused the inventory of plutonium in Pond B-1 sediment to increase from 0.085 curies in 1971 to 2.9 curies in 1973. Plutonium activity in Pond B-1 sediment in June 1973 varied from 10 to 502 picocuries per gram (pCi/g) of dry sediment based on the CSU sampling (DOE, 1992).

An RFP study completed in June 1973 indicated radioactive contamination of sediments upstream from the drainage ponds. This study found an average activity concentration of 40 dpm/g from the "west culvert" (the culvert west of the Building 995 outfall) to the "east culvert" (the culvert immediately east of the Building 995 outfall). The area of contaminated soil/sediment was estimated to cover an area approximately 650 feet in length with an estimated width of 6 feet (DOE, 1992).

On December 3 and 4, 1978, a bulk caustic storage tank leaked sodium hydroxide which flowed eastward in the Central Avenue Ditch (PAC 000-190). The sodium hydroxide was diverted to Pond B-1 for temporary holding (DOE, 1992).

On September 26, 1979, a steam condensate line break in the Building 707 area occurred (PAC 700-194). This break allowed the steam condensate to reach Pond B-4 and South Walnut Creek below Pond B-4 (DOE, 1992).

On December 2, 1980, approximately 155 gallons of a 25% solution of ethylene glycol (antifreeze) was discharged to the B-Series drainage (PAC 000-192), (DOE, 1992).

A release of chromic acid to Pond B-3 by discharge through the sewage treatment plant (Building 995) occurred on February 22 and 23, 1989. It is believed that approximately 30 pounds of chromium reached Building 995, but that approximately 4.7 pounds of chromium were released by Building 995 to Pond B-3. The water from Pond B-3 was then sprayed on the East Spray Fields (PAC NE-216.1 - NE-216.3) and some of the Pond B-3 water reached Pond B-5. This release of chromic acid was reported in a RCRA Contingency Plan Implementation Report (Number 89-001), (DOE, 1992).

The Sanitary Sewer System discussion (PAC 000-500) has additional information on materials released to the sanitary sewer system that may have had some impact on the B-Series drainage (DOE, 1992).

Responses to Operation or Occurrence

Prior to the NPDES permit system (1974), action was taken in response to the exceedance of guidelines or standards established for RFP discharges by either the AEC or by the operating contractor for AEC. The standards that were adopted were often standards or guidelines of outside agencies such as the U.S. Public Health Service (DOE, 1992).

In response to the identification of plutonium contamination in the sediments of the drainages in 1973, a study was conducted to ascertain the source of the plutonium contamination present in the B-Series drainage. This study indicated that approximately 88% of the total activity released by Building 995 was due to the release of laundry decontamination water to the sanitary sewer. After December 21, 1973, laundry water was only discharged to Pond B-2 which could also be pumped to Pond A-2. In the fall and winter of 1973, removal operations for contaminated soil were being conducted in the stream bed below the Building 995 outfall (DOE, 1992).

Following the implementation of the NPDES Permit system at the RFP, responses to permit exceedances were structured so that the applicable discharge limits would be met for future discharges. Materials released in an NPDES permit exceedance were typically not addressed by any sort of collection or treatment response action. The Historical Release Report (DOE, 1992) details the NPDES permit exceedances for the B-series drainage at the Rocky Flats Plant.

The response to the 1979 sodium hydroxide spill was to divert it to Pond B-1, neutralize the water in B-1 with alum, and then pump the liquid to Solar Pond 207B-North. See PAC 000-190 narrative for a more complete discussion on these response activities (DOE, 1992).

In response to the September 26, 1979 steam condensate release (PAC 700-194) valve settings were changed so that most of the water was routed to Pond B-1 where it was impounded. Sampling of the pond and drainage waters was also conducted. Results indicated tritium activity concentrations of up to 926 pCi/l in Pond B-4, and 24 hour composite samples at Walnut Creek at Indiana Street of 1,163 pCi/l for September 26, and 700 pCi/l for September 27 (DOE, 1992).

In response to the December 2, 1980 antifreeze spill (PAC 000-192), all flow upstream of the B-Series drainage was routed to Pond B-1. An additional 5,000 gallons of water was used to flush the system to Pond B-1 (DOE, 1992).

In the early 1980s, actions were taken at Pond B-5 to reduce the potential for off-site movement of contaminated sediments. The discharge structure for this pond was modified by adding a vertical standpipe and a perforated pipe along the bottom of the pond surrounded by granular material. Some sediments present in Pond B-5 were also removed from the drainage and deposited in the Soil Dump Area in the northeast buffer zone discussed as PAC NE-156.2. These activities helped to minimize off-site transport of contaminated sediments (DOE, 1992).

In response to leaching of contaminants out of pondcrete, which led to the presence of contaminants in the B-Series Drainage, two RCRA Contingency Plan Implementation Reports, 88-001 and 88-002, were filed. These events are more fully discussed in PAC 900-213 (DOE, 1992).

In response to the 1989 release of chromic acid, a RCRA Contingency Plan Implementation Report (89-001) was submitted to the EPA. In addition to this, surface water and soil sampling was conducted. The analytical results for these samples indicated that, in general, the drainage ponds had chromium concentrations below the drinking water standard of 0.05 milligrams per liter (mg/l). Although a number of the initial water samples exceeded the drinking water standard for chromium, later samples verified that the chromium concentration had decreased to below the drinking water standard. Analysis of soil samples indicated that the concentrations of leachable chromium were far below the RCRA Extraction Procedure Toxicity limits (DOE, 1992).

In 1990, a pipeline was built from Pond B-5 to Pond A-4 in order to allow transfer of water to Pond A-4 for treatment. Since the construction of this pipeline, the B-Series ponds have only discharged through Pond A-4 following treatment. Prior to construction of this pipeline, treatment had taken place at the terminal pond of each drainage leaving the RFP (Pond A-4, Pond B-5, and Pond C-2). Centralized treatment of the water is now conducted at Pond A-4. The treatment consists of pre-filtration of the water followed by treatment in two activated carbon tanks in series. This action was taken in response to the identification of low concentrations of atrazine, an herbicide, in waters discharged from the RFP (DOE, 1992).

Fate of Constituents Released to Environment

No documentation was found which detailed the fate of constituents released to the environment (DOE, 1992). This IHSS was studied as part of OU6, Walnut Creek Priority Drainage (DOE 1996a).

Action/No Further Action Recommendation

As documented in the Phase I RFI/RI Report for OU6 (DOE, 1996a), IHSS 142.9 (Pond B-5) (PAC NE-142.9) was removed from further evaluation in the HHRA because concentrations did not exceed criteria established in the CDPHE screen. Based on this conclusion, IHSS 142.9 (PAC NE-142.9) is recommended for no further action. IHSSs 142.5, 142.6, 142.7, and 142.8 (i.e., Ponds B-1, B-2, B-3 and B-4) were evaluated in the HHRA for OU6 as Area of Concern (AOC) number 4. The AOC was defined because these ponds all have similar chemical constituents in the pond sediment and are all in the South Walnut Creek Drainage. Further, these ponds are hydrologically connected and form a logical AOC. The results of the HHRA for the AOC showed that for all current and future onsite receptors the cumulative hazard indices for non-carcinogenic health effects are 0.1 or less therefore no adverse non-cancer health effects are expected under the exposure conditions evaluated. For all current and future onsite receptors the excess lifetime cancer risk was estimated at 6E-06 which indicates risk to these receptors is within the EPA target range of 1E-06 to 1E-04 (DOE, 1996a).

IHSSs 142.5, 142.6, 142.7, 142.8, and 142.9 (B-Ponds) were considered a source area in the Ecological Risk Assessment (ERA) for the Walnut Creek Watershed (DOE, 1996a). The results of the ERA indicate the following:

- Metals and organics (primarily polynuclear aromatic hydrocarbons) in B-Pond sediments are noted with respect to the aquatic life receptor group. However, conclusions state that risks are primarily due to PAHs in the sediments, no toxicity was detected in the sediment toxicity tests with *Hyalella azteca.*

- Aroclor-1254 in pond sediments is noted with respect to the aquatic-feeding birds receptor group. However, conclusions indicate that Aroclor-1254 concentrations in B-Pond sediments exceed the risk-based criteria only if top aquatic predators were present. The B-Ponds currently do not support this type of community.

- Mercury in B-Pond sediments is noted with respect to the aquatic-feeding birds receptor group. Mercury was detected in 75% of fish from B-Ponds. The maximum concentration was detected in B-5, which has the lowest contaminant content. The maximum hazard quotient was 2. The ERA concludes that mercury concentrations do not appear to represent a risk to herons.

- Di-n-butyl phthalate is noted with respect to the aquatic-feeding birds receptor group. However, conclusions indicate that all detectable concentrations of this contaminant were estimated values; only one sample corresponded to a hazard quotient of greater than 1 (i.e., HQ = 2); and that di-n-butyl phthalate does not appear to represent a risk to herons or mallards.

- Chromium, lead, mercury, and vanadium are noted with respect to the terrestrial-feeding raptors receptor group. The conclusions noted that the source of chromium and lead is unclear; however, risk are possible to individual birds feeding in the area but minimal with respect to the population at RFETS. The conclusions also noted that mercury and vanadium detections were at a low frequency and the associated risk appeared minimal.

The human health risk evaluation supports the recommendation for no further action and is consistent with the criteria for recommending no further action decisions presented in RFCA. The results of the ERA do not indicate a substantial and definitive risk to ecologic receptors (DOE, 1996a). IHSSs 142.5, 142.6, 142.7, 142.8, and 142.9 are proposed for no further action. The OU6 Corrective Action Decision/Record of Decision, which is presently being prepared, is expected to be consistent with this recommendation.

Comments

None

References

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1996a, *Final Phase I RFI/RI Report Walnut Creek Priority Drainage, Operable Unit 6*, RF/ER-95-0119.UN, Rev 0. Rocky Flats Environmental Technology Site, Golden, CO, February.

DOE, 1996b, *Final Rocky Flats Cleanup Agreement*, Department of Energy, Rocky Flats Environmental Technology Site, Golden, CO, July.

PAC REFERENCE NUMBER: NE-156.2

IHSS Reference Number: 156.2, Operable Unit 6

Unit Name: Soil Dump Area (between the A-Series and B-Series Drainages)

Approximate Location: N751,000; E2,087,000

Date(s) of Operation or Occurrence

1968 - 1973

Description of Operation or Occurrence

An area immediately north of Pond B-1 (PAC NE-142.5) and between the A-Series drainage and B-Series drainage was used for the dumping of soil. The possible sources of the soil disposed of in this area are listed below.

- Soil excavated for a multiple building construction project (Part V) may have been placed in this area in the late 1960s.
- Sediments removed from the Pond B-5 discharge outlet modification activities were also placed in this general area.

RCRA 3004(u) identified this area as a soil disposal location from construction activities at Building 774. The RCRA 3004(u) document is considered to be in error on this point (DOE, 1992).

Physical/Chemical Description of Constituents Released

No documentation was found that contained analyses of the soil from the Part V project or from the Pond B-5 modification work (DOE, 1992).

Responses to Operation or Occurrence

No documentation was found which detailed responses to this occurrence (DOE, 1992). This IHSS was studied as part of OU6, Walnut Creek Priority Drainage (DOE, 1996a).

Fate of Constituents Released to Environment

No documentation was found which detailed the fate of constituents released to the environment (DOE, 1992). This IHSS was studied in accordance with the IAG schedule for OU6 (DOE, 1996a).

Action/No Further Action Recommendation

As documented in the OU6 RFI/RI Report, IHSS 156.2 (PAC NE-156.2) was grouped with IHSSs 165 (PAC 900-165) and 141 (900-141) as an Area of Concern (AOC) based on the results of the CDPHE conservative screen for purposes of the Human Health Risk Assessment (HHRA). These sources form a logical AOC because they are in close proximity and have chemical constituents in the same media (DOE, 1996a). The results of the HHRA for the AOC showed that for all current and future onsite receptors the cumulative hazard indices for non-carcinogenic health effects are 0.01 or less therefore no adverse non-cancer health effects are expected under the exposure conditions evaluated. For all current and future onsite receptors the excess lifetime cancer risk was estimated at 4E-07 indicating negligible risk. Additionally, results of the Ecological Risk Assessment for the Walnut Creek Watershed did not indicate that IHSS 156.2 was a source area (DOE, 1996a). IHSS 156.2 (PAC NE-156.2) is proposed for no further action. The recommendation for no further action is consistent with the criteria for recommending no further action decisions presented in RFCA (DOE, 1996b). The OU6 Corrective Action Decision/Record of Decision, which is under preparation, is expected to be consistent with this recommendation.

Comments

None.

References

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1996a, *Final Phase I RFI/RI Report Walnut Creek Priority Drainage, Operable Unit 6*, RF/ER-95-0119.UN, Rev 0. Rocky Flats Environmental Technology Site, Golden, CO, February.

DOE, 1996b, *Final Rocky Flats Cleanup Agreement*, Department of Energy, Rocky Flats Environmental Technology Site, Golden, CO, July.

PAC REFERENCE NUMBER: NE-167.1

IHSS Reference Number: 167.1, Operable Unit 6

Unit Name: Landfill Spray Fields (North Area - 167.1)

Approximate Location: N753,000; E2,084,000

Date(s) of Operation or Occurrence

Spray evaporation at the North Spray Field began in approximately May 1974 and ceased no later than May 1981, when the landfill was expanded and the West Landfill Pond (also known as Landfill Pond 1 or the Leachate Collection Pond) was buried (DOE, 1992).

Description of Operation or Occurrence

Spray evaporation was conducted near the landfill to prevent the release of waters from the landfill ponds. These ponds were intended to protect surface water and groundwater in the vicinity of the landfill. The west pond was constructed to impound any leachate generated by the landfill. The East Pond was built to catch any overflow from the West Pond and to intercept groundwater (if necessary), and surface runoff (DOE, 1992).

Spray evaporation water in the North Spray Field originated from the West Landfill Pond. The North Spray Field covered an area of approximately three acres with the dimensions of approximately 280 feet by 480 feet (DOE, 1992).

Water from Building 771 and Building 774 footing drains was also applied to land north of the landfill. This water was collected from the Building 771 and Building 774 outfall pond, trucked out to the landfill area, and then sprinkled from the truck onto the North Spray Field area. After March 1975, the Building 771 and Building 774 footing drain water was no longer sprayed or spread at the landfill area because of "damage to the landscape" (DOE, 1992).

Prior to spraying activities, water to be sprayed was analyzed to ensure that the Rocky Flats Plant criteria for spraying were met. Similarly, the water present in the East and West Landfill Ponds was also routinely monitored regardless of spray evaporation activities (DOE, 1992).

Physical/Chemical Description of Constituents Released

Spray evaporation activities at the North Spray Field were monitored to prevent environmental degradation. Table NE-167.1-1 details the characteristics of the west landfill pond waters prior to the start of spray evaporation, and the self-imposed standards for spraying. Average tritium concentrations and volumes of water sprayed for the North Spray Field are shown in Table NE-167.1-2.

The source of spray evaporation water listed above was either water from the landfill pond, water collected from the Building 771 and Building 774 footing drain pond, or a combination of both. The data pertain to the water which was actually applied to the spray field. Much more data for a number of different analytes is presented in the Present Landfill Closure Plan. These data were developed from analysis of east landfill pond waters regardless of whether spraying operations were being conducted. Baseline analyses of soil samples collected in the north spray field area (prior to evaporation activities) are given in Table NE-167.1-3 (DOE, 1992).

TABLE NE-167.1-1
LIMITS AND TYPICAL CONCENTRATIONS OF SELECTED CONTAMINANTS APPLIED TO NORTH LANDFILL SPRAY FIELD (excerpt from DOE, 1992)

COMPOUND	TYPICAL CONCENTRATION	LIMIT FOR SPRAYING
Phenol	200 ppb	500 ppb
Tritium	5,000 pCi/l	100,000 pCi/l
Strontium 90	5 pCi/l	25 pCi/l
Plutonium	5 pCi/l	20 pCi/l
Americium	100 pCi/l above background	200 pCi/l above background
Total Long-Lived Alpha	200 pCi/l	400 pCi/l
Nitrate	100 mg/l	200 mg/l

TABLE NE-167.1-2
WATER VOLUMES AND TRITIUM CONCENTRATIONS APPLIED TO NORTH LANDFILL SPRAY FIELD (excerpt from DOE, 1992)

DATE	AVERAGE TRITIUM RADIOACTIVITY CONCENTRATION (pCi/l)	VOLUME SPRAYED (gallons)
May 1974	5,300	51,600
June 1974	26,000	160,000
August 1974	26,000	36,000
October 1974	20,200	83,000
March 1975	950	242,200
May 1975	1,270	140,600
June 1975	950	319,500
November 1975	1,600	21,400
March 1976	Not Available	56,100

TABLE NE-167.1-3
NORTH LANDFILL SPRAY FIELD BASELINE SOIL CONCENTRATIONS PRIOR TO SPRAYING (excerpted from DOE, 1992)

SAMPLE NUMBER	PHENOL (ppb)	STRONTIUM 90 (pCi/l)	PLUTONIUM (dpm/g)	NITRATE (mg/l)
1	60	1.04	0.39	300
2	120	0.83	0.24	330
3	50	0.84	0.26	240
4	170	0.76	0.21	260
5	120	0.68	0.25	270
6	50	0.50	0.21	250

Responses to Operation or Occurrence

Operation of the North Landfill Spray Field ceased by May 1981 when the West Landfill Pond was buried beneath landfill waste due to the expansion of the landfill boundaries to the east (DOE, 1992).

Fate of Constituents Released to Environment

No documentation was found which detailed the fate of constituents released to the environment (DOE, 1992). This IHSS was studied as part of OU6, Walnut Creek Priority Drainage (DOE, 1996a).

Action/No Further Action Recommendation

As documented in the OU6 RFI/RI Report, IHSS 167.1 (PAC NE-167.1) was identified as an Area of Concern (AOC) based on the results of the CDPHE conservative screen for purposes of the Human Health Risk Assessment (HHRA). This IHSS source formed a logical AOC because it is isolated from the other chemical source areas within OU6 (DOE, 1996a). The results of the HHRA for the AOC showed that for all current and future onsite receptors the cumulative hazard indices for non-carcinogenic health effects are 0.01 or less therefore no adverse non-cancer health effects are expected under the exposure conditions evaluated. For all current and future onsite receptors the excess lifetime cancer risk was estimated at 5E-08 indicating negligible risk (DOE, 1996a). Additionally, results of the Ecological Risk Assessment for the Walnut Creek Watershed indicated that barium concentrations detected within IHSS 167.1 would pose negligible risks to the small mammal receptor group (DOE, 1996a). IHSS 167.1 (PAC NE-167.1) is proposed for no further action. This recommendation is consistent with the criteria for recommending no further action decisions presented in RFCA (DOE, 1996b).

The OU6 Corrective Action Decision/Record of Decision, which is under preparation, is expected to be consistent with this recommendation.

Comments

None.

References

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1996a, *Final Phase I RFI/RI Report Walnut Creek Priority Drainage, Operable Unit 6*, RF/ER-95-0119.UN, Rev 0. Rocky Flats Environmental Technology Site, Golden, CO, February.

DOE, 1996b, *Final Rocky Flats Cleanup Agreement*, Department of Energy, Rocky Flats Environmental Technology Site, Golden, CO, July.

PAC REFERENCE NUMBER: NE-216.2 & NE-216.3

IHSS Reference Number: 216.2 & 216.3, Buffer Zone Operable Unit

Unit Name: East Spray Fields, (Center and South Areas)

Approximate Location: N750,000; E2,089,000

Date(s) of Operation or Occurrence

The general dates of operation for the East Spray Fields (center and south) were from 1979 to 1990. For specific portions of the East Spray Fields the dates of operation were:

PAC NE-216.2 - Center Area: 1979 to the early 1980s, and
PAC NE-216.3 - South Area: early 1980s to 1990.

Description of Operation or Occurrence

IHSS 216.2 (PAC NE-216.2) is located immediately north of the East Access Road and was only operated for a few years until it was closed due to erosion and soil slumping problems on hillsides near the spray field. IHSS 216.3 (PAC NE-216.3) was a considerably larger spray field located immediately south of the East Access Road and was operated for a period of approximately 10 years (DOE, 1992). The northernmost spray field, IHSS 216.1, (PAC NE-216.1) was proposed for No Further Action Based upon risk calculations in the First Annual Update to the Historical Release Report (HRR), (DOE,1996).

Spray irrigation of Pond B-3 water was initiated in 1979 as an action to achieve zero off-site discharge of sanitary effluent from the Rocky Flats Plant. Water from Pond B-3, which receives treated sanitary wastewater flows, was applied to these spray fields. This activity was allowed in the NPDES Permit of May 1981 (DOE, 1992).

For spray irrigation at the East Spray Fields, water was pumped from Pond B-3 and spray irrigated on the nearby land. Gasoline-driven pumps and a series of laterals and sprinkler nozzles distributed the water to the ground surface for evaporation and infiltration into the subsurface. It is estimated that during spray irrigation activities, up to 20 million gallons per year of water was disposed in this manner. When used, the spray system often saturated the soils near the spray fields, leading to overland flow of the sprayed effluent into the detention ponds (DOE, 1992).

Direct runoff of spray-irrigated water from the south portion of the East Spray Field into Woman Creek was observed on March 2, 1987. The direct runoff constituted a technical NPDES violation since the point of discharge to Woman Creek was not an NPDES permitted discharge point (DOE, 1992). A second incident occurred following a spill of chromic acid in Building 444 on February 22, 1989. This chromic acid was inadvertently pumped to the sanitary sewer system and it was estimated that 4.7 pounds of chromium was discharged to Pond B-3. The water from

this pond was then spray irrigated on the North and South portions of the East Spray Fields. Some of the runoff from the north portion of the East Spray Field was collected in Pond B-5 requiring the submittal of a RCRA Contingency Plan Implementation Report (CPIR Number 89-001), (DOE, 1992).

Physical/Chemical Description of Constituents Released

The analyses of treated sanitary effluent discharged to Pond B-3 and actual analysis of the pond water is representative of the waters applied to the East Spray Fields. The analytical data for treated sanitary effluent discharges to Pond B-3 are presented on a monthly basis in the "Rocky Flats Plant Monthly Environmental Monitoring Report," and summarized annually in the "Rocky Flats Plant Annual Environmental Monitoring Report." The chemical analytes for which data are presented in these reports consist of: pH, five day biochemical oxygen demand, total suspended solids, nitrate as nitrogen, total chromium, total phosphorus, total residual chlorine, fecal coliform, and, in more recent years, oil and grease. Dates of application and volumes of water applied to the East Spray Fields are maintained by the Rocky Flats Utilities Department.

Responses to Operation or Occurrence

In response to the NPDES technical violation of March 2, 1987, a ditch was constructed to divert runoff waters from the south portion of the East Spray Field into Pond C-2. Pond C-2 is an NPDES permitted discharge point (DOE, 1992).

In response to the application of waters potentially contaminated with chromium to the north and south portions of the East Spray Fields, 34 soil samples were collected. Two of the samples were duplicates. The samples were collected from the ground surface, zero to one-inch depth, and from the six- to seven-inch depth. Samples were analyzed for total chromium using the EPA Extraction Procedure (EP) Toxicity test in order to measure the amount of chromium that is leachable from the soil. Sampling locations were representative of the application, surface run-off and background areas. The EP Toxicity chromium analyses of these soil samples indicated that background soil concentrations of leachable chromium varied from <0.010 to 0.023 mg/l, whereas the spray field soils had leachable chromium concentrations of <0.010 to 0.082 mg/l (DOE, 1992).

Spray field operation ceased in the spring of 1990 due to concerns over the validity of spray irrigation as a water control technique, possible interactions of the spray field with old waste disposal sites, and uncertainty over the definition of spray irrigation as a "good engineering practice" as specified in the NPDES permit (DOE, 1992).

Fate of Constituents Released to Environment

No documents were found which detailed the fate of constituents released to the environment.

Action /No Further Action Recommendation

Analytical data from IHSS 216.2 and IHSS 216.3 has been reviewed independently of the original Area of Concern (AOC) which included the East Trenches, the Mound, 903 Pad and associated 903 Lip Area as geographically grouped in the Operable Unit 2, Phase II, RFI/RI Report (DOE, 1995a). Analytical data for surficial soils show that contaminants associated with spray evaporation in IHSSs 216.2 and 216.3 pose no significant risk. Following the chromium release, 34 surficial soil samples were collected from the two spray fields. The results from this sampling show that chromium concentrations in surface soils were well below remediation goals (DOE, 1995b). Further, surface soils in the East Spray Fields do not require remediation to achieve a 15 mrem effective dose equivalent, based upon the open space exposure scenario (DOE, 1994). For these reasons, IHSS 216.2 (PAC NE-216.2) and IHSS 216.3 (PAC NE-216.3) do not warrant further investigation and are proposed for No Further Action (NFA).

Comments

It should be noted that groundwater contamination has been identified in areas east of the 903 Pad (IHSS 112), the Mound (IHSS 113) and East Trenches. Groundwater contamination is known to exist under the East Spray Fields and will be remediated as a separate action.

References

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1994, *Human Health Risk Assessment, 903 Pad, Mound, and East Trenches Area, Operable Unit 2,* Rocky Flats Plant, Golden, CO, September.

DOE, 1995a, *Phase II RFI/RI Report 903 Pad, Mound, and East Trenches Area, Operable Unit No. 2, Vol. 3,* Rocky Flats Environmental Technology Site, Golden, CO, October.

DOE, 1995b, *Interim Measures/Interim Remedial Action Decision Document, 903 Pad and Windblown Soils, Operable Unit 2,* Rocky Flats Environmental Technology Site, Golden, CO, November.

DOE, 1996, *Annual Update for the Historical Release Report, August 1, 1995 through August 1, 1996.* RF/ER-96-0046, Rocky Flats Environmental Technology Site, Golden, CO, September.

PAC REFERENCE NUMBER: SE-142.10 - SE-142.11

IHSS Reference Number: SE-142.10 & SE-142.11, Operable Unit 5

Unit Name: Retention Ponds C-1 and C-2.

Approximate Location: N747,000; E2,088,000

Date(s) of Operation or Occurrence

1955 - Present

Description of Operation or Occurrence

Pond C-1 was constructed in 1955 to provide temporary holding and provide for monitoring of Woman Creek waters and waters discharged from RFP Ponds 6, 7, and 8. Pond 6, Pond 7, and Pond 8 were located adjacent to Woman Creek upstream from Pond C-1. The first discharge from Pond C-1 was observed on March 29, 1955. Pond 6 received water treatment plant backwash, Pond 7 received steam condensate from the Building 881 cooling towers and could have received sewage lift station overflows, and Pond 8 probably received Building 881 cooling tower overflow/blowdown. See descriptions for PAC SW-196, PAC SE-1600, PAC SE-1601.1, and PAC SE-1601.2 for a more complete discussion of these ponds. It is believed that Pond 6 was a multi-purpose pond, with the following materials being placed in the pond in October 1954: ashes from the plant incinerator, graphite, used caustic drums, and general trash. Pond 6, Pond 7, and Pond 8 are no longer in existence and never received an alpha-numeric designation. The numeric pond numbering system at the RFP was replaced by an alpha-numeric system in the early 1970s. Because Pond C-1 received waters from Pond 6, Pond 7, and Pond 8, all potential contaminants in Ponds 6, 7, and 8 are also potential contaminants in Pond C-1 and the portions of the Woman Creek drainage downstream of Pond C-1 (DOE, 1992).

The South Interceptor Ditch was constructed in order to re-route runoff from the southern portions of the RFP main manufacturing area to Pond C-2. Water from the South Interceptor Ditch is the only input to Pond C-2, allowing Pond C-2 to serve as a surface water retention and spill control pond. Woman Creek flow enters Pond C-1 which serves as a flow-through temporary detention pond. Discharges from Pond C-1 are routed around Pond C-2 and back into the natural Woman Creek channel (DOE, 1992).

Problems or releases that are known to have occurred on the C-Series drainage as summarized in the Historical Release Report (DOE, 1992) are listed below.

- Sanitary sewer overflow and discharge of untreated sanitary sewage were released to Woman Creek. Discharges ceased on February 21, 1955.

- A release of 2,700 gallons of steam condensate from Building 881 to Pond 7 occurred due to a break in the process waste line leading to Building 774. The break occurred on September 27, 1955.

- Pond C-1, the drainage, and the general area near Pond C-1 and Pond C-2 are believed to have been impacted by re-suspended soils and runoff from the 903 Pad area (PAC 900-112 and PAC 900-155).

- An armored vehicle turned over into Woman Creek upstream of Pond C-1 on October 19, 1975 (PAC SW-1700). An oil slick was observed on the C-series drainage west of the clay pits during the week of October 20, 1975. This oil slick was not observed at Pond C-1 nor where the C-Series drainage passed beneath Indiana Street. The source of this oil slick is believed to be from the overturned vehicle (PAC SW-1700).

- Leakage from the South Interceptor Ditch to Woman Creek near the outfall of the Building 881 footing drain was observed during the week ending March 12, 1982. Repairs to the South Interceptor Ditch were requested.

- Direct runoff from the East Spray Field (PAC NE-216.1 - NE-216.3) to Woman Creek was observed on March 2, 1987. This constituted a technical violation of the Rocky Flats National Pollutant Discharge Elimination System Permit.

- A spill of waste acid may have impacted the South Interceptor Ditch and Pond C-2 on April 10, 1989.

- Measurable quantities of Atrazine were identified in Pond C-2 in 1989.

Physical/Chemical Description of Constituents Released

Monitoring of effluents discharged offsite from the Woman Creek drainage has routinely taken place since the first discharge from Pond C-1. In 1955 these analyses consisted of daily composite samples for pH, nitrate, and activity, with a detailed mineral analysis on a monthly composite. More recently, the analytes that have been monitored in offsite discharges from the C-Series drainage have consisted of pH, nitrate as nitrogen, and nonvolatile suspended solids. Pond C-1 sediments are known to contain low levels of plutonium, americium, and uranium contamination (DOE, 1992).

Some data are available on the characteristics of the backwash and sludge blowdown waters from the water treatment plant. The 1953 data indicate that the water discharged from the water treatment plant was very turbid, slightly basic, and had a slightly higher concentration of dissolved chemicals than the raw water treated by the water treatment plant (DOE, 1992).

Based on the RCRA Contingency Plan Implementation Report done for the April 10, 1989 waste acid spill, 5 to 7 gallons of a dilute nitric acid and nitrad waste solution entered a storm drain that eventually drains to Pond C-2 (via the South Interceptor Ditch). A more complete discussion of the activities surrounding this event can be found in PAC 400-205 (DOE, 1992).

Responses to Operation or Occurrence

Since the C-Series drainage was potentially impacted by the 903 Pad, response actions to the 903 Pad are also partly response actions applicable to the C-Series drainage. These response actions were soil removal, soil capping, grass seeding, restriction of traffic in areas contaminated by the wind-blown contamination, and restriction of access to the area impacted. A more complete discussion of the problems and response actions can be found in the 903 Pad Area narrative (PAC 900-112) and 903 Lip Area narrative (PAC 900-155), (DOE, 1992).

Discharges of cooling tower wastes ceased when the RFP directed these flows to the sanitary wastewater treatment system. This re-routing of flows was probably accomplished in the mid-1970 (DOE, 1992).

The water treatment plant backwash waters were discharged to the Woman Creek drainage until a sludge drying bed system was installed for these waters at the water treatment plant. This recycle system was probably installed sometime in the mid-1970s (DOE, 1992).

Procedures and physical structures were modified following the April 10, 1989 release of dilute acid. These changes were made to prevent the recurrence of similar events. This event was reported in RCRA Contingency Plan 89-002, dated April 18, 1989, (DOE, 1992).

Fate of Constituents Released to Environment

These IHSSs were studied as part of OU5, Woman Creek Priority Drainage (DOE, 1996a). Fate of Constituents Released to the Environment is described in following section.

Action/No Further Action Recommendation

As documented in the OU5 RFI/RI Report, IHSSs 142.10, and 142.11 (PACs SE-142.10 and SE-142.11) along with the South Interceptor Ditch and Woman Creek Source Area were grouped as an Area of Concern 3 (AOC 3) for purposes of the Human Health Risk Assessment (HHRA). These sources form a logical AOC because they are in close proximity and have chemical constituents in the same media (DOE, 1996a). Further, these ponds are hydrologically connected and form a logical AOC. The results of the HHRA for AOC 3 showed that for all current and future onsite receptors the cumulative hazard indices for non-carcinogenic health effects are 0.001 or less therefore no adverse non-cancer health effects are expected under the exposure conditions evaluated. For all current and future onsite receptors the excess lifetime cancer risk was estimated at 6E-08 or less indicating negligible risk (DOE, 1996a).

IHSSs 142.10 and 142.11 were considered a source area in the Ecological Risk Assessment (ERA) for the Woman Creek Watershed. The results of the ERA indicate the following:

- Metals and organics (primarily polynuclear aromatic hydrocarbons) in C-Pond sediments is noted with respect to the aquatic life receptor group. However, conclusions state that risks are primarily due to PAHs in the sediments, no toxicity was detected in the sediment toxicity tests with *Hyalella azteca.*

- Aroclor-1254 in SID sediments is noted with respect to the aquatic-feeding birds receptor group. However, conclusions state that Aroclor-1254 concentrations in sediment did not exceed the risk-based criteria developed for sediment at RFETS.

- Mercury in C-Pond sediments is noted with respect to the aquatic-feeding birds receptor group. However, conclusions state that mercury was detected in 2 of 24 fish from C-ponds and no other fish. Risks would be significant only if birds obtain all food from Pond C-1.

The human health estimates support the recommendation for no further action and are consistent with the criteria for recommending no further action decisions presented in RFCA (DOE, 1996b). The results of the ERA do not indicate a substantial and definitive risk to ecologic receptors. IHSSs 142.10, 142.11, the South Interceptor Ditch, and Woman Creek Source Area are proposed for no further action.

Comments

Pond C-1 (which had previously been known as Pond 9) was built in March 1955. Pond C-2 was built in 1979. The South Interceptor Ditch was built in 1979. The South Interceptor Ditch discharges to Pond C-2 (DOE, 1992).

This PAC is indicated on the maps as only the drainage ponds, but it is considered to include the drainage on the RFP site upstream and downstream of the ponds (DOE, 1992).

The October 19, 1975 and October 20, 1975 Woman Creek incidents are thought to be related (DOE, 1992).

1991 NPDES permit exceedances, if any, have not been included in this discussion (DOE, 1992).

A considerable amount of analytical data has been generated for the C-Series Drainage. These data primarily address radioactivity concentrations in the Terminal Pond C-2 (DOE, 1992).

References

DOE, 1992, *Historical Release Report for the Rocky Flats Plant,* Rocky Flats Plant, Golden, CO, June.

DOE, 1996a, *Final Phase I RFI/RI Report Woman Creek Priority Drainage, Operable Unit 5*, RF/ER-96-0012.UN, Rev 0. Rocky Flats Environmental Technology Site, Golden, CO, April.

DOE, 1996b, *Final Rocky Flats Cleanup Agreement*, Department of Energy, Rocky Flats Environmental Technology Site, Golden, CO, July.

PAC REFERENCE NUMBER: SE-209

IHSS Number: 209, Operable Unit 5

Unit Name: Surface Disturbance Southeast of Building 881

Location: N746,500; E2,087,000

Date(s) of Operation or Occurrence

No documentation was found which detailed the dates of operation. Aerial photographs indicate that the site existed in July 1955 (DOE, 1992).

Description of Operation or Occurrence

This area consists of a surface disturbance at the site of a former borrow pit. Gravel taken from the pit was used for RFP construction activities. Although waste disposal is not believed to have taken place at this location, DOE agreed to investigate the site as a possible waste disposal area (DOE, 1992).

Physical/Chemical Description of Constituents Released

No documentation was found detailing a release at this site (DOE, 1992).

Responses to Operation or Occurrence

No documentation was found detailing responses to this occurrence (DOE, 1992).

Fate of Constituents Released to Environment

No documentation was found which detailed a release at this site (DOE, 1992). This IHSS was studied as part of OU 5, Woman Creek Priority Drainage (DOE, 1996a).

Action/No Further Action Recommendation

As documented in the Phase I RFI/RI Report for OU5 (DOE, 1996a), IHSS 209 (PAC SE-209) and the source area west of the IHSS was removed from further evaluation in the human health risk assessment because concentrations did not exceed criteria established in the CDPHE screen. Additionally, results of the Ecological Risk Assessment for the Woman Creek Watershed did not indicate that IHSS 209 was a source area (DOE, 1996a). This IHSS is proposed as no further action. This recommendation is consistent with the criteria for recommending no further action decisions presented in RFCA (DOE, 1996b).

Comments

None.

References

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1996a, *Final Phase I RFI/RI Report Woman Creek Priority Drainage, Operable Unit 5*, RF/ER-96-0012.UN, Rev 0. Rocky Flats Environmental Technology Site, Golden, CO, April.

DOE, 1996b, *Final Rocky Flats Cleanup Agreement*, Department of Energy, Rocky Flats Environmental Technology Site, Golden, CO, July.

PAC REFERENCE NUMBER: SW-133.5

IHSS Reference Number: 133.5, Operable Unit 5

Unit Name: Incinerator

Approximate Location: N747,500; E2,079,500

Date(s) of Operation or Occurrence

1952 - 1968

Description of Operation or Occurrence

An incinerator (Facility 219 or Building 219) was located south of the west access road near the Plant's original west boundary. The incinerator was used to burn office wastes. Design and as-built drawings of the incinerator indicate it was 32 feet high (DOE, 1992).

In 1960, it was necessary to reline the firebox and the stack with a plastic refractory. Between 1960 and 1967, the incinerator continued to deteriorate to the point that it was necessary to cease using the incinerator and dispose of trash in some other manner. The Present Landfill (PAC NW-114) was constructed as a substitute for the incinerator and waste disposal in the Present Landfill began on August 14, 1968 (DOE, 1992).

A review of aerial photographs reveals that the incinerator was present August 7, 1969 and removed by August 6, 1971. No documentation was found indicating the dismantling and removal of the incinerator (DOE, 1992).

Physical/Chemical Description of Constituents Released

Until 1959, the ashes and noncombustible material were placed around the incinerator and to the south near the concrete wash pad area. After 1959, they were placed in trenches to the south and southeast of the incinerator. An unknown quantity of depleted uranium contaminated material was burned in the incinerator and was estimated to contain at least 100 grams of depleted uranium (DOE, 1992). Residual ash has been sampled and found to be radioactive. A monthly ash sampling program was initiated in January 1962 and data are available in the monthly History Reports by the Waste Disposal Coordination Group (DOE, 1992).

Responses to Operation or Occurrence

Emission samples were taken during burning in September 1956. Smear surveys of the incinerator before and after burning of contaminated waste showed no increase in contamination. Air sampling of the incinerator continued in 1958 during combustion of radioactively contaminated trash from Building 444 and Building 447; however, no results were available

(DOE, 1992). An "ash dump" south of the plant was monitored in May 1959 and found to contain up to 4,000 counts per minute (cpm) alpha activity and 20 millirems per hour (mr/hr) beta activity. Low angle oblique photographs of the incinerator area show fill material almost to the height of the top of the incinerator. The unvegetated fill material is clearly non-native soil, but it is unclear whether the fill material is ash. Uncertainty exists whether the ash was placed in the immediate area, thus building up to the level of the incinerator, or whether the fill material is some other material and the ash was placed into the original landfill (PAC SW-115), or if ash were placed both around the incinerator and in the original landfill (DOE, 1992).

Fate of Constituents Released to Environment

No documentation was found which further detailed the fate of the constituents released. IHSS 133.5 was studied in accordance with the IAG schedule for OU5.

Action/No Further Action Recommendation

Analytical data from IHSS 133.5 (PAC SW-133.5), IHSS 133.6 (PAC SW-133.6) and PAC SW-1701 has been reviewed independently of the original Area of Concern (AOC) for this part of Operable Unit 5. The original AOC for this part of Operable Unit 5 was comprised of IHSSs 133.1, 133.2, 133.3, 133.4, 133.5 and 133.6 as geographically grouped in the Final Phase 1 RFI/RI Report for Operable Unit 5 (DOE, 1996). Analytical data for surficial and subsurface soils show that contaminants associated with the incinerator facility at this location are below RFCA Tier I and Tier II action levels and pose no significant risk. Further, surface and subsurface soils in IHSS 133.5 do not require remediation to achieve a 15 mrem effective dose equivalent, based upon the open space exposure scenario. For this reason, IHSS 133.5 (PAC SW-133.5) does not warrant further investigation and is proposed for No Further Action (NFA).

Comments

None

References

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1996, *Final Phase I RFI/RI Report, Woman Creek Drainage, Operable Unit 5, Vol. 1*, Rocky Flats Environmental Technology Site, Golden, CO, April.

PAC REFERENCE NUMBER: SW-133.6

IHSS Reference Number: 133.6, Operable Unit 5

Unit Name: Concrete Wash Pad

Approximate Location: N747,500; E2,079,000

Date(s) of Operation or Occurrence

1953 - Present

Description of Operation or Occurrence

Excess concrete from construction activities on plant site was routinely washed from concrete trucks southwest of the plant (DOE, 1992). In March 1979, Plant Services was requested to clean up debris from past cement truck washouts and that cement truck washouts be conducted at the landfill. This area is adjacent to the former Plant Incinerator (IHSS 133.5) and a reference was made to ash being disposed of southwest of the Incinerator, which may have been close to this area.

Physical/Chemical Description of Constituents Released

The concrete wash pad was a waste concrete disposal site; however, concrete is not a hazardous waste. Potentially contaminated ash generated from the incinerator may have been deposited southwest of the incinerator in the area of the concrete wash pad. Ground disturbance in the area is obvious from aerial photographs beginning in 1953 and other RFP photos.

Responses to Operation or Occurrence

No documentation was found which detailed responses to any activity related to this occurrence.

Fate of Constituents Released to Environment

No documentation was found which detailed the fate of constituents released. This IHSS was studied in accordance with the IAG schedule for OU5.

Action/No Further Action Recommendation

Analytical data from IHSS 133.5 (PAC SW-133.5), IHSS 133.6 (PAC SW-133.6) and PAC SW-1701 has been reviewed independently of the original Area of Concern (AOC) for this part of Operable Unit 5. The original AOC for this part of Operable Unit 5 was comprised of IHSSs 133.1, 133.2, 133.3, 133.4, 133.5 and 133.6 as geographically grouped in the Final Phase 1 RFI/RI Report for Operable Unit 5 (DOE, 1996).

Analytical data for surficial and subsurface soils show that contaminants associated with the Concrete Wash Pad (IHSS 133.6) are below RFCA Tier I and Tier II action levels and pose no significant risk. Further, surface and subsurface soils in IHSS 133.6 do not require remediation to achieve a 15 mrem effective dose equivalent, based upon the open space exposure scenario. For this reason, IHSS 133.6 (PAC SW-133.6) does not warrant further investigation and is proposed for No Further Action (NFA).

Comments

None

References

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1996, *Final Phase I RFI/RI Report, Woman Creek Drainage, Operable Unit 5, Vol. 1*, Rocky Flats Environmental Technology Site, Golden, CO, April.

PAC REFERENCE NUMBER: SW-1701

IHSS Reference Number: Not Applicable

Unit Name: Recently Identified Ash Pit

Approximate Location: N747,500; E2,079,000

Date(s) of Operation or Occurrence

September 30, 1994

Description of Operation or Occurrence

On September 30, 1994, during field investigations near IHSS 133.6 (Concrete Wash Pad) in the Woman Creek drainage, field crews encountered metallic debris with a count rate of 2,500 counts per minute beta/gamma. The project was stopped to assess the finding and notify the Radiological Engineering Department. Geophysical surveys conducted in the summer of 1993 identified this and several other small anomalies with the potential for radiological contamination from depleted uranium (235/238 isotopes).

Physical/Chemical Description of Constituents Released

Magnetometer surveys conducted in the summer of 1993 identified this anomaly as a suspected ash pit used for discarding incinerated plant wastes from the nearby incinerator facility (IHSS 133.5). References were cited in the Historical Release Report (DOE, 1992) that potentially contaminated ash generated from the incinerator may have been deposited southwest of the incinerator in an area close to the Concrete Wash Pad (IHSS 133.6). An unknown quantity of depleted uranium contaminated material was burned in the Incinerator and was estimated to contain at least 100 grams of depleted uranium (DOE, 1992).

Responses to Operation or Occurrence

Field crews were dressed in level C Personal Protective Equipment (PPE) when the metallic debris was discovered. Radiological monitoring personnel immediately conducted surveys of the equipment and soil. Contaminated sampling equipment and samples collected from the area were double bagged and transported to a Radiologically Controlled Area (RCA). There was no removable contamination found.

Fate of Constituents Released to Environment

No documentation was found which detailed the fate of constituents released from the incinerator facility and subsequent burial of ash from 1952 to 1968.

Action/No Further Action Recommendation

Analytical data from IHSS 133.5 (PAC SW-133.5), IHSS 133.6 (PAC SW-133.6) and PAC SW-1701 has been reviewed independently of the original Area of Concern (AOC) for this part of Operable Unit 5. The original AOC for this part of Operable Unit 5 was comprised of IHSSs 133.1, 133.2, 133.3, 133.4, 133.5 and 133.6 as geographically grouped in the Final Phase 1 RFI/RI Report for Operable Unit 5 (DOE, 1996).

Analytical data for surficial and subsurface soils show that contaminants associated with the suspected ash pit finding (PAC SW-1701) in 1994 are below RFCA Tier I and Tier II action levels and pose no significant risk. Further analysis show that surface and subsurface soils in and around PAC SW-1701 do not require remediation to achieve a 15 mrem effective dose equivalent, based upon the open space exposure scenario. For this reason, PAC SW-1701 does not warrant further investigation and is proposed for No Further Action (NFA).

Comments

PAC SW-1701 is also referred to as time domain electromagnetic survey area (TDEM-1) in the Phase I RFI/RI Report for Operable Unit 5 (DOE, 1996). The site is located immediately north and adjacent to IHSS 133.6.

References

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1994, *Quarterly Update Report to the Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, October.

DOE, 1996, *Final Phase I RFI/RI Report, Woman Creek Drainage, Operable Unit 5, Vol. 1*, Rocky Flats Environmental Technology Site, Golden, CO, April.

PAC REFERENCE NUMBER: 300-135

IHSS Reference Number: 135, Industrial Area Operable Unit

Unit Name: Cooling Tower Blowdown

Approximate Location: N751,000; E2,083,000

Date(s) of Operation or Occurrence

1980 - 1982

Description of Operation or Occurrence

The first documented use of the Building 373 Cooling Tower pond was on June 12, 1981 when the cooling tower was cleaned and the slurry portion was pumped into a small retention pond. During the night, some of the water leaked through the dirt dike and gate valve and drained into Walnut Creek (DOE, 1992).

It can be seen in aerial photographs that the Cooling Tower was present as early as 1978. A photograph taken on June 1, 1980 indicates a pond-like structure north of Building 374. Utility drawings support this as the location of the Cooling Tower retention pond, indicating a "holding pond" where Tank 808A and Tank 808B are now located. The drawings indicate a sluice gate at the northeast corner of the pond with a connecting culvert that extends from it in a northeasterly direction. It is possible that the leak mentioned above was capable of flowing through this culvert into North Walnut Creek (DOE, 1992). Interviewees for the CEARP Phase 1 document indicated that the retention pond was located to the south of Building 374, however no documents could be found to support this. In addition, there are no cooling towers located to the south of Building 374. It is proposed that this PAC should be located near the Cooling Tower where aerial photographs and utility drawings indicate a pond (DOE, 1992).

Physical/Chemical Description of Constituents Released

Generally, a corrosion-inhibitor was added to the cooling water. Phosphate-containing compounds were used after the late 1970s; chromate was used prior to this (DOE, 1992). Because the switch from chromates to phosphates occurred in the same time period as the initiation of activity at the Building 373 Cooling Tower, it is possible the chromates may have been present in the cooling water blowdown. Analysis of the water from the above incident resulted in no detectable quantities of phosphates. It is possible that prior to use of the pond, effluent from the Cooling Tower may have contained tritium (DOE, 1992).

Responses to Operation or Occurrence

In December 1981, a new gate valve was installed to prevent leakage (DOE, 1992). No other documentation was found which detailed clean-up operations.

Fate of Constituents Released to Environment

Prior to 1980, water from the Cooling Tower (stated in the reference as being in Building 371-374) was allowed to drain into Walnut Creek. This was occurring as late as October 1979 (DOE, 1992). No other documentation could be found pertaining to fate of constituents released to the environment. This IHSS was studied in accordance with the IAG schedule for Operable Unit 8.

Action/No Further Action Recommendation

As documented in the Operable Unit 8 RFI/RI Report, IHSS 135 (PAC 300-135) was sampled at five locations. There were no positive detections for total metals, semi-volatile organic compounds, or radionuclides. Total cumulative risk to human receptors from this site are negligible based upon the sampling results. The recommendation for no further action is consistent with the criteria for recommending no further action decisions presented in RFCA (DOE, 1996).

Comments

None

References

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1994, *Phase I RFI/RI Work Plan for Operable Unit 8, 700 Area, Vol. 1,* Rocky Flats Environmental Technology Site, Golden, CO, October.

DOE, 1996, *Final Rocky Flats Cleanup Agreement*, Department of Energy, Rocky Flats Environmental Technology Site, Golden, CO, July.

PAC REFERENCE NUMBER: 300-151

IHSS Reference Number: 151, Industrial Area Operable Unit

Unit Name: Tank 262 Fuel Oil Spills (IAG Name: Fuel Oil Leak)

Approximate Location: N751,000; E2,082,500

Date(s) of Operation or Occurrence

1981 - 1988

Description of Operation or Occurrence

Tank 262 is an 47,500 gallon underground tank located north of Building 371 and Building 374. It was installed in 1980 and is overlain by a 15 by 25 foot concrete pad. The first documented spill was on August 12, 1981 when about 196 gallons of No. 2 diesel fuel were spilled on the ground north of Building 374 (DOE, 1992). The size of the spill was approximately 30 by 35 feet. A second spill released 50 gallons of diesel fuel in July 1982 (DOE, 1992). In October of the same year 120 liters were spilled. While conducting a routine system circulation of Tank 262 another spill of 10 to 20 gallons occurred in September 1988 when a vent was left open.

Physical/Chemical Description of Constituents Released

Spills were limited to Number 2 diesel fuel. An estimated 400 cubic yards of soil were affected by the 1981 spill (DOE, 1992).

Responses to Operation or Occurrence

Reports from the 1981 incident indicated that cleanup would be initiated when the ground dried. It is documented that cleanup of the saturated soil occurred adjacent to the tank surface foundation after the 1988 spill and that the State Oil Inspector was notified (DOE, 1992). A site visit conducted for the OU-8, Phase I RFI/RI Work Plan (DOE, 1994) indicated that only small areas of staining one to three feet in diameter remained around the pad, suggesting cleanup of the larger 1981 spill.

Fate of Constituents Released to Environment

One reference stated that the 196-gallon diesel fuel spill did not reach a water course (DOE, 1992). No environmental impact was expected from the 50 gallon spill. Permission was given by Environmental Sciences to use the 120 liters of diesel on roads (onsite) for dust suppression (DOE, 1992). This IHSS was studied in accordance with the IAG schedule for Operable Unit 8.

Action/No Further Action Recommendation

As documented in the Operable Unit 8 Draft Data Summary Report (DOE, 1995), IHSS 151 (PAC 300-151) was sampled in five locations for Total Petroleum Hydrocarbons (TPH), Total CLP Metals, and BTEX. Soil gas investigations reveal one detection of trichlorofloromethane at very low ppb range. There were no other detections of hydrocarbon contaminants (or any other contaminants) suggesting that past diesel fuel spills were cleaned up. Based upon the sampling data, this site poses no threat of adverse health affects to human receptors and therefore is proposed as no further action. The recommendation for no further action is consistent with the criteria for recommending no further action decisions presented in RFCA (DOE, 1996).

Comments

None

References

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1994, *Phase I RFI/RI Work Plan for Operable Unit 8, 700 Area, Vol. 1,* Rocky Flats Environmental Technology Site, Golden, CO, October.

DOE, 1995, *Operable Unit 8, Data Summary Report, 700 Area, Vol. 1,* Rocky Flats Environmental Technology Site, Golden, CO, September.

DOE, 1996, *Final Rocky Flats Cleanup Agreement*, Department of Energy, Rocky Flats Environmental Technology Site, Golden, CO, July.

PAC REFERENCE NUMBER: 300-156.1

IHSS Reference Number: 156.1, Industrial Area Operable Unit

Unit Name: Building 371 Parking Lot (IAG Name: Building 334 Parking Lot)

Approximate Location: N750,000; E2,082,500

Date(s) of Operation or Occurrence

1969(?) - February 1973

Description of Operation or Occurrence

In February 1973, concern was raised because a contaminated soil pile north of Building 334 was located in the construction area for Building 371 (DOE, 1992). Inspection of aerial photographs shows evidence of soil being placed in this area as early as 1969 from unknown activities. In February 1973, the soil was moved to an area east of the cargo container field (IHSS 165).

Physical/Chemical Description of Constituents Released

Some of the soil stored behind Building 334 originated from construction of an addition to Building 774 or from the removal of underground holding tanks in an area adjacent to Building 774. Soil samples were taken before the pile was removed from behind Building 334 (DOE, 1992). Results ranged from 3 to 704 disintegration per minute per gram. The volume is stated as 250 cubic yards at the time of removal from the 300 Area (DOE, 1992).

An interview with a former employee on December 6, 1991 revealed that some of the soil may have originated from Building 707 (DOE, 1992). Interviewees for the CEARP Phase 1 document indicated that the soil pile was located under what is now the Building 334 parking lot. No documentation could be found to substantiate this. It is assumed that this is the same unit because the origins of the soil pile seem to correlate. Aerial photographs show signs of a soil pile in the southeast corner of what is now Building 371.

Responses to Operation or Occurrence

The soil pile was removed from the 300 Area and placed in the east end of the cargo container field which is IHSS 165 (PAC 900-165). See PAC 900-165 for additional information regarding the new location to which this soil was moved. A former employee recalled that some of the soil may have been transported to north and west of Building 559 until the area was eventually leveled out (DOE, 1992). This augments CEARP Interview Notes which states that the soil was spread out over the hillside southeast of where Building 374 is located. The 371 Parking Lot now covers the area of the soil pile.

Fate of Constituents Released to Environment

No documentation could be found which detailed the fate of constituents released to the environment. This IHSS was studied in accordance with the IAG schedule for Operable Unit 14.

Action/No Further Action Recommendation

As documented in the Operable Unit 14 RFI/RI Data Summary Report, IHSS 156.1 (PAC 300-156.1), which is broken into two separate locations, was sampled extensively. All analytical data were below PRGs. This site poses no threat of adverse health effects to human receptors and is proposed for no further action. The recommendation for no further action is consistent with the criteria for recommending no further action decisions presented in RFCA (DOE, 1996).

Comments

None

Reference

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1995, *Phase I RFI/RI Work Plan/Data Summary for Operable Unit 14, Radioactive Sites, Vol. 1, Draft,* Rocky Flats Environmental Technology Site, Golden, CO, June.

DOE, 1996, *Final Rocky Flats Cleanup Agreement*, Department of Energy, Rocky Flats Environmental Technology Site, Golden, CO, July.

PAC REFERENCE NUMBER: 300-181

IHSS Reference Number: 181, Industrial Area Operable Unit

Unit Name: Building 334 Cargo Container Area

Approximate Location: N750,000; E2,082,500

Date(s) of Operation or Occurrence

Summer of 1984 - July 1986

Description of Operation or Occurrence

This storage area was located to the north Building 334 and consisted of one cargo container with an area of 160 square feet. Although it had the capacity to hold up to eighteen drums, the maximum number of drums stored in the container was seven. No berms surrounded the area, but a collection pan was located in the bottom of the cargo container (DOE, 1992).

Physical/Chemical Description of Constituents Released

Wastes stored in the container included machine oils, solvents, machine coolants and possibly low-level radioactive wastes (DOE, 1992).

Responses to Operation or Occurrence

While in use, the storage container was monitored weekly on the inside and outside. No other documentation was found which detailed the response to this operation.

Fate of Constituents Released to Environment

No documentation of spills or leaks were found in relationship to this unit. According to the closure plan, there is no visual evidence of a release to the environment. This IHSS was studied in accordance with the IAG schedule for Operable Unit 10.

Action/No Further Action Recommendation

As documented in the Operable Unit 10 Technical Memorandum 1 Report (DOE, 1995), three soil gas samples were collected within IHSS 181 (PAC 300-181). One detection of methane gas was identified at 50 ppm. There were no other positive detections. Based upon the history of this IHSS having no documented spills and the existing analytical data, it is proposed that this site poses no threat of adverse health effects to human receptors. The recommendation for no further action at this site is consistent with the criteria for recommending no further action decisions presented in RFCA (DOE, 1996).

Comments

Methane gas is commonly found at levels mentioned above (50 ppm) due primarily to decomposing organic matter and interbedded coal seams along the front range.

Reference

DOE, 1991, *Phase I RFI/RI Work Plan, Operable Unit 10, Other Outside Closures, Draft Final,* Rocky Flats Environmental Technology Site, Golden, CO, November.

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1995, *Technical Memorandum 1, Operable Unit 10, Other Outside Closures,* Rocky Flats Environmental Technology Site, Golden, CO, January

DOE, 1996, *Final Rocky Flats Cleanup Agreement*, Department of Energy, Rocky Flats Environmental Technology Site, Golden, CO, July.

PAC REFERENCE NUMBER: 300-188

IHSS Reference Number: 188, Industrial Area Operable Unit

Unit Name: Acid Leak

Approximate Location: N750,500; E2,082,500

Date(s) of Operation or Occurrence

1983

Description of Operation or Occurrence

The CEARP Phase 1 Report documents an acid leak from a drum. The leak reportedly occurred near the east gate of Building 374. The ground was unpaved at the time of this incident (DOE, 1992).

Physical/Chemical Description of Constituents Released

The drum contained a mixture of nitric acid and hydrochloric acid. The amount would have been a maximum of 55 gallons. It is likely that the mixture was a waste metal leaching solution originating from the 400 Area which suggests that it might have contained some trace heavy metals (DOE, 1992).

Responses to Operation or Occurrence

No documentation was found which detailed a response to this occurrence.

Fate of Constituents Released to Environment

According to the CEARP Phase 1 document, no environmental hazard should remain. This IHSS was studied in accordance with the IAG schedule for Operable Unit 8.

Action/No Further Action Recommendation

As documented in the Operable Unit 8 Data Summary Report (DOE, 1995), five samples were collected for inorganics within IHSS 188 (PAC 300-188). There were no detections with the exception of slightly elevated cobalt. Due to the relatively small amount of acid spilled, the neutralization effect over time, and the existing analytical data, no threat of adverse health effects exist under the exposure conditions evaluated. The recommendation for no further action at this site is consistent with the criteria for recommending no further action decisions presented in RFCA (DOE, 1996).

Comments

None

Reference

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1994, *Phase I RFI/RI Work Plan, Operable Unit 8,* Rocky Flats Environmental Technology Site, Golden, CO, October.

DOE, 1995, *Operable Unit 8, Data Summary Report, 700 Area, Vol. 1,* Rocky Flats Environmental Technology Site, Golden, CO, September.

DOE, 1996, *Final Rocky Flats Cleanup Agreement*, Department of Energy, Rocky Flats Environmental Technology Site, Golden, CO, July.

PAC REFERENCE NUMBER: 300-212

IHSS Reference Number: 212, Operable Unit 15

Unit Name: Building 371 Drum Storage, Unit 63

Approximate Location: N750,500; E2,082,500

Date(s) of Operation or Occurrence

1980 - Present (DOE, 1992)

Description of Operation or Occurrence

Unit 63 is located in Room 3420 of Building 371 and is used to store transuranic (TRU) mixed solid waste. The storage capacity is 950 55-gallon drums or 259 cubic yards of solid waste. However, because of the Settlement and Compliance Order of July 1, 1989, the maximum allowed number of drums is 668. No processing is done in Room 3420. Drums are brought to Building 371 from various sources at the Rocky Flats Plant and stored in Room 3420. From there, they are sent to a staging area prior to shipment to a disposal facility (DOE, 1992).

Physical/Chemical Description of Constituents Released

Interviews with operations personnel indicate that a release has never occurred from any drum stored in Room 3420. Some of the allowable constituents of the waste include transuranic waste, carbon tetrachloride, 1,1,1-trichloroethane (1,1,1-TCA) and toluene. The Interim Status Closure Plan provides a complete list of hazardous constituents (DOE, 1992).

Responses to Operation or Occurrence

Unit 63 is currently in use. No documentation was found which details a response to the operation (DOE, 1992).

Fate of Constituents Released to Environment

No documentation was found which detailed a release associated with Room 3420. Walls, floors and berms are all constructed of concrete with an epoxy finish and drums are placed on pallets to protect them from other liquids and allow for inspection (DOE, 1992).

Action/No Further Action Recommendation

The closure of IHSS 212 (PAC 300-212) will be addressed in Part VIII of the RFETS RCRA Mixed Residues Modification Permit (DOE, 1995).

Comments

Closure Plan comments were received by DOE on May 1, 1990, and responded to, but these responses were never incorporated into the Closure Plan. The DOE has requested that this unit no longer be reviewed by the regulators since it is needed as part of the total maximum storage volume.

References

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1995, *Phase I RFI/RI Report for Operable Unit 15 Inside Building Closures*, RFP/ERM-94-00035, January.

PAC REFERENCE NUMBER: 400-129

IHSS Reference Number: 129, Industrial Area Operable Unit

Unit Name: Oil Leak

Approximate Location: N749,000; E2,082,500

Date(s) of Operation or Occurrence:

1952 - Present (Tanks #1 - #3; one of which was installed in 1967)
1967 - 1986 (Tank#4) (DOE, 1992)

Description of Operation or Occurrence

There are four No. 6 fuel oil supply tanks located east of Building 443, two of which were installed in 1952 and two in 1967. They measure approximately 11 by 20 feet and are buried under two feet of soil. The tanks were used as local supply tanks to Building 443 (Steam Plant) when natural gas was unavailable. Releases of No. 6 fuel oil are known to have occurred from filling operations and related maintenance since the tanks were first installed (DOE, 1992).

From 1952 to 1967, fuel was transferred from the larger tanks south of Building 551 to tanker trucks which in turn transferred the fuel to the supply tanks. Small spills were noted during this process. This practice ceased when underground transfer lines were installed in 1967. In November 1977, a leak in the underground transfer line was discovered. No documentation was found that detailed the quantity of oil released to the environment; however, the sewage treatment plant was able to recover 600 gallons of oil. Since 1983, above ground transfer lines have been used (DOE, 1992).

Contamination in the area became evident on March 6, 1986, when compressor oil was found at the bottom of a four and a half foot deep excavation located in the vicinity of the tanks. Three days later, No. 6 fuel oil was discovered in another excavation. The excavations were required to install a chain-link fence on the east side of Building 443 (DOE, 1992). The 1987 Closure Plan for Tank #4 indicates that there was a leak in the top of tank #4. The level indicator recorded no drops in the fuel oil level; however, there were increases in the level due to water seeping into the tank. On February 6, 1989, the level indicator in one of the tanks failed while it was being filled allowing about 500 gallons of No. 6 fuel oil to be released to the immediate area and onto Fifth Street. The spill did not reach a drainage or watercourse. Four days later, 50 more gallons were spilled because the valves were left open. On July 29 and 30, 1989, 1,700 gallons were again released to the environment. No documentation could be found which detailed the cause of this most recent spill (DOE, 1992).

Physical/Chemical Description of Constituents Released

Samples of the oil found in the excavations were analyzed. The primary constituent was No. 6 fuel oil with traces of No. 2 diesel oil. Results also showed trace amounts of 1,1,1-trichloroethane (DOE, 1992).

Response to Operation or Occurrence

No documentation was found which detailed a response to the cracked transfer pipe in 1977. It was assumed that due to the low viscosity of the oil, it would not migrate underground. In February 1989, the oil was left on the ground until the next day to let it solidify in the cold. The State Oil Inspector was notified for the cases occurring in 1986 and 1989 (DOE, 1992).

The IHSS 129 Accelerated Action Project completed on September 13, 1996, involved emptying, cleaning and foaming Tank #4. The first two phases of the project were performed as a routine maintenance action. Foaming of Tank #4 was performed in accordance with the Final Proposed Action Memorandum (PAM) for the Contaminant Stabilization of Underground Storage Tanks approved by the Agencies on May 16, 1996 (DOE, 1996).

Fate of Constituents Released to Environment

No documentation was found which detailed the fate of constituents released to the environment (DOE, 1992).

Action/No Further Action Recommendation

In accordance with the PAM (DOE, 1996), the removal action greatly reduced the source of contamination at this location and is considered consistent with the long-term remedial goals of the Industrial Area and IHSS 129. Based on the final report for the removal, Tank #4 is considered "RCRA stable" as defined in the RFETS Part B Permit and will be addressed under RFCA as part of the Industrial Area Operable Unit (DOE, 1997).

Comments

In 1970, a 1,500-gallon sulfuric acid spill occurred near Building 443 and was contained in a pit (PAC 400-187.2). A sodium hydroxide spill of approximately 1,000 gallons was released from the steam plant catch basin to Central Avenue (PAC 000-190). Both instances have contributed to potential contamination in the area.

References

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1996, *Proposed Action Memorandum for the Contaminant Stabilization of Underground Storage Tanks*, Rocky Flats Plant, Golden, CO, May.

DOE, 1997, *Final Report for the IHSS 129, Tank #4 Source Removal Project.* RF/RMRS-97-051.UN. Rocky Flats Environmental Technology Site, Golden, Colorado. July.

PAC REFERENCE NUMBER: 400-191

IHSS Reference Number: 191, Industrial Area Operable Unit

Unit Name: Hydrogen Peroxide Spill

Approximate Location: N749,300; E2,082,200

Date(s) of Operation or Occurrence

April 1981

Description of Operation or Occurrence

In April 1981, two 55-gallon drums of hydrogen peroxide being transported by warehouse personnel fell off a pallet. One of the drums burst open and the hydrogen peroxide flowed into a culvert at the corner of Fifth Street and Central Avenue (DOE, 1992).

Physical/Chemical Description of Constituents Released

The drums contained 35% hydrogen peroxide (DOE, 1992).

Responses to Operation or Occurrence

A hole was dug in the Central Avenue ditch east of Fifth Avenue and Fire Department personnel hosed down the area allowing the diluted hydrogen peroxide to drain into the hole. Barricades were erected around the area. The hole was refilled on April 23, 1981. The area has been paved since the time of the spill (DOE, 1992).

Fate of Constituents Released to Environment

No documentation was found that details the fate of constituents released to the environment. This IHSS was studied in accordance with the IAG schedule for Operable Unit 13.

Action/No Further Action Recommendation

Due to the relatively small amount of hydrogen peroxide spilled and the neutralization effect over time, no threat of adverse health effects exist under the exposure conditions evaluated. The recommendation for no further action at this site is consistent with the criteria for recommending no further action decisions presented in RFCA (DOE, 1996).

Comments

None

References

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1996, *Final Rocky Flats Cleanup Agreement*, Department of Energy, Rocky Flats Environmental Technology Site, Golden, CO, July.

PAC REFERENCE NUMBER(S): 600-117.3 & 152

IHSS Reference Number: 117.3, Industrial Area Operable Unit
152, Industrial Area Operable Unit

Unit Name: Chemical Storage - South Site (IHSS 117.3) and Fuel Oil Tank 221 Spills (IHSS 152)

Approximate Location: N749,500; E2,083,000

Date(s) of Operation or Occurrence

Prior to 1965 - 1969

Description of Operation or Occurrence

Various RFP photographs indicate that the area southwest of the intersection of Central Avenue and Sage Street was used for storage from approximately 1964 until 1969. Until 1996, there were two Number 6 Fuel Oil tanks at the site. They consisted of an 800,000-gallon capacity tank, Tank 221, which was built in 1955, and a 1,800,000-gallon capacity tank, Tank 224, which was built in 1973. Tank 221 was located west of Tank 224 (DOE, 1992).

Low-level oblique RFP photographs show miscellaneous materials stored in the area around Tank 221 from at least 1965 to June 1969 (DOE, 1992). Wooden boxes are evident south and east of Tank 221 in 1965 and 1966. It appears that drums were stored east of Tank 221 in 1966. In 1969, wooden boxes, reportedly containing contaminated debris from the May 1969 fire in Building 776 and Building 777, are evident east of Tank 221. By 1969, the boxes were no longer stored in this area (DOE, 1992).

On May 4, 1965, a glovebox (H-22), which was being transferred from Building 776 to the south site chemical storage area, leaked highly contaminated oil along the last 400 feet of the route, near the intersection of A and G Roads, which are now referred to as Central Avenue and 7th Street. The glovebox, which had been used for heat treating product material, was considered excess contaminated property and was being removed for disposal (DOE, 1992). Although the glovebox had been packaged in a plastic sheet-lined wooden waste box, the oil escaped from the box. Approximately 2 to 3 liters of oil was released, contaminating Central Avenue, some ground at the storage area, a fork lift, a flatbed and a pick-up truck (DOE, 1992).

The leaking oil affected a strip of pavement approximately 18 inches wide, and approximately 900 square feet of earth. The glovebox was placed on plastic sheeting at the corner of Seventh Street and Central Avenue until removal (DOE, 1992).

On June 15, 1965, a leaking waste box was discovered in the "waste storage area south of 51." The box was returned to Building 881 for investigation and repackaging. It is likely that the "area south of 51" was IHSS 117.3 (DOE, 1992).

On January 29, 1971, 700 gallons of Number 6 fuel oil leaked from Tank 221. The fill line valve, which is used to transfer oil from transport trucks to the tank, had not been closed after use. Reportedly, the released oil was confined to ditches and an open field area east of the tank. Documentation on the incident indicates that this was the second incident of this nature in four weeks. No documentation regarding the first incident was found.

A leak was discovered in the heater coil of one of the fuel oil tanks on April 4, 1975, when the pressure dropped below the head pressure of oil in the tank. The leak enabled oil to flow through the condensate drain line and into the diked area around the tank. The specific tank was not documented.

During the week ending February 16, 1979, an estimated 400 gallons of Number 6 fuel oil was spilled during the filling of the Central Avenue storage tanks. Neither the specific tank, nor details of the release, were documented.

During the week ending February 17, 1989, approximately 50 gallons of Number 6 fuel oil were released when the valve was left open. Reportedly, the oil did not enter a water course.

Physical/Chemical Description of Constituents Released

The oil released during the May 1965 incident contained plutonium, and was considered to be highly contaminated. Oil spots on the road were monitored by alpha survey instruments and had measurements of greater than 100,000 cpm (DOE, 1992).

No documentation was found regarding the constituents of the material leaking from the waste box in the June 1965 incident.

Each release from the 221 Tank (IHSS 152) consisted of Number 6 fuel oil.

Responses to Operation or Occurrence

The asphalt contaminated by the May 1965 incident was removed, placed in lined barrels and buried in a sludge pit. The soil affected by the leaking glovebox was also removed and drummed, in preparation for offsite disposal. Removal of the soil under the glovebox was completed on May 7, 1965 (DOE, 1992). No documentation was found regarding cleanup following the June 1965 incident.

Fate of Constituents Released to Environment

Investigations were conducted in this area as part of the Operable Unit 13 RFI/RI. IHSS 152 (PAC 600-152) was also included in this investigation and was considered as a single source with

IHSS 117.3 (PAC 600-117.3) due to their proximity. Fifty-five soil gas samples were collected at a depth of five feet and analyzed for volatile organic compounds. Data for the soil gas survey are reported in Table 2 (attached). Eleven surface soil samples were collected and analyzed for radionuclides and metals. Soil concentration results for this investigation are summarized in Table 1 and described in the Draft OU 13 Data Summary, No.2 for the Operable Unit 13-100 Area dated June 1995 (DOE, 1995b).

The results of the OU 13 sampling activities show that future remedial action is not warranted. A comparison of the OU 13 results to the RFETS Programmatic Risk-based Preliminary Remediation Goals (PPRGs) is presented in Table 1 (DOE, 1995a). The Office Worker Scenario was selected for this comparison based upon requirements defined in the RFETS Action Levels and Standards Framework for Surface Water, Groundwater, and Soils document for Tier II Surface Soils located in the Industrial Use Area (DOE, 1996). These data are below the Tier II action levels, indicating that the source area does not pose a threat to human health (carcinogenic risk of 10^{-6} or a hazard quotient of 1).

Action/No Further Action Recommendation

In accordance with the No Further Action (NFA) criteria, any geographic area that passes the CDPHE conservative screen is a candidate for NFA (DOE, 1996). Passing the conservative screen requires a carcinogenic risk ratio sum of below 1 each. As seen in Table 3, the carcinogenic ratio sum is 3.5E-01 and the non-carcinogenic ratio sum is 2.38E-02. In cases where the ratio sum is less than 1 for a source area, the potential risk from dermal contact with soil is evaluated to ensure that cumulative risk, including dermal exposure, does not exceed a level of concern (ratio sum > 1) [see Table 4]. The carcinogenic effects ratio sum for benzene, chloroform, vinyl chloride, cobalt, selenium, and zinc is 2.36E-02 while the carcinogenic ratio sum is 3.74E-03. The methodology used in calculating the dermal exposure ratio sum is shown as an attachment after the tables.

Both Tables 3 and 4 indicate that the risk to human health from exposure to soil at IHSS 117.3 and 152 would be minimal based upon the exposure assumptions for the residential scenario. The total carcinogenic ratio sum (dermal ratio + screen ratio) for this area is 3.57E-01, while the total non-carcinogenic ratio sum is 4.74E-02.

The NFA decision criteria document states that a geographic area that passes the CDPHE conservative screen must also undergo an Ecological Risk Assessment (ERA) screen before it can proceed through the NFA process (DOE 1996). However, because this site is located in the Industrial Area, an ERA is not applicable for this area. Additionally, a review that was conducted for compliance with the National Environmental Policy Act did not identify any ecologically sensitive systems/species located in this area.

Based upon the above evidence, the NFA criteria have been met and therefor no further action is warranted for this area.

Comments

Storage of materials similar to those stored at the south site chemical storage area (PAC 600-117.3) also occurred south of Tank 221, in the Building 444 Parking Lot (see PAC 600-160).

A portion of PAC 400-802 underlies IHSS 152 and will be reconfigured based upon sampling conducted as part of the characterization for IHSS 152 and IHSS 117.3.

It is believed that the referenced sludge pit in which the contaminated asphalt was buried is one of the sewage sludge disposal trenches also referred to as the East Trenches (PAC NE-111.1 - NE-111.8).

References

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1995a, P*rogrammatic Risk-Based Preliminary Remediation Goals, Final Revision3*, Department of Energy, Rocky Flats Environmental Technology Site, Golden, CO, August.

DOE, 1995b, *Draft Data Summary 2, Operable Unit 13, 100 Area*, Department of Energy, Rocky Flats Environmental Technology Site, Golden, CO, June.

DOE, 1996, *Final Rocky Flats Cleanup Agreement*, Department of Energy, Rocky Flats Environmental Technology Site, Golden, CO, July.

Table 1
Chemicals of Concern Detected within IHSS 152 and 117.3 Source Area

Analytes	# of samples taken	# of detections above background	IHSS 152 & 117.3 Maximum[1]	RFETS PPRGs for Surface Soil [4,5]
Volatile Organic Compounds (mg/Kg)[7]				
Benzene	55	2	0.616	1.97×10^{2}
Chloroform	55	1	0.821	9.38×10^{2}
Trichlorofluoromethane	55	9	-	-
Vinyl Chloride	55	1	0.011	3.01
Metals (mg/kg)				
Colbalt	11	1	53.5	1.23×10^{5}
Lead	11	2	90.6	*[6]
Selenium	11	1	1.5	1.02×10^{4}
Zinc	11	7	1580	6.13×10^{5}
Radionuclides (pCi/g)				
$Pu^{239/240}$	11	4	0.385	1.01×10^{1}
$U^{233/234}$	11	2	2.261	7.08×10^{1}
U^{238}	11	1	1.952	2.99

(-) information not availble

1. Data Summary No. 2, Operable Unit No. 13, 100 Area (Document RF/ER-95-0090) June 1995
2. Geochemical Characterization of Background Soils Characterization Program, RFETS, U.S. DOE, May 1995
3. Backgound concntration equals mean plus two standard deviations.
4. Programmatic Risk-Based Preliminary Remediation Goals; RFETS; Final-Revision 3, August 1995
5. PPRGs, Office Worker Scenario for Surface Soil (1.0E-06); for CDPHE conservative screen surface soil is considered to be from 0'-12'
6. Although a PPRG has not been calculated for lead in soil, the maximum lead concentration of 90.6 mg/kg is well below EPA's screening level of 400 mg/kg.
7. Volatile organic compounds detected using soil gas data and reported in mg/l. Conversion from mg/l to mg/kg shown in Table 2.

Table 2
Conversion of Soil-gas Data to Soil Concentrations for IHSSs 152 and 117.3

Analyte	No. of Samples	No. of Detects	Maximum Soil-gas Concentration (mg/L)[a]	Henry's Constant (H')[b]	K_{oc} (L/kg)[b]	Fraction of Organic Carbon (f_{oc})[b]	Estimated Soil Concentration (mg/kg)[c]
Benzene	55	2	1.1	0.224	57	0.0022	0.616
Chloroform	55	1	1.1	0.165	56	0.0022	0.821
Trichlorofluoromethane	55	9	31	--	159	0.0022	--
Vinyl Chloride	55	1	1.6	3.45	11	0.0022	0.011

MAX HITS

Notes:

(a) Soil-gas survey results reported in OU 13 Technical Memorandum, June 1995. Data collected from 5-ft depth.

(b) H', K_{oc}, and F_{oc} used to calculate RFETS subsurface soil action levels.

(c) Conversion equation derived from formula for estimating soil-gas concentrations using soils concentrations in *Air/Superfund National Technical Guidance: Assessing Potential Indoor Air Impacts for Superfund Sites* (EPA 1992).

Table 3

RBC[1] Screen for IHSSs 152 and 117.3 -- Soils 1 to 12 Feet

Analyte[2]	Maximum Concentration or Activity	Depth of Sample	Residential Soil RBCs		Ratio of Concentration to RBC	
			Carcinogenic	Noncarcinogenic	Carcinogenic	Noncarcinogenic
Organics[3] (mg/kg):						
Benzene	0.616	5 ft	2.21E+01	-	2.79E-02	-
Chloroform	0.821	5 ft	1.05E+02	2.74E+03	7.82E-03	3.00E-04
Trichlorofluoromethane	-	5 ft	-	-	-	-
Vinyl Chloride	0.011	5 ft	3.37E-01	-	3.26E-02	-
Metals (mg/kg):						
Cobalt	53.5	0-2 cm	-	1.65E+04	-	3.24E-03
Selenium	1.5	0-2 cm	-	1.37E+03	-	1.09E-03
Lead[4]	90.6	0-2 cm	-	-	-	-
Zinc	1580	0-2 cm	-	8.23E+04	-	1.92E-02
Radionuclides[5] (pCi/g):						
Plutonium-239/240	0.385	0-2 cm	2.51E+00	-	1.53E-01	-
Uranium-233/234	2.261	0-2 cm	1.75E+01	-	1.29E-01	-
Uranium-238	1.952	0-2 cm	7.47E+02	-	2.61E-03	-
				Ratio Sum	**3.54E-01**	**2.38E-02**

[1] RBC = Risk-based concentration; chemical-specific RBCs are from August 1995 Programmatic Risk-based Preliminary Remediation Goals (DOE, 1995b). The RBCs used in this conservative screen were based on a residential scenario for exposure to soil.

[2] Only metals and radionucludes with concentrations or activities greater than background mean plus 2 standard deviations are listed.

[3] VOC soil concentrations were derived from soil-gas survey data (see Table 3). A concentration could not be calculated for trichlorofluoromethane because an H' value was not available, nor were PPRGs calculated.

[4] Although no toxicity values exist for lead in soil, the maximum lead concentration of 90.6 mg/kg is well below EPA's screening level of 400 mg/kg for residential soil (EPA, 1994).

[5] For radionuclides listed with more than one isotope, the more conservative RBC was used.

Table 4
RBC Screen for IHSSs 152 and 117.3 -- Dermal Exposure

Analyte[1]	Maximum Concentration (mg/kg)	Oral Slope Factor[2]	Oral RfD[2]	Carcinogenic Intake Factor[3]	Noncarcinogenic Intake Factor[3]	Residential Dermal RBCs (mg/kg)[4]		Ratio of Concentration to RBC	
						Carcinogenic	Noncarcinogenic	Carcinogenic	Noncarcinogenic
Organics:									
Benzene	0.616	2.90E-02	-	8.54E-08	-	4.04E+02	-	1.53E-03	-
Chloroform	0.821	6.10E-03	1.00E-02	8.54E-08	2.80E-07	1.92E+03	3.57E+04	4.28E-04	2.30E-05
Vinyl Chloride	0.011	1.90E+00	-	8.54E-08	-	6.16E+00	-	1.78E-03	-
Metals:									
Cobalt	53.5	-	6.00E-02	-	2.80E-08	-	1.65E+04	-	3.24E-03
Selenium	1.5	-	5.00E-03	-	2.80E-08	-	1.37E+03	-	1.09E-03
Zinc	1580	-	3.00E-01	-	2.80E-08	-	8.23E+04	-	1.92E-02
							Dermal Ratio Sum	3.74E-03	2.36E-02
							Screen Ratio Sum	3.54E-01	2.38E-02
							Total Ratio Sum	**3.57E-01**	**4.74E-02**

[1] Radionuclides are not evaluated because "dermal uptake is generally not an important route of uptake for radionuclides, which have small dermal permeability constants" (EPA, 1989). Lead and trichlorofluoromethane were also not included (see Table 2).
[2] DOE, 1994. Units of slope factors are risk per mg chemical/kg body weight-day; units of reference dose (RfDs) are mg/chemical/kg body weight-day. Oral toxicity criteria were not adjusted for absorption or other corrections applicable to dermal contact.
[3] Intakes were calculated using assumptions and equation shown in text. Units are kg soil/kg body weight-day.
[4] Carcinogenic RBC = target risk/(intake factor x slope factor); noncarcinogenic RBC = (target hazard index x RfD)/intake factor.

Dermal Exposure Evaluation

In cases where the ratio sum is less than 1 for a source area, the potential risk from dermal contact with soil is evaluated to ensure that cumulative risk, including dermal exposure, would not exceed a level of concern (ratio sum >1). For IHSSs 152 and 117.3, risk-based concentrations (RBCs) for dermal contact with soil were calculated assuming residential exposure. The RBCs for carcinogens were calculated assuming residential exposure. The RBCs for carcinogens were calculated assuming a target excess lifetime cancer risk of 10^{-6}, exposed skin surface area (SA) of 2,910 cm^2 (approximately equivalent to hands, face, and forearms), absorption factors (AB) of 0.001 for metals and 0.01 for organics, a soil adherence factor of 0.5mg/cm^2, an exposure frequency (EF) of 350 days/year, exposure duration (ED) of 30 years, body weight of 70 kg, an averaging time (AT) of 25,550 days (70 years), and a unit conversion factor (CF) of 10^{-6} kg/mg. In calculating RBCs for noncarinogenic effects, all of the exposure parameters are the same except the averaging time is 10,950 days (30 years) and the target hazard index of 1 replaces the target excess lifetime cancer risk. The intake factor (IF) equation for dermal contact is:

$$IF = \frac{(SA)(AB)(AF)(EF)(ED)(CF)}{(BW)(AT)}$$

If the carcinogenic and noncarcinogenic total ratios for dermal contact with chemicals in soil are less than 1 and when added to the ratios for other soil exposures do not result in a ratio sum greater than 1, the source area is a candidate for no further action pending an ARARs review. If either the carcinogenic or noncarcinogenic ratio for dermal contact to chemicals in soil or sediment is greater than 1, or when added to the ratios for other soil or sediment exposures result in a ratio sum greater than 1, the source area will be retained for further evaluation.

Dermal absorption of radionuclides is not quantified because "dermal uptake is generally not an important route of uptake for radionuclides, which have small dermal permeability constants (EPA 1989).

Reference:

EPA 1989. Risk Assessment Guidance for Suoerfund. Volume I. Human Health Evaluation Manual (Part A). EPA/540/1-89/002. December.

PAC REFERENCE NUMBER: 600-164.1

IHSS Reference Number: 164.1, Industrial Area Operable Unit

Unit Name: Radioactive Slab From Building 776 (IAG Name: Radioactive Site 800 Area Site No. 2 - Concrete Slab)

Approximate Location: N748,500; E2,083,500

Date(s) of Operation or Occurrence

September 1957

Description of Operation or Occurrence

After the 1957 fire in Building 776/777, a radioactively contaminated slab from the east wall of the building was placed in an area northwest of Building 881 for temporary storage. The area impacted is now covered by the southeast corner of the Building 881 Parking Lot (DOE, 1992).

Physical/Chemical Description of Constituents Released

Several hundred square feet of ground surface were affected. No documentation was found which detailed the constituents released to the environment. However, the concrete slab originated from Building 776 which is a plutonium manufacturing facility; therefore, it is possible that plutonium contaminated the slab (DOE, 1992).

Responses to Operation or Occurrence

The slab was reportedly broken up, removed, and the area was cleaned (DOE, 1992).

Fate of Constituents Released to Environment

No documentation was found which detailed the fate of the constituents released to the environment. This IHSS was studied according to the IAG schedule for Operable Unit 14.

Action/No Further Action Recommendation

As documented in the Operable Unit 14 Data Summary Report (DOE, 1995), fifteen surficial soil samples were collected and analyzed for radionuclides within IHSS 164.1 (PAC 600-164.1). There were no positive detections above the PRGs supporting the fact that potentially contaminated concrete was cleaned up. Analytical data and process knowledge that the concrete slab was removed and the area cleaned up support the conclusion that no threat of adverse health effects exist under the exposure conditions evaluated. The recommendation for no further action

at this site is consistent with the criteria for recommending no further action decisions presented in RFCA (DOE, 1996).

Comments

None

References

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1995, *Operable Unit 14, Radioactive Sites, Draft Data Summary 1, Vol. 1*, Rocky Flats Environmental Technology Site, Golden, CO, June.

DOE, 1996, *Final Rocky Flats Cleanup Agreement*, Department of Energy, Rocky Flats Environmental Technology Site, Golden, CO, July.

PAC REFERENCE NUMBER: 600-189

IHSS Reference Number: 189, Industrial Area Operable Unit

Unit Name: Nitric Acid Tanks (IAG Name: Multiple Acid Spills)

Approximate Location: N35,900; E19,600

Date(s) of Operation or Occurrence

1952

Description of Operation or Occurrence

The 218 Acid Tanks, also known as the Building 218 Acid Farm, are located adjacent to the railroad tracks east of Building 444 and south of Cottonwood Avenue. The tanks have been used for the storage of nitric acid since 1952, and are assigned the facility number 218. The tanks supplied acid to Building 771 and Building 883 (DOE, 1992).

On October 27, 1982, brown gas and a brown cloud were observed coming from the Acid Tank Farm. No documentation was found explaining the incident (DOE, 1992).

An overflow occurred on September 25, 1985, during a filling operation. The quantity of acid released was not documented (DOE, 1992).

On June 28, 1986, the level probe in a dumpster tank failed, causing a release of nitric acid to the safety overflow and onto the ground. Approximately one gallon of acid was released to the ground surface (DOE, 1992).

Physical/Chemical Description of Constituents Released

Nitric acid was released to the environment in each of the occurrences.

Responses to Operation or Occurrence

Two containers of sodium bicarbonate were used to neutralize the September 1985 spill. The volume of the containers is unknown (DOE, 1992).

Following the June 1986 overflow incident, the Fire Department washed down, diluted and neutralized the acid with sodium bicarbonate (DOE, 1992).

The acid tanks were removed on September 29, 1996, as part of the plantwide Demobilization and Decommissioning (D&D) schedule.

Fate of Constituents Released to Environment

No documentation was found which detailed the fate of the constituents released to the environment. IHSS 189 (PAC 600-189) was studied in accordance with the IAG schedule for Operable Unit 12.

Action/No Further Action Recommendation

Due to the relatively small amount of acid spilled and the neutralization effect over time, it is proposed that the cumulative hazard indices for noncarcinogenic health effects are 0.01 or less and therefore no adverse noncancer health effects are expected under the exposure conditions evaluated. The recommendation for no further action is consistent with the criteria for recommending no further action decisions presented in RFCA (DOE, 1996).

Comments

This IHSS was originally identified as Multiple Acid Spills, 800 Area. However, information from the CEARP source is vague. Interviewees for CEARP Phase 1 indicated that the "nitric acid receiving area (area 218) located north of Building 881" was the location of numerous small spills during acid transfer and operation. Other interviewees for the same document indicated the nitric acid farm west of Building 881 was the location for spills which were rinsed off onto the ground. RCRA 3004(u) did not place IHSS 189 on a map but defined the IHSS as multiple acid spills north and west of Building 881 (DOE, 1992).

It should be noted that, at one time, there were overhead acid lines between the 218 Tanks and the northwest side of Building 881. It is not unlikely that lines were hit by vehicular traffic at times causing acid to spill onto the ground. This may have been a source of the referenced releases identified in CEARP as north and west of Building 881.

References

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1995, *Technical Memorandum No. 2, Operable Unit 12, 400/800 Areas, Draft*, Department of Energy, Rocky Flats Environmental Technology Site, Golden, CO, February.

DOE, 1996, *Final Rocky Flats Cleanup Agreement*, Department of Energy, Rocky Flats Environmental Technology Site, Golden, CO, July.

PAC REFERENCE NUMBER: 600-1001

IHSS Reference Number: Not Applicable

Unit Name: Temporary Waste Storage Building 663

Approximate Location: N749,000; E2,083,000

Date(s) of Operation or Occurrence

1954-1971
June 23, 1997

Description of Operation or Occurrence

Two temporary buildings were constructed on concrete slabs by the Austin Construction Company for use during construction activities for the original plant construction in the early 1950s. These buildings were located where Building 662 and Building 663 presently are located. The wooden structures were removed prior to 1954, but the concrete slabs remained. The slabs from Buildings 662 and 663, as well as the area around them, were used for storage purposes (DOE, 1992).

In April 1954, it was proposed that the Building 663 slab be used for temporary storage of non-combustible waste awaiting disposal. It is believed from the research for the HRR that the slab is also known as the East Slab, as it is located both east of Building 334, which also had a storage slab, and Building 444, from where most of the waste stored at Building 663 came. Storage operations began in May 1954, when 302 drums of graphite and 49 drums of liquid waste were placed on the Building 663 slab. Waste coolant drums were also stored on the slab. In November 1954, all of the drums were removed from the slab; however, storage at the area later resumed (DOE, 1992).

The area was found to be an advantageous loading area, and plans were made to convert the slab into a loading facility. On May 25, 1955, approval was requested for the conversion of the slab east of the Building 663 slab, which is the current location of Building 662, to a loading facility. The north end of the loading facility was reinforced and refinished with concrete in October 1958 On October 14, 1960, a waste storage building was erected upon the Building 663 slab. Accumulated drums of waste from the production buildings were moved to the building upon completion of construction. In November 1962, drums and boxes of waste from Buildings 771 and 774 were moved to the west side of Building 663 for outside storage (DOE, 1992).

As summarized in the original HRR (DOE, 1992), documented releases occurring at these storage areas include the following:

- On November 16 and 17, 1954, 59 drums of contaminated wastes were moved from the concrete slab (Building 663) to the Mound Site for burial (PAC 900-113). At this time, many drums were found to be in poor condition. Drums of liquid wastes, which had been placed at the storage area in April 1954, had corroded and developed leaks. The south side of the concrete slab was contaminated as a result of the leaks.

- On September 5, 1958, a drum containing highly contaminated coolant was punctured on the East Slab. As a result, the slab was contaminated up to greater than 100,000 cpm direct reading, and up to 20,000 cpm removable contamination. Routine smear surveys conducted at the East Slab in August 1959 indicated a maximum reading of 108 dpm, and an average reading of 16 dpm. The high reading was taken from a roped off area of the slab. Spot checks indicated direct readings of 100,000 cpm in this area. No documentation was found which explained why the area was roped off.

- Routine smear surveys conducted on the East Slab in March 1960 indicated a maximum reading of 1,734 dpm, and an average reading of 67 dpm. Also, 59 drums at the East Slab were surveyed, resulting in a maximum beta-gamma reading of 0.4 mr/hr. Additionally, during March 1960, the lids of two waste drums from Building 883 came loose, resulting in contamination of approximately 2 square feet of slab, to 3,000 cpm, with solid material. Additionally, a waste drum from Building 881 was found to be leaking. Direct readings up to 300 cpm were found. During May 1960, 3 waste drums from Building 881 were found to be leaking. The drums were returned. Apparently, acidic waste material was being released from the corroded drums and contaminating the loading facility.

- Routine smear surveys conducted on the East Slab in June 1960 indicated a maximum reading of 126 dpm and an average reading of 21 dpm. Also during June, 1960, a drum from Building 881 leaked on the East Slab. The drum was returned, and no contamination was found on the slab.

- Routine smear surveys conducted on the East Slab in August 1961 indicated a maximum reading of 24 dpm, and an average reading of 6 dpm. During August 1961, leaking drums from Building 444 and Building 776 were monitored many times. No contamination was found.

- During loading operations on March 19, 1963, a leaking drum was discovered. The liquid was determined to be radioactive. The ground, forklift, and trailer were contaminated. The contents of the drum and the quantity released were not documented. On March 26, 1963, a leaking waste drum in the area outside of Building 663 resulted in the contamination of a fork lift, truck trailer, cross bar, lining in a truck trailer, the fork lift operator, a laborer and the ground. Other documentation states that during loading operations in March 1963, 3 "leakers" were discovered. The trailers, 2 fork lifts, the work area and personal clothing were contaminated. It is unknown whether these two reports discuss the same incident or two separate incidents. No documentation regarding the contents of the drums or the extent of ground contamination was found for either case.

- A waste drum leak on September 17, 1963 contaminated a fork truck, panel truck and semi-trailer at Building 663. No documentation was found which detailed the contents of the drum or release to the environment.

- On January 12, 1990, there was a gasoline spill on the east side of Building 662. The gasoline was leaking from a truck. The problem was corrected.

In addition to these releases, on June 23, 1997, while conducting a surveillance walkdown of the Building 663 Laydown Yard (PAC 600-1001), two oil stained areas were identified on the soil immediately west of the building. The first stained area was approximately 10 feet west of the southwest corner of the building where a 5 gallon bucket containing an oil-water mixture had overflowed due to recent rain. Stained soil around the bucket indicated that overflowing of the bucket had been ongoing for several years. During the assessment of the first finding, a second oil stain was identified approximately 100 feet north of the first where an abandoned piece of equipment was observed leaking what appeared to be hydraulic fluid onto the ground (soil). Radiological surveys were conducted at both sites followed by soil sampling and sampling of the unknown oil in the five gallon bucket. The bucket and contents were placed into an overpack container and both oil stained areas were immediately cleaned up in accordance with plant procedures (RMRS, 1997).

Physical/Chemical Description of Constituents Released

Constituents which may be present due to storage activities include oil, still bottoms, perclene, waste coolant, and solids. Gasoline was released during the January 1990 incident (DOE, 1992). With respect to the June 23, 1997 identification, independent sampling was conducted from both of the soil stained areas and the liquid remaining in the five gallon bucket for fingerprint analysis (oil), radiological screens, isotopic analysis (Pu, U, Am), total CLP metals, total Volatile Organic Analysis (VOAs) and Polychlorinated Biphenyls (PCBs). Laboratory analysis of the soil from both locations found undetected or equivalent to background concentrations for all parameters analyzed. Positive results for several compounds were identified in the liquid sample (shown below):

Compound	Units (ppm)
Ethylbenzene	43
Total Xylenes	260
1,1,1-Trichloroethane	230
1,2,4-Trimethylbenzene	100
N-Butylbenzene	44
Napthalene	61
1,3-Dichlorobenzene	25

Response to Operation or Occurrence

With the exception of the June 23, 1997 occurrence, detailed descriptions of the response to operation or occurrence are provided in the original HRR (DOE, 1992). In response to the June 23, 1997 occurrence, the individual conducting the walkdown immediately notified supervision, the Shift Manager, and the RFETS Fire Department. The HAZMAT Team and Shift Superintendent responded to the site and initial radiological screening was conducted. Samples were collected from the liquid in the bucket and both soil areas. Gravel and soil from the two sites were containerized per plant procedure and transported to a RCRA permitted storage facility (RFETS Fire Dept. Response Tracking 97-318).

Fate of Constituents Released to the Environment

With the exception of the June 23, 1997 occurrence, no documentation was found which detailed the fate of the constituents released to the environment (DOE, 1992). Sampling and analysis adequately characterized the compounds associated with the oil in the five gallon bucket and stained soil in both areas. The area was immediately cleaned up in accordance with plant procedures and the soil was containerized prior to transporting to a RCRA permitted storage facility. In addition, the five gallon bucket and contents were overpacked prior to removal. There were no other contaminants associated with the release and the spill was verified to be cleaned up. The fate of constituents and associated risk to environment from this release are considered minimal.

Action/No Further Action Recommendation

PAC 600-1001 requires further investigation given the information provided in the HRR (DOE, 1992); however, in relation to the June 23, 1997 occurrence and specifically to the stained soil areas identified, no further action is required.

Comments

Photographs of the slab in 1959 clearly show significant cracks in the concrete and circular rings where drums had been stored. Photographs taken of the Building 663 floor during a site visit in December 1991 show similar cracks in the concrete as well as circular stains where drums had been stored. Building 663 is currently used for nonhazardous equipment storage (DOE, 1992).

The June 23, 1997 release did not result in any injury or potential hazard to human health or the environment.

References

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1997, *Serious Incident Report #318*, Rocky Flats Environmental Technology Site, Golden, CO, June.

RMRS, 1997, *Environmental Operations CERCLA History Files*, Rocky Flats Environmental Technology Site, Golden, CO, July.

PAC REFERENCE NUMBER: 700-123.1

IHSS Reference Number: 123.1, Industrial Area Operable Unit

Unit Name: Valve Vault 7

Approximate Location: N750,000; E2,084,000

Date(s) of Operation or Occurrence

April 4, 1983

Description of Operation or Occurrence

Valve Vault 7 is located to the southwest of Building 707, adjacent to the north side of the PSZ inner fence. Valve Vault 7 controls the 800 Area main process waste line (DOE, 1992).

On April 4, 1983, a check valve in Valve Vault 7 malfunctioned allowing process wastewater to backflow into the sump. The vault filled with process wastewater and overflowed. The high water level alarm system in Valve Vault 7 was apparently inoperative at the time of the overflow (DOE, 1992). The process wastewater drained into an adjacent storm runoff collection system ditch near Eighth Street and Sage Avenue and flowed east toward South Walnut Creek and the B-Series drainage ponds. Runoff was noticed flowing across the former 750 Parking Lot, through the Building 991 normal runoff drainage (DOE, 1992).

Physical/Chemical Description of Constituents Released

The release consisted of process wastewater from the 800 and 400 Areas which typically contains uranium, solvents, oils, beryllium, nitric acid, hydrochloric acid, and fluoride (DOE, 1992).

Responses to Operation or Occurrence

The transfer of liquid waste from the holding tanks at Building 881 was discontinued after personnel verified that wastewater was flowing out of Valve Vault 7. Temporary dikes were constructed to contain the overflow (DOE, 1992). A dam was constructed in the ditch east of the guard shack at Portal #1 and another dam was placed just west of Guard Shack 762. Drainage from the area was diverted to Pond B-1. Attempts were made to remove oil by using chemical absorbent bats. Environmental samples were taken from the vault and other areas of concern. Water was pumped out of the vault and the containment dikes and transferred to Waste Processing by tanker truck. Snow melt water was retained in the ditch for several days and later transferred to Process Waste Storage. The malfunctioning check valve was repaired or replaced, the sump pump was replaced and repair of the electrical system was initiated. A new type of check valve was ordered for all the check valves in the waste transfer system (DOE, 1992). The

ditch along Sage Avenue between Valve Vault 7 and Ninth Street was cleaned of all visible contamination. The excavated material was stored for drying in the old Building 771 parking lot.

Fate of Constituents Released to Environment

The runoff diversion activities were partially successful. Oil from the spill was visible in Pond B-1. A small amount of oil was observed in Pond B-4 and Pond B-5. All visible contamination was excavated from the ditch along Ninth Street (DOE, 1992). No documentation was found which detailed the complete removal of release constituents from the site. Analysis of water samples from Pond B-1 and Pond B-4 one week following the incident indicated no abnormal pH, or concentrations of oil, nitrate, or radioactivity. Evaluation of data for Pond B-5, the only pond that discharged off site during that period, indicated no presence of material from the spill. Pond B-5 water was to have been held for about two weeks after April 15, 1983 before being released to Great Western Reservoir. One reference indicated the environmental impact was negligible (DOE, 1992).

IHSS 123.1 (PAC 700-123.1) was studied in accordance with the IAG schedule for Operable Unit 8.

Action/No Further Action Recommendation

As documented in the Operable Unit 8 Data Summary Report (DOE, 1995), IHSS 123.1 was sampled in seven locations for inorganics, radionuclides, volatile organic compounds, and semi-volatile organic compounds. There were no detections with the exception of benzo(a)pyrene which was present in the sample but below the MDL. No threat of adverse health effects exist under the exposure conditions evaluated and therefore this site is proposed for no further action. The recommendation for no further action is consistent with the criteria for recommending no further action decisions presented in RFCA (DOE, 1996).

Comments

Further discussion of PAC 700-123.1 is documented in the Historical Release Report (DOE, 1992).

References

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1994, *Phase I RFI/RI Work Plan for Operable Unit 8, 700 Area, Vol. 1,* Rocky Flats Environmental Technology Site, Golden, CO, October.

DOE, 1995, *Operable Unit 8, Data Summary Report, 700 Area, Vol. 1,* Rocky Flats Environmental Technology Site, Golden, CO, September.

DOE, 1996, *Final Rocky Flats Cleanup Agreement*, Department of Energy, Rocky Flats Environmental Technology Site, Golden, CO, July.

PAC REFERENCE NUMBER: 700-132

IHSS Reference Number: 132, Industrial Area Operable Unit

Unit Name: Radioactive Site - 700 Area - Site Number 4

Approximate Location: N750,700; E2,083,900

Date(s) of Operation or Occurrence

1956 - October 1984

Description of Operation or Occurrence

The *Historical Release Report* (DOE, 1992) reported that the tanks included in IHSS 132 (PAC 700-132) are located beneath Building 730, which is between Building 771 and Building 776. Building 730 is approximately 150 feet south of Building 771 and 80 feet north of Building 776 as measured from RFP Utility drawings. Documented incidents involving laundry tanks north of Building 776 and south of Building 771 are likely to have occurred at the tanks in Building 730 (DOE, 1992).

Utilities personnel stated that they were unaware of infiltration of groundwater into the Building 730 tanks, but believed that leakage from these tanks was likely, based on the condition of the tanks. Although some references noted that overfill of these laundry tanks was unlikely, personnel familiar with the tanks remember a number of incidents involving overfilling the tanks as well as other releases associated with these tanks (DOE, 1992).

On September 23, 1975, there was a slight spill onto the ground "near Building 776" during the removal of contaminated process waste sludge from the underground concrete holding tanks. Another document reports the clean out of a waste tank "north of Building 776" caused contamination to the environment which included the contamination of a cement truck. On July 30, 1979, laundry tanks overflowed in the "new pit" (DOE, 1992).

There are four underground waste holding tanks located in the small structure identified as Building 730. They were previously designated as Tanks 776 A through D. They were built in approximately 1956, and were taken out of service in the 1980s. Tanks A & B are now used as plenum deluge tanks. The tanks would, therefore, normally be dry (DOE, 1992).

The tanks are concrete, and have a 26 foot depth. The capacity of Tanks 776 A and B is 22,500 gallons each (DOE, 1992). These tanks are also referred to as Tank T-9 in the Interagency Agreement Underground Storage Tank Source Removal Project (DOE, 1996). Tanks 776 C and D have a capacity of 4,500 gallons each (DOE, 1992). These tanks are also referred to as Tank T-10 in the Interagency Agreement Underground Storage Tank Source Removal Project (DOE, 1996). The dimensions of 776 A and B (i.e., Tank T-9) are 25'L x 15'W x 10'W each, and those

of 776 C and D (i.e., Tank T-10) are 5'L x 15'W x 10'H each. Tanks 776 A and B (i.e., Tanks T-9) are laundry waste holding tanks and Tanks 776 C and D (i.e., Tank T-10) are process waste holding tanks. If tanks C and D overflowed, the excess liquid could drain into tanks A and B, and vice versa. A pipe header at the tanks allowed alternatives of pumping the laundry water to the sanitary sewer system, the Solar Evaporation Ponds, or Building 774 (DOE, 1992; DOE, 1996a).

Physical/Chemical Description of Constituents Released

Materials introduced to the environment from leaks in these tanks are mostly water with small amounts of detergent and radionuclides. The incident in September 1975 involved radioactively contaminated sludge that had accumulated in the tank. Six smear samples which were taken when the laundry tanks overflowed in the "new pit" in July 1979 had activities of less than 20 dpm (DOE, 1992).

Responses to Operation or Occurrence

The September 1975 incident was cleaned up in an undescribed manner at a cost of $2,288. Six smear samples were taken when the laundry tanks overflowed in the "new pit" on July 30, 1979. The four tanks were removed from service as waste receiving tanks. The 4,500-gallon tanks (Tank T-10) were decommissioned from laundry service in December 1982 and the 22,500-gallon tanks (Tank T-9) were decommissioned from laundry service in October 1984. Reference documents suggest all four tanks have been cleaned, painted and converted to Building 771 plenum deluge tanks; the tanks may occasionally fill with groundwater (DOE, 1992).

At present, the T-9 tanks are active plenum deluge tanks for Building 776 (Process Waste Pit) (DOE, 1996a). Tank T-10 was included within the scope of the Accelerated Action Plan for the Interagency Agreement Underground Storage Tanks Containing RCRA-Regulated Materials (DOE, 1995a) and was emptied, rinsed, sampled, and foamed in accordance with the Proposed Action Memorandum for the Contaminant Stabilization of Underground Storage Tanks (DOE, 1996b). The source removal from Tank T-10 is detailed in the Completion Report for the Underground Storage Tanks Source Removal Project (DOE, 1996a).

Fate of Constituents Released to Environment

The IHSS was studied in accordance with the IAG schedule for Operable Unit 9 (DOE, 1992). In accordance with Technical Memorandum No.1, Addendum to Phase I RFI/RI Work Plan, Field Sampling Plan, Volume I, Part A - Outside Tanks (DOE, 1994), the tank contents of Tanks T-9 and T-10 were sampled along with surface soil, subsurface soil, and groundwater within the area surrounding these tanks. The results and conclusions from the sampling are presented in the Data Summary Report No. 2, Operable Unit No. 9, Outside Tanks (DOE, 1995b). Volatile organic compounds were detected in subsurface soils collected below the water table and in groundwater in the area of these tanks (DOE, 1995b) however, these contaminants are believed to be related to IHSS 118.1.

No Action/No Further Action Recommendation

The source removal from the T-10 tanks was successful in stabilizing the tanks in accordance with the Proposed Action Memorandum for the Contaminant Stabilization of Underground Storage Tanks (DOE, 1996b) as described in the Completion Report for the Underground Storage Tanks Source Removal (DOE, 1996a). The T-10 tanks were rinsed a total of three times and contaminant levels were reduced from approximately 1,200 ppb (metals & volatiles) to less than 100 ppb. Radionuclide contamination was reduced by a factor of approximately 25 in the east tank and a factor of approximately 650 in the west tank. The rinsing efforts were considered complete and the tanks were foamed once there was no appreciable decrease (30%) in the target parameters between rinses.

The T-9 tanks remain active plenum deluge tanks (DOE, 1996a) and will require further action once taken off-line.

Comments

It is possible that the discrepancy regarding infiltration of groundwater into these tanks may be a misinterpretation. The two waste tanks north of Building 771 (the Building 728 tanks) were also used as laundry tanks in the past, and are also used for plenum deluge water currently. These tanks north of Building 771 are known to be subject to groundwater infiltration as discussed in PAC 700-126 (DOE, 1992).

The laundry waste tanks housed in Building 730 are related to a sewer line overflow incident discussed as PAC 700-144. This unit is part of the OPWL system which is discussed as PAC 000-121 (DOE, 1992).

Nearby IHSS 118.1 was caused by a leaking underground carbon tetrachloride tank. This IHSS is believed to be the primary source of contamination in the surrounding soil and groundwater at this location.

References

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1994, *Technical Memorandum No.1, Addendum to Phase I RFI/RI Work Plan, Field Sampling Plan, Volume I, Part A - Outside Tanks*, May.

DOE, 1995a, *Accelerated Action Plan for the Inter-Agency Agreement Underground Storage Tanks Containing RCRA-Regulated Materials*, December.

DOE, 1995b, *Data Summary Report No. 2, Operable Unit No.9, Outside Tanks, Volume 1*, RFP/ERM-95-00000, Environmental Restoration Department, October.

DOE, 1996a, *Completion Report for the Underground Storage Tanks Source Removal Project*, RF/ER-96-0050, October.

DOE, 1996b, *Proposed Action Memorandum for the Contaminant Stabilization of Underground Storage Tanks* RF/ER-96-0021.UN, April.

DOE, 1996c, *Final Rocky Flats Cleanup Agreement*, Department of Energy, Rocky Flats Environmental Technology Site, Golden, CO, July.

PAC REFERENCE NUMBER: 700-143

IHSS Reference Number: 143, Industrial Area Operable Unit

Unit Name: 771 Outfall (IAG Name: Old Outfall)

Approximate Location: N751,150; E2,083,525

Date(s) of Operation or Occurrence

1953 - 1965 (DOE, 1992)

Description of Operation or Occurrence

When Building 771 went into operation in 1953, some waste liquids passed through a storm drain located north and west of the building and into North Walnut Creek. The main source was outfall from the Building 771 Laundry holding tanks. Other sources included the analytical laboratory and radiography sinks, the personnel decontamination room, and runoff from the roof of Building 771 and the ground areas (DOE, 1992).

Liquid wastes in the laundry holding tanks were discharged to this drain if the plutonium concentration was below 3300 disintegration per minute per liter. Between mid-1953 and mid-1957, 4.5 million gallons of liquid was released containing a total of 2.23 mCi. In 1957, a waste line was completed which allowed an option of releasing these liquids to the Building 774 release below Building 995 (PAC NE-142). Due to equipment problems, periodic releases from the laundry holding tanks to the 771 outfall continued until 1965. During this period 430,000 gallons were released containing 0.25 mCi (DOE, 1992).

The other release sources for the 771 Outfall went directly to the storm sewer and there is no documentation of the liquid quantity or quality (DOE, 1992).

On April 9, 1958, it was noted that a decontamination sink was tied into a process waste drain that emptied into Walnut Creek north of Building 773. Water continuing to drain through the pipe and outfall undoubtedly contributed to the spread of contamination in to Walnut Creek (DOE, 1992).

In May 1971, a sewer line break resulted in storage tanks overflowing through the 771 Outfall (DOE, 1992).

During the week ending August 4, 1978, a hot spot approximately 875 square feet in size was found near a culvert northwest of the Building 771 parking lot (DOE, 1992).

Physical/Chemical Description of Constituents Released

Plutonium contaminated waste-waters that also contained soaps and detergent which originated from the Building 771 laundry, analytical laboratory, and radiography areas and a decontamination sink (DOE, 1992).

Site Survey Monthly Reports from 1955 were obtained. They characterize the releases by reporting the monthly alpha activities in the waters released to the environment. As reported in the Historical Release Report, the alpha activity reported for the "71 Building to Walnut Creek" releases ranged 2.216E-04 to 1.03E-04 for 1955 (DOE, 1992).

In addition to the waters released from Building 771, a soil stabilizing solution was frequently applied during remedial activities in 1971. The stabilizer was a mixture of water, ethylene glycol, and Dowell J-197 soil stabilizer (DOE, 1992).

Responses to Operation or Occurrence

As early as 1953, contamination at the outfall was measured at 17,400 dpm/g in the soil. Contamination of the soil at the discharge was reported in May 1956 with the highest sample being 130 dpm/g gross alpha activity (DOE, 1992).

In April 1958, instrument readings of up to 8,000 counts per minute were obtained on the rocks in the area. In May 1958, contamination of the soil was reported to be as high as 2,000 dpm/g gross alpha activity (DOE, 1992).

Discharges of laundry waste to the outfall ceased in 1965. Remediation activities which followed are detailed below (DOE, 1992).

"Initial discovery" of the hot spot occurred in April 1970 with samples greater than 190,000 dpm/g plutonium. The area was then subject to frequent soil sampling and some monitoring with direct counting instruments. The sampling continued throughout the remediation process. Soil samples ranged from 28,621 to 229,290 dpm/g plutonium on October 19, 1970 (prior to soil removal activities). On February 18, 1971, activities ranged from 47 to 4,437 dpm/g plutonium during soil removal. Much more soil sampling data is available (DOE, 1992).

Sampling in April 1970 also found 12 dpm/g gross alpha activity in the water draining through the effluent pipe (DOE, 1992).

In August 1970, Health Physics Operations Group Technical and Construction reported that a 12-inch drain line used for the disposal of rain and underground water was found to be slightly contaminated where it drained into McKay Ditch. An investigation indicated that an overflow pipe from the laundry had been accidently piped into this line. The plumbing was corrected and contaminated soil and foliage was removed and drummed as Low Specific Activity (LSA) waste (DOE, 1992).

In September 1970, approximately 75 cubic feet of contaminated soil was removed from the area. Another document states that in September two 55-gallon drums of contaminated soil were removed (DOE, 1992).

In January 1971, the Health Physics Operations Group Technical and Construction Report stated that recent instrument surveys taken in the ditch indicated the prior removal of two barrels of soil and vegetation was insufficient. The removal resumed in February 1971. As of February 18, 1971, there were no known open drain lines from the building to the outfall (DOE, 1992).

A letter dated February 19, 1971 stated that, although it had been requested that the drain pipe to the outfall be capped, the capping would be withheld. This was because the water running out of it was not contaminated at that time and it was being checked daily by Health Physics (DOE, 1992).

As of February 26, 1971, approximately 350 cubic feet of contaminated soil had been removed and barreled from an area of about 750 square feet. It was believed that no contamination had been spread by the wind because the outfall was in a depression about 20 feet deep at the bottom of a hill, the soil was constantly moist and the area was covered with grasses and cattails (DOE, 1992).

The Health Physics Monthly Status Report for the month of February 1971 reported that 20 soil samples obtained from McKay Ditch indicated that the plutonium contamination was localized and did not travel downstream (DOE, 1992).

In early March 1971, water collected from the effluent pipe at the outfall was analyzed and found to have gross activity of 9.60 pCi/l. A typical Rocky Flats water sample averaged about 40 pCi/l at the time (DOE, 1992).

Operations during May 1971 consisted of transferring contaminated mud from 23 used drums to new drums with provisions to absorb any contained liquid. Digging was to be resumed as the weather improved and the mud dried (DOE, 1992).

By August 31, 1971, the removal of soil was complete. It had started in February 1971 and resulted in 149 drums that were shipped as hot waste (presumably offsite but this was not specified in the documentation found). Cement was added to each drum before and after filling to absorb any contained liquid. The contaminated area was approximately 800 square feet with contamination being as deep as 3.5 feet in one small area. The maximum soil sample result was 39,000 dpm/g. Final survey of the area showed no direct alpha count greater that 250 c/m. Final soil sampling averaged 34 dpm/g with a maximum of 150 dpm/g (DOE, 1992).

Clean up of the soil found in the culvert in August 1978 occurred during the summer of 1980. The removal was complete by July 18, 1980, resulting in nine boxes of contaminated soil. The removal was done to allow for the construction of the PSZ (DOE, 1992).

The area that formally was the outfall culvert has been filled in with soil and is now a paved parking lot for Building 771. Filling and parking lot construction occurred some time after the soil removal in 1980 (DOE, 1992).

Fate of Constituents Released to Environment

It was noted that the plutonium had penetrated the soil farther than had been expected. The soaps and detergents used in the laundry may have affected the transport of contamination or deposition of soils over the contamination may explain its position (DOE, 1992).

Action/No Further Action Recommendation

This IHSS was originally designated as part of OU6; however, according to the OU6 RFI/RI Report (DOE, 1996a), this IHSS will be studied in accordance with the RFCA schedule for the Industrial Area Operable Unit (DOE, 1996b).

Comments

The "drain line found" in August of 1970 appears to be the 771 Outfall but some of this information seems inconsistent with other documents. The contamination found in 1978 is believed to be related to this IHSS (DOE, 1992).

Several interviews with retired plant employees eluded that the storm drain located within the Building 776 west loading dock is connected to the 771 outfall.

References

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1996a, *Final Phase I RFI/RI Report Walnut Creek Priority Drainage, Operable Unit 6*, RF/ER-95-0119.UN, Rev 0. Rocky Flats Environmental Technology Site, Golden, CO, February.

DOE, 1996b, *Final Rocky Flats Cleanup Agreement*, Department of Energy, Rocky Flats Environmental Technology Site, Golden, CO, July.

PAC REFERENCE NUMBER: 700-1102

IHSS Reference Number: Not Applicable

Unit Name: Transformer Leak - 776-4

Approximate Location: N750,500; E2,083,500

Date(s) of Operation or Occurrence:

Prior to January, 1986

Description of Operation or Occurrence

Prior to January 1986, Transformer 776-4 was located approximately 100 feet west of the northwest corner of Building 776. The transformer pad at this location was positioned on an incline with drainage toward an access road 15 feet to the east. In January 1986, a plant employee reported that leaking was observed from Transformer 776-4. In February 1986, the transformer was again reported to be leaking on the radiator, around the gauges, valves, and bushing compartment. There was an oily film on most of the surfaces of the transformer and on the transformer pad. In an August 1986 photograph, staining was visible on the concrete pad beneath the transformer. Further leaking was reported in August and September of 1986. Samples collected in November 1986 of the concrete under the transformer drain valve and soil at the south edge of the transformer pad was found to be contaminated with PCBs (DOE, 1992). The transformer was moved to a new pad several feet to the north in 1987 (DOE, 1996b).

Physical/Chemical Description of Constituents Released

In September 1976, the fluid in Transformer 776-4 had a PCB concentration of approximately 5 percent. Samples of the oil collected in November 1977, indicate that the fluid in the transformer had a PCB concentration of approximately 3 percent. However, in October 1985, it was reported to have contained PCB oil (>500 ppm). In November 1986, wipe samples collected from a valve, sidewall, and the concrete pad were found to contain 29.8, 5.0, and 417.5 ppm PCBs, respectively. Also in November 1986, a wipe sample collected from the concrete pad beneath the drain valve was found to contain 498 $\mu g/cm^2$ PCBs. Soil in the bottom of a small excavation at the south edge of the 776-4 transformer pad also showed 14,900 ppm PCB contamination (DOE, 1992).

Response to Operation or Occurrence

In September 1976, Transformer 776-4 was documented as being drained and refilled with a non PCB silicone oil. The transformer was scheduled for replacement under the PCB Fire Hazard Elimination Project in Fiscal Year 1988. The transformer was removed for retrofilling and relocated several feet to the north in 1987. The old transformer pad was partially removed to a

depth of 4 inches and surrounded with fill.

In March 1989, it was reported that transformer 776-4 was replaced under the Environmental Hazards Elimination Project. Further cleanup of the site was scheduled on August 10, 1989 (DOE, 1992).

During a sitewide sampling program in August 1991, soil samples were collected in accordance with Agency approved EPA sampling protocol and analyzed for PCBs using EPA Method 8080. The highest PCB concentration found in soil collected adjacent to the old concrete transformer pad was 480 ppm (DOE, 1996b).

Working under an agency approved Final Proposed Action Memorandum for Remediation of Polychlorinated Biphenyls (PAM) (DOE, 1995), additional samples were collected in 1995 and 1996 to verify the lateral and vertical extent of PCB migration. Soil samples were analyzed using EPA Draft Method 4020 and concrete samples were analyzed using EPA Method 8080. Based upon analytical results for the concrete samples, the highest PCB contamination level on the concrete pad was 56 ppm. In accordance with the PAM (DOE, 1995), approximately 177 cubic yards of PCB-contaminated soil and 10.7 cubic yards of PCB-contaminated concrete were excavated to a total depth of 17 feet, containerized, and shipped to an EPA licensed TSCA landfill in Kettleman, California for disposal (DOE, 1997). An area of soil approximately 20 square feet, at the bottom of the excavation, remains PCB-contaminated. Soil was remediated to 70 ppm using EPA Method 8080 as documented in the Closeout Report for the Source Removal of Polychlorinated Biphenyls (DOE, 1997). Excavation was stopped due to equipment limitations and health and safety concerns.

Fate of Constituents Released to Environment

No historical documentation was found that detailed the disposition of the concrete removed from the transformer pad in 1988 or the fate of constituents released to the environment (DOE, 1992).

Action/No Further Action Recommendation

PAC 700-1102 was remediated from an initial PCB contaminant level of 480 ppm Aroclor-1260 in the soil to 70 ppm. Because the residual contamination is 17 feet below ground surface, the source removal significantly reduced risk to human health and the environment (DOE, 1997). Tier I Subsurface soil action levels for Aroclor-1260 are 3,820 ppm. This site poses no threat of adverse health effects to human receptors and therefore is recommendation for no further action consistent with criteria for recommending no further action decisions presented in RFCA (DOE, 1996a).

Comments

The excavation was filled with clean structural backfill in 1996.

References

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1995, *Final Proposed Action Memorandum for Remediation of Polychlorinated Biphenyls*, RF/ER-95-0066.UN, Rocky Flats Environmental Technology Site, Golden, CO, July.

DOE, 1996a, *Final Rocky Flats Cleanup Agreement*, Department of Energy, Rocky Flats Environmental Technology Site, Golden, CO, July.

DOE, 1996b, *Annual Update for the Historical Release Report, August 1, 1995 through August 1, 1996*. RF/ER-96-0046. September.

DOE, 1997, *Closeout Report for the Source Removal of PCBs*. RF/RMRS-97-044. Revision 0. July.

PAC REFERENCE NUMBER: 800-102

IHSS Reference Number: 102, Operable Unit 1

Unit Name: Oil Sludge Pit

Approximate Location: N747,500; E2,084,000

Date(s) of Operation or Occurrence

1958

Description of Operation or Occurrence

In 1958, thirty to fifty drums of nonradioactive materials were dumped in a pit south of Building 881. The site may be located south of the security fence on the hillside and the dimensions are estimated to be about 25 feet by 50 feet. The Phase III RFI/RI Work Plan locates it 500 feet south of Building 881 with dimensions of 40 feet by 70 feet. It also states that it is visible in 1955 aerial photographs. The RCRA 3004(u) Report identifies the pit as being 180 feet south of the building and having dimensions of 50 feet by 80 feet (DOE, 1992).

Physical/Chemical Description of Constituents Released

The pit was filled with material consisting of oil sludge from tank cleanouts. It is not known if one tank was involved or several, although one of the tanks involved may have stored Number 6 fuel oil. It is possible that the tanks are the underground storage tanks which are discussed in PAC 800-105.1 and PAC 800-105.2. No radioactivity was thought to be involved (DOE, 1992).

Responses to Operation or Occurrence

The pit was backfilled when disposal operations ceased. The corners of the pit were marked; however, on a site visit conducted November 21, 1991 no evidence could be found of such markings (DOE, 1992). In the Phase III RFI/RI, eight boreholes were drilled adjacent to and downgradient of PAC 800-102 (IHSS 102) (DOE, 1994).

Fate of Constituents Released to Environment

No documentation was found which detailed the fate of constituents released to the environment specifically related to this occurrence (DOE, 1992). This IHSS was studied in accordance with the IAG schedule as part of Operable Unit 1. The Final Phase III RFI/RI Report for Operable Unit 1 was issued in 1994 (DOE, 1994). As summarized in the Final Phase III RFI/RI Report for Operable Unit 1, eight boreholes were located to delineate the potential release. Only isolated, low concentrations of chlorinated solvents, polynuclear aromatic hydrocarbons, and radionuclides were detected at this IHSS. The report concluded the nature and distribution of detected

contaminant concentrations at PAC 800-102 (IHSS 102) was indicative of potential background contamination or off-site sources (DOE, 1994).

Action/No Further Action Recommendation

No Action for PAC 800-102 (IHSS 102) was approved by the Agencies and is documented in the CAD/ROD for Operable Unit 1, 881 Hillside Area (DOE, 1997). The declaration statement from the CAD/ROD is included in Appendix A.

Comments

No documentation was found which verifies the existence of this site. Interviews were conducted on November 11, 1991 and December 4, 1991 with RFP personnel who were employed at the time of the incident; however, they could not recall any such dumping. (DOE, 1992) Results of the Phase III RFI/RI suggest that waste disposal at PAC 800-102 (IHSS 102) did not occur or cause subsurface contamination (DOE, 1994).

References

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1994, *Final Phase III RFI/RI Rocky Flats Plant 881 Hillside Area (Operable Unit No, 1)*, Department of Energy, Rocky Flats Plant, Golden, CO, June.

DOE, 1997, *Corrective Action Decision/Record of Decision, Operable Unit 1: 881 Hillside Area, IHSS 119.1*, Department of Energy, Rocky Flats Environmental Technology Site, Golden, CO, February.

PAC REFERENCE NUMBER: 800-103

IHSS Reference Number: 103, Operable Unit 1

Unit Name: Chemical Burial

Approximate Location: N748,000; E2,084,000

Date(s) of Operation or Occurrence

Unknown

Description of Operation or Occurrence

There is an area south of Building 881 that was reportedly used to bury unknown chemicals (DOE, 1992).

Physical/Chemical Description of Constituents Released

References state that "unknown" chemicals were buried (DOE, 1992).

Responses to Operation or Occurrences

No documentation was found which detailed responses to this occurrence (DOE, 1992). In the Phase III RFI/RI, five boreholes were drilled in the vicinity of IHSS 103. Of these boreholes one was drilled within the approximate boundary of the IHSS, one downslope, and three upslope (DOE, 1994).

Fate of Constituents Released to Environment

No documentation was found which detailed the fate of the constituents released to the environment in support of the Historical Release Report (DOE, 1992). This IHSS was studied in accordance with the IAG schedule as part of Operable Unit 1. The Final Phase III RFI/RI Report for Operable Unit 1 was issued in 1994 (DOE, 1994). The report concluded that IHSS 103 (PAC 800-103) was not a source of contamination (DOE, 1994).

Action/No Further Action Recommendation

No Action for IHSS 103 was approved by the Agencies and is documented in the CAD/ROD for Operable Unit 1, 881 Hillside Area (DOE, 1997). The declaration statement from the CAD/ROD is included in Appendix A.

Comments

No documentation was found which verifies the existence of the site. Personnel who were employed by RFP during the time frame related to this site were interviewed. They could recall no such incidents of dumping as close to Building 881. It is possible that previous reports may have confused this site with Trench T-2 farther east (PAC 900-109). Trench T-2 is believed to have been used for the dumping of liquid chemicals (DOE, 1992). Results of the Phase III RFI/RI suggest that waste disposal at IHSS 102 did not occur or cause subsurface contamination (DOE, 1994).

References

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1994, *Final Phase III RFI/RI Rocky Flats Plant 881 Hillside Area (Operable Unit No, 1)*, Department of Energy, Rocky Flats Plant, Golden, CO, June.

DOE, 1997, *Corrective Action Decision/Record of Decision, Operable Unit 1: 881 Hillside Area, IHSS 119.1*, Department of Energy, Rocky Flats Environmental Technology Site, Golden, CO, February.

PAC REFERENCE NUMBER: 800-104

IHSS Reference Number: 104, Operable Unit 1

Unit Name: Liquid Dumping

Approximate Location: N748,500; E2,084,000

Date(s) of Operation or Occurrence

Prior to 1969

Description of Operation or Occurrence

The CEARP Phase 1 report indicates that an area east of Building 881 was used for disposal of unknown liquids and drums. This report did not resolve the exact location of the pit or its dimensions (DOE, 1992).

Physical/Chemical Description of Constituents Released

The types of liquids that were dumped here could not be determined from available documentation (DOE, 1992).

Responses to Operation or Occurrence

No documentation was found which indicated response to this occurrence (DOE, 1992).

Fate of Constituents Released to Environment

No documentation was found which detailed the fate of the constituents released to the environment (DOE, 1992). This IHSS was studied in accordance with the IAG schedule as part of Operable Unit 1. The Final Phase III RFI/RI Report for Operable Unit 1 was issued in 1994 (DOE, 1994). As summarized in the Final Phase III RFI/RI Report for Operable Unit 1, one borehole was drilled within the boundaries of IHSS 104. Only isolated, low concentrations of plutonium and polynuclear aromatic hydrocarbon compounds were detected at this IHSS. The report concluded that IHSS 104 was not a source for radionuclide contamination. Shallow, localized PAH contamination was noted (DOE, 1994).

Action/No Further Action Recommendation

No Action for IHSS 104 was approved by the Agencies and is documented in the CAD/ROD for Operable Unit 1, 881 Hillside Area (DOE, 1997). The declaration statement from the CAD/ROD is included in Appendix A.

Comments

No documentation was found which verifies the existence of the site. Personnel who were employed by RFP during the time frame related to this site were interviewed. They could recall no such incidents of dumping as close to Building 881. It is possible that previous reports may have confused this site with Trench T-2 farther east (PAC 900-109). Trench T-2 is believed to have been used for the dumping of liquid chemicals (DOE, 1992). Results of the Phase III RFI/RI suggest that waste disposal at IHSS 104 did not occur or cause subsurface contamination (DOE, 1994).

References

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1994, *Final Phase III RFI/RI Rocky Flats Plant 881 Hillside Area (Operable Unit No, 1)*, Department of Energy, Rocky Flats Plant, Golden, CO, June.

DOE, 1997, *Corrective Action Decision/Record of Decision, Operable Unit 1: 881 Hillside Area, IHSS 119.1*, Department of Energy, Rocky Flats Environmental Technology Site, Golden, CO, February.

PAC REFERENCE NUMBER: 800-105.1 & 800-105.2

IHSS Reference Number: 105.1 & 105.2, Operable Unit 1

Unit Name: Building 881 East and West Out-of-Service Fuel Tanks

Approximate Location: N748,000; E2,084,000

Date(s) of Operation or Occurrence

1958 to 1976

Description of Operation or Occurrence

Interviewees for the CEARP Phase 1 document mentioned that asbestos was placed in two underground, out-of-service tanks located south of Building 881. The tanks were later filled with concrete (DOE, 1992).

Physical/Chemical Description of Constituents Released

The tanks were used to hold diesel fuel and were later filled with concrete and asbestos (DOE, 1992).

Responses to Operation or Occurrence

No documentation was found which detailed a response to this occurrence (DOE, 1992). In the Phase III RFI/RI, six boreholes were drilled in the vicinity of PAC 800-105.1/800-105.2 and PACs 800-106,800-107, and 800-145 (DOE, 1994).

Fate of Constituents Released to Environment

No documentation was found which details the fate of the constituents released to the environment (DOE, 1992). This IHSS was studied in accordance with the IAG schedule as part of Operable Unit 1. The Final Phase III RFI/RI Report for Operable Unit 1 was issued in 1994 (DOE, 1994). As summarized in the Final Phase III RFI/RI Report for Operable Unit 1, trichloroethene was detected in one borehole located near PACs 800-105.1 and 800-105.2. The report noted relatively little contamination from solvents with respect to these PACs (DOE, 1994).

Action/No Further Action Recommendation

No Action for IHSS 105.1/105.2 (PAC 800-105.1 and PAC 105.2) was approved by the Agencies and is documented in the CAD/ROD for Operable Unit 1, 881 Hillside Area (DOE, 1997). The declaration statement from the CAD/ROD is included in Appendix A.

Comments

The 881 Hillside Oil Leak (PAC 800-107) may have been caused by leakage from these tanks. Surface drainage from this area is expected to flow towards Woman Creek or the South Interceptor Ditch (DOE, 1992).

References

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1994, *Final Phase III RFI/RI Rocky Flats Plant 881 Hillside Area (Operable Unit No, 1)*, Department of Energy, Rocky Flats Plant, Golden, CO, June.

DOE, 1997, *Corrective Action Decision/Record of Decision, Operable Unit 1: 881 Hillside Area, IHSS 119.1*, Department of Energy, Rocky Flats Environmental Technology Site, Golden, CO, February.

PAC REFERENCE NUMBER: 800-106

IHSS Reference Number: 106, Operable Unit 1

Unit Name: Outfall

Approximate Location: N748,000; E2,084,000

Date(s) of Operation or Occurrence

Early 1950s - December, 1977 (Date of last documented discharge) (DOE, 1992)

Description of Operation or Occurrence

In the 1950s and 1960s the intermittent discharging of untreated sanitary waste took place in an area south of Building 881. Although this practice was halted, the outfall continued to be used for discharges of cooling water blowdown into the late 1970s. The outfall was originally described as a six-inch diameter vitrified clay pipe; however, a site visit conducted on November 21, 1991 revealed that the pipe is made of iron. It originates from Building 887 and through water quality analysis was determined to be the clean-out pipe for an overflow line from Building 881 cooling tower. Effluent was found discharging from this outfall onto the hillside on December 22, 1977. No liquid was discharging from the pipe in 1991 (DOE, 1992).

Physical/Chemical Description of Constituents Released

Discharges occurring in the 1950s consisted of untreated sewage and any other waste that may have entered the sanitary system of Building 881. It is uncertain when these discharges began or ended. In 1955, sampling revealed the presence of colon organisms and high bacteria counts in Woman Creek below Building 881 east to the cattle fence. Radioactivity was not found above background levels but bacterial counts at the outfall and at the cattle fence on Woman Creek were both high. Sampling at the outfall in 1971 (known at that time as the sewage lift station) indicated activities of 1.05 and 0.30 dpm/g (DOE, 1992).

The 881 Hillside Remedial Investigation Report Draft (July 1, 1987) indicated that there was a small pond below the outfall. (No pond was present in 1991.) A sample taken from the pond on May 26, 1987 indicated plutonium and americium levels of 0.69 pCi/l and 0.18 pCi/l, respectively. No other hazardous substances were found in the sample (DOE, 1992).

Responses to Operation or Occurrence

Concern was raised about the outfall because the discharge was allowed to enter Woman Creek. Several small retention ponds were built in 1955 (PAC SE-1600, PAC SE-1601.1 and PAC SE-1601.2) and an interceptor ditch was built in 1979 which would carry the outfall water to Pond C-2 (PAC SE-142.10 and PAC SE-142.11). Surface water samples have been taken at all of these

locations in addition to ground water samples from monitoring wells in the vicinity in the course of recent work on OU1 (DOE, 1992). In the Phase III RFI/RI, six boreholes were drilled in the vicinity of PAC 800-106 and PACs 800-105.1/800-105.2, 800-107, and 800-145 (DOE, 1994).

Fate of Constituents Released to Environment

No documentation was found which detailed the fate of the constituents released to the environment (DOE, 1992). This IHSS was studied in accordance with the IAG schedule as part of Operable Unit 1. The Final Phase III RFI/RI Report for Operable Unit 1 was issued in 1994 (DOE, 1994). As summarized in the Final Phase III RFI/RI Report for Operable Unit 1, tetrachloroethene and trichloroethene were detected in one borehole located near PAC 800-106. The report noted relatively little contamination from solvents with respect to this IHSS (DOE, 1994).

Action/No Further Action Recommendation

No Action for IHSS 106 (PAC 800-106) was approved by the Agencies and is documented in the CAD/ROD for Operable Unit 1, 881 Hillside Area (DOE, 1997). The declaration statement from the CAD/ROD is included in Appendix A.

Comments

Available information indicates that Pond 7 (PAC SE-1600) was located at the end of the pipe corresponding to this PAC.

References

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1994, *Final Phase III RFI/RI Rocky Flats Plant 881 Hillside Area (Operable Unit No, 1)*, Department of Energy, Rocky Flats Plant, Golden, CO, June.

DOE, 1997, *Corrective Action Decision/Record of Decision, Operable Unit 1: 881 Hillside Area, IHSS 119.1*, Department of Energy, Rocky Flats Environmental Technology Site, Golden, CO, February.

PAC REFERENCE NUMBER: 800-107

IHSS Reference Number: 107, Operable Unit 1

Unit Name: Building 881 Hillside Oil Leak (IAG Name: Hillside Oil Leak)

Approximate Location: N748,000; E2,084,000

Date(s) of Operation or Occurrence

1973 (DOE, 1992)

Description of Operation or Occurrence

On May 29, 1973 oil was discovered flowing from the slope south of Building 881. An investigation was initiated to discover the source of the oil in order to stop the flow to Woman Creek. Oil was also found in a 60-inch diameter standpipe that was located just south of the security fence. The water on which the oil was floating was first traced back to a outfall culvert 300 feet south of the security fence which was later found to be the footing drain from Building 881 (DOE, 1992).

It was first thought that the oil was coming from leaks in two out-of-service storage tanks (PAC 800-105.1 and PAC 800-105.2) since the footing drain passes directly under the tanks. The tanks and lines were tested and no leaks were detected. The pipes that carry the oil from the tanks to the building's furnace lay within a concrete-lined trench which has a drain hole in it. It was postulated that oil spills occurring during the filling of the tanks flowed out the drainhole into the underlying gravel. After 20 years of usage an underground reservoir of waste oil developed to an extent that it started seeping out of the hillside (DOE, 1992).

Physical/Chemical Description of Constituents Released

The tanks in question have since been filled with concrete and asbestos (PAC 800-105.1 and PAC 800-105.2). It is possible that the oil originated from these tanks. Another theory is that the oil may have originated from the oil sludge pit that is also located in this area (PAC 800-102). Groundwater data indicated the presence of volatile organic compounds (VOCs) in monitoring wells along the hillside. There have also been known releases and burial along this hillside including plutonium contaminated soil, multiple solvent spills, and other unknown chemicals (DOE, 1992).

The 881 Hillside Remedial Investigation Report Draft indicated that elevated levels of PCE (128 ppb) and TCE (14 ppb) were found in water samples collected from the north end of the skimming pond (DOE, 1992).

Responses to Operation or Occurrence

The underground fuel tanks and associated lines were leak tested with negative results. The oil was soaked up with straw which was later deposited in the present landfill (PAC NW-114). A concrete "skimming pond" was constructed to contain the oil flowing from the footing drain and an interceptor ditch was constructed to prevent to water from reaching Woman Creek. Groundwater monitoring wells were installed to identify the extent of contamination. Wells to the west have indicated the presence of volatile organic compounds and radionuclides (DOE, 1992). RFP photographs document soil removal from this site.

The Phase III RI/RFI Report for Operable Unit 1 indicated that the skimming pond was removed during construction of the French Drain (DOE, 1994).

Fate of Constituents Released to Environment

Originally groundwater and surface water would flow directly to Woman Creek and be detained at Pond C-1 (PAC SE-142.10). After 1979, the drainage from the hillside was captured by the interceptor trench and carried to Pond C-2 (PAC SE-142.11), (DOE, 1992).

This IHSS was studied in accordance with the IAG schedule as part of Operable Unit 1. The Final Phase III RFI/RI Report for Operable Unit 1 was issued in 1994 (DOE, 1994). As summarized in the Final Phase III RFI/RI Report for Operable Unit 1, PAC 800-107 (IHSS 107) was addressed collectively with PACs 800-105.1, 800-105.2, 800-106, and 800-145 in the vicinity of Building 881. The report noted no contamination with respect to PAC 800-107 (DOE, 1994).

Action/No Further Action Recommendation

No Action for IHSS 107 (PAC 800-107) was approved by the Agencies and is documented in the CAD/ROD for Operable Unit 1, 881 Hillside Area (DOE, 1997). The declaration statement from the CAD/ROD is included in Appendix A.

Comments

None.

References

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1994, *Final Phase III RFI/RI Rocky Flats Plant 881 Hillside Area (Operable Unit No, 1)*, Department of Energy, Rocky Flats Plant, Golden, CO, June.

DOE, 1997, *Corrective Action Decision/Record of Decision, Operable Unit 1: 881 Hillside Area, IHSS 119.1*, Rocky Flats Environmental Technology Site, Golden, CO, February.

PAC REFERENCE NUMBER: 800-145

IHSS Reference Number: 145, Operable Unit 1

Unit Name: Sanitary Waste Line Leak

Approximate Location: N748,000; E2,084,000

Date(s) of Operation or Occurrence

January 1981

Description of Operation or Occurrence

On January 21, 1981 the sanitary waste line was found to be leaking on the hillside south of Building 881. From utility drawings it has been determined that the line in question is probably the 6-inch diameter, cast iron sanitary sewer line that originates at the Building 887 Lift Station. This contradicts the RCRA 3004(u) document which stated that the line was a 4-inch cement-asbestos pipe. No documentation was found which indicates this type of pipe (DOE, 1992).

Physical/Chemical Description of Constituents Released

The sanitary waste line was used from about 1969 to 1973 to transport radioactive laundry effluent (DOE, 1992).

Responses to Operation or Occurrence

Liquid from the leak was contained by a dirt dike to prevent drainage to the South Interceptor Ditch and Woman Creek. The waste line was repaired as of January 30, 1981 (DOE, 1992).

Fate of Constituents Released to Environment

No documentation was found which details the fate of constituents released to the environment (DOE, 1992). This IHSS was studied in accordance with the IAG schedule as part of Operable Unit 1. The Final Phase III RFI/RI Report for Operable Unit 1 was issued in 1994 (DOE, 1994). As summarized in the Final Phase III RFI/RI Report for Operable Unit 1, PAC 800-145 (IHSS 145) was addressed collectively with PACs 800-105.1, 800-105.2, 800-106, and 800-107 in the vicinity of Building 881. The report noted no contamination with respect to PAC 800-145 (DOE, 1994).

Action/No Further Action Recommendation

No Action for IHSS 145 (PAC 800-145) was approved by the Agencies and is documented in the CAD/ROD for Operable Unit 1, 881 Hillside Area (DOE, 1997). The declaration statement from the CAD/ROD is included in Appendix A.

Comments

None.

References

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1994, *Final Phase III RFI/RI Rocky Flats Plant 881 Hillside Area (Operable Unit No, 1)*, Department of Energy, Rocky Flats Plant, Golden, CO, June.

DOE, 1997, *Corrective Action Decision/Record of Decision, Operable Unit 1: 881 Hillside Area, IHSS 119.1*, Department of Energy, Rocky Flats Environmental Technology Site, Golden, CO, February.

PAC REFERENCE NUMBER: 800-147.2

IHSS Reference Number: 147.2, Industrial Area Operable Unit

Unit Name: Building 881 Conversion Activity Contamination Area

Approximate Location: N748,000; E2,084,000

Date(s) of Operation or Occurrence

1964 - 1966

Description of Operation or Occurrence

No documentation was found which detailed when items were first stored in an area northeast of Building 881. Interviews with former RFP employees indicate that miscellaneous equipment was stored in this area such as lathe parts and rolling mill parts. The equipment may have been stored there during the conversion activities that took place in Building 881 in 1964 (DOE, 1992).

Aerial photographs show items in this area as early as 1964 and again in 1966. By 1969, the area had been covered by a parking lot. The site is located about 250 feet east of Building 883 and 450 feet south of Central Avenue. It measures approximately 50 feet by 150 feet (DOE, 1992).

Physical/Chemical Description of Constituents Released

Interviews with former RFP employees indicate that it was possible that some of this equipment may have been contaminated with beryllium and/or enriched or depleted uranium; however, the activity levels would not have been high (DOE, 1992).

Responses to Operation or Occurrence

No documentation was found which details a response to this operation.

Fate of Constituents Released to Environment

No documentation was found which details the fate of the constituents released to the environment.

IHSS 147.2 (PAC 800-147.2) was studied in accordance with the IAG schedule for Operable Unit 12.

Action/No Further Action Recommendation

As documented in the Operable Unit 12 Technical Memorandum No. 2 (DOE, 1995), IHSS 147.2 (PAC 800-147.2) was sampled in nine locations for radionuclides, metals, pesticides, and PCBs. The only positive detections were for calcium (31,500 mg/kg) and Zinc (251 mg/kg). This site poses no threat of adverse health effects to human receptors and therefore recommended for no further action consistent with the criteria for recommending no further action decisions presented in RFCA (DOE, 1996).

Comments

None

References

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1995, *Technical Memorandum No. 2, Operable Unit 12, 400/800 Areas, Vol. 1,* Department of Energy, Rocky Flats Environmental Technology Site, Golden, CO, February.

DOE, 1996, *Final Rocky Flats Cleanup Agreement*, Department of Energy, Rocky Flats Environmental Technology Site, Golden, CO, July.

PAC REFERENCE NUMBER: 900-109

IHSS Reference Number: 109, Buffer Zone Operable Unit

Unit Name: Ryan's Pit (Previous Name, Trench T-2)

Approximate Location: N748,600; E2,085,800

Date(s) of Operation or Occurrence

1969 - 1971

Description of Operation or Occurrence

IHSS 109 (PAC 900-109) has also been called Ryan's Pit and is located south of the 903 Pad (PAC 900-112). The area was primarily used for disposal of solvents, paint thinners, diesel fuel and other construction related chemicals/materials (DOE, 1992). The operation was to perform radiation screening of the waste and if identified as nonradioactive, the solvents were dumped in the trench as a method of disposal. The trench is referred to as Ryan's Pit after a member of the Waste Disposal Coordination Group who was involved with past solvent disposal (DOE, 1996a).

After a review of the information gathered in preparation of the Historical Release Report (DOE, 1992), it is believed that Ryan's Pit was not used in the same manner as the East Trenches as indicated in RCRA 3004(u). Based on a review of historical documents, an evaluation of many historical photographs, and interviews with former RFP personnel who were directly involved with plant waste disposal activities, it is probable that Ryan's Pit was used from approximately 1969 to 1971 for the disposal of nonradioactive liquid chemical wastes. Previously, Ryan's Pit was believed to have been used similarly to the East Trenches because of discussion in a 1970 document entitled "A Summary of On Site Radioactive Waste Disposal". An evaluation of aerial and low-angle oblique photographs was made and included the years 1953, 1955, 1957, 1964, 1969, 1970, and 1971. Activities involving on-site burial of sludge from the sanitary waste-water treatment plant occurred from July 1954 through August 1968. These photographs clearly indicate the existence of the East Trenches in various stages of development. Yet none of the photographs from 1953 through 1968 provides any indication of ground disturbances in the area of Ryan's Pit. In 1969 and 1970, there clearly is an open trench in the area south of the 903 Pad and in the general area as located in the 1970 report. In a May 1971, photograph, the trench is backfilled and graded, but still visible (DOE, 1996a).

Physical/Chemical Description of Constituents Released

Soils contaminated from the dumping of solvents and other wastes were sampled extensively during the removal action in 1995 and prior to treatment. Analytical results for these samples indicated elevated volatile organic compounds including tetrachloroethene, xylene, toluene, 1,1,1-trichloroethane, trichloroethene, and ethylbenzene. Radionuclides in the soil were compared to

RFCA Tier I and Tier II Subsurface Soil Action Levels (DOE, 1996b). The soil met the criteria stipulated in RFCA and was returned to the excavation with concurrence from the agencies (DOE, 1997).

Responses to Operation or Occurrence

Disposal of waste at Ryan's Pit was discontinued in 1971 and the trench was backfilled. The IHSS 109 Accelerated Action Project was initiated in September of 1995 as a source removal in accordance with the Final Proposed Action Memorandum (PAM) approved by the Agencies on August 28, 1995 (DOE, 1995a). Approximately 180 cubic yards of contaminated soil and debris (primarily crushed drums) were excavated from IHSS 109 and treated by low temperature thermal desorption to destroy the volatile organic component of contamination in the soil. Treatment of these soils required a CDPHE approved modification to the existing RCRA Part B permit (DOE, 1995b). The removal of contaminated soil from Ryan's Pit was completed in September 1995 and treatment completed in February 1996.

Fate of Constituents Released to Environment

Solvents that may have been disposed included tetrachloroethene, trichloroethane, and possibly carbon tetrachloride, though not as likely. These were the solvents typically used at the plant during the time-frame. Other chemicals which were dumped included paint thinner, diesel fuel (used as a brush softener) and small quantities of construction-related chemicals. RFI/RI investigations for Operable Unit 2 have identified elevated levels of volatile organic compounds (VOCs) in groundwater downgradient from the Ryan's Pit location (DOE, 1995c).

Action/No Further Action Recommendation

The post-treatment levels of volatile organic compounds in the treated soils returned to Ryan's Pit (PAC 900-109) were less than the thermal desorption unit performance standards specified in the PAM Permit Modification (DOE, 1995b) as documented in the completion report (DOE, 1997). Additionally, the excavation verification sample results for the volatile organic contaminants of concern indicated that the soils remaining were below the cleanup standards specified in the PAM (DOE, 1995a). Radiological samples collected showed plutonium-239, americium-241 and uranium-233/-234, -235 and -238 at levels above background in the excavated soils; however, these radiological levels are less than the 15 mrem hypothetical future resident scenario (the most restrictive scenario for the future land use of the site), (DOE, 1996a). The results for the verification samples are presented in the completion report for the project (DOE, 1997).

Because the source removal at IHSS 109 (PAC 900-109) met the cleanup and treatment levels specified in the PAM (DOE, 1995a), the site is proposed as no further action.

Comments

None.

References

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1995a, *Final Proposed Action Memorandum for the Remediation of Individual Hazardous Substance Site 109, Ryan's Pit*, Rocky Flats Plant, Golden, CO, August.

DOE, 1995b, *Proposed Action Memorandum and Draft Modification of the Corrective Action Section for the Operating Permit for the Rocky Flats Environmental Technology Site*, Rocky Flats Plant, Golden, CO, November.

DOE, 1995c, *Final OU 2, Phase II RFI/RI Report,* Rocky Flats Plant, Golden, CO, October.

DOE, 1996a, *Annual Update for the Historical Release Report, August 1, 1995 through August 1, 1996*. RF/ER-96-0046. September.

DOE, 1996b, *Final Rocky Flats Cleanup Agreement*, Department of Energy, Rocky Flats Environmental Technology Site, Golden, CO, July.

DOE, 1997, *Closeout Report for the Remediation of Individual Hazardous Substance Site 109, Ryan's Pit,* Revision 0. RF-ER-96-0034.UN, July.

PAC REFERENCE NUMBER: 900-113

IHSS Reference Number: 113, Operable Unit 2

Unit Name: Mound Area

Approximate Location: N749,500; E2,086,500

Date(s) of Operation or Occurrence

August 1954 - September 1958

Description of Operation or Occurrence

In April 1954, the mounding of contaminated combustible wastes from Building 444 was suggested as a method of disposal. The Mound was developed by scraping a shallow trench, aligning drums in rows, and covering them with soil with the resulting burial site extending above initial ground level. RFP photographs from April 21, 1954, show the mounding of the first 869 drums of contaminated wastes from Building 444. The drums had been shipped to the Mound area between April 12, 1954, and April 21, 1954. Several drums had pinhole leaks at the time of burial (DOE, 1992).

Mounding activities continued until September 1958. Drums from Building 444, Building 869, Building 883, Building 771, and Building 776 were placed in the Mound. Different sides of the Mound were opened periodically for disposition of drums. After September 1958, additional drums were moved to the Mound area but not placed in the mound. In July 1959, they were moved to the 903 Pad area. The burning of uranium-contaminated oil became an acceptable method of disposal in 1959 and mounding was discontinued (DOE, 1992).

On February 9, 1959, one drum of liquid waste from Building 776 was punctured at the Mound. Two trucks were contaminated to a level greater than 100,000 cpm and were cleaned at Building 774. One service department employee's shoes were contaminated as well and cleaned at Building 776. One drum of liquid waste from Building 881 leaked at the Mound in April 1960 (DOE, 1992).

During the construction of the PSZ in 1981, several areas of uranium-contaminated soil were detected in the Mound area and removed (DOE, 1992).

Physical/Chemical Description of Constituents Released

Contamination resulted from organic liquid wastes. Radioactive elements of the waste were in the forms of depleted uranium and enriched uranium, with some limited plutonium. As a result of the punctured drum in February 1959, an unknown amount of soil in the Mound area was contaminated to a level greater than 100,000 cpm (DOE, 1992).

The ground and pallets had levels of contamination greater than 100,000 cpm due to the liquid waste from Building 881 that leaked in April 1960. The area was roped off pending cleaning. No documentation was found detailing the results of the cleaning effort (DOE, 1992).

Odors of solvents were detected by construction workers when they encountered groundwater in the Mound area during construction of the PSZ (DOE, 1992).

Responses to Operation or Occurrence

On August 26, 1954, soil samples were taken from a barrel burial site located southeast of Building 991. Soil contaminated as a result of the punctured drum in February 1959 was removed to a level of 1,000 cpm. This contaminated soil was associated with the Mound and not Trench No. 1 because the trench was not activated until November 1954 (DOE, 1992).

On April 14, 1970, excavation of the Mound began. All drums were removed by the end of May 1970. Approximately 10 percent of the drums were thought to have holes. No detectable alpha contamination was found in the soil at the time of removal. Solid material was shipped offsite for burial. Drums with liquids were sent to Building 774 for processing. Those that were leaking at the time of excavation were pumped into sound drums before processing in Building 774. Empty drums were boxed with absorbent material and shipped for off-site burial. No personnel or equipment contamination resulted from the excavation of the mound and no airborne contamination was detected. Soil from the excavation was graded and excess was placed in the Present Landfill. Four wells were drilled in the four corners of the Mound area for groundwater monitoring (DOE, 1992).

A source removal action was initiated on March 21, 1997 and completed on April 8, 1997. Soil from the Mound site (IHSS 113) was temporarily staged and managed in an area designed for this purpose until treatment could begin. A sampling grid was established whereby 25 nodes were identified along the sidewalls and bottom of the excavation to confirm that the cleanup criteria was met. Two of the excavation bottom samples indicated VOC contamination in excess of the cleanup standard. As stated in the PAM, the limiting conditions had been met and excavation of the Mound halted with concurrence from the Regulatory Agencies (see attached letter). There was no radiological contamination identified during removal of the contaminated soils.

Treatment began on August 5, 1997, utilizing Low Temperature Thermal Desorption (LTTD) and was completed by August 22, 1997. Treated soil was placed back into the Mound excavation by September 8, 1997. This action was authorized by the Agency approved Proposed Action Memorandum (PAM) for the Source Removal at the Mound Site, IHSS 113 in February, 1997 (DOE, 1997). The following tables show contaminant levels remaining within the Mound Site excavation, and ranges of VOC concentrations remaining in the treated soil:

Excavation Boundary Concentrations

CONTAMINANT	VOC CLEANUP TARGET (UG/KG)	LOW CONCENTRATION (UG/KG)	HIGH CONCENTRATION (UG/KG)
PCE	11,500	620 U	86,000
TCE	9,270	620 U	900
Methylene Chloride	5,770	620 U	630 U
Carbon Tetrachloride	11,000	620 U	630 U

U = detection limit, contaminant was not detected at or above this level.
J = estimated concentration.

Post Treatment Concentrations

CONTAMINANT	TREATMENT GOAL (UG/KG)	LOW CONCENTRATION (UG/KG)	HIGH CONCENTRATION (UG/KG)
PCE	6,000	625 U	630 U
TCE	4,000	625 U	630 U
Methylene Chloride	5,770	300 J, B	3,050
Carbon Tetrachloride	2,000	625 U	630 U

U = detection limit, contaminant was not detected at or above this level.
J = estimated concentration.
B = contaminant was found in blank.

Fate of Constituents Released to Environment

At the time of initial mounding of drums, it was believed that any water leaching the material contained in the drums would have drained into the gully north of the Mound because of the natural topographic slope. The gully also received sewage treatment plant effluent. Any activity not removed by the soil in the Mound and then carried by water to the gully would have been diluted by the effluent and the retention ponds. These retention ponds have been monitored since the beginning of plant operations. Migrating contaminants would have been detected prior to their off-site release. These retention ponds are detailed in PAC NE-142.5 - NE-142.9 (DOE, 1992). Groundwater monitoring reports indicate that groundwater in the vicinity of the Mound Area is contaminated with inorganics, radionuclides, and volatile organic compounds. This IHSS was studied as part of Operable Unit 2, 903 Pad, Mound and East Trenches.

Action/No Further Action Recommendation

A source removal action was performed in the summer of 1997 to excavate and treat contaminated material using low-temperature thermal desorption. This action was authorized by an Agency approved Proposed Action Memorandum (PAM) for the Source Removal at the Mound Site, IHSS 113 (DOE, 1997). A completion report for the project is under preparation. The completion report details the treatment process, contaminants removed, the condition of the

excavation following the removal action, and includes sample analytical results. IHSS 113 (PAC NE-113) is proposed as No Further Action in this annual update because operations to remove the contaminated soil (source) were completed within the reporting period for this report (ie. prior to August 1, 1997). The cleanup criteria and objectives as set forth and approved by the Agencies in the PAM (DOE, 1997) were met.

Comments

Many references document that the Mound was no longer used for the burial of waste materials after 1959; however, several documents indicate activities at the Mound at later dates. A request was made and approval was given in December 1962 for the burial of 14 drums of depleted uranium waste in the Mound burial area. No documentation was found stating that the burial occurred; yet, documents indicate that Trench T-1 (PAC 900-108), located adjacent to the mound, accepted these drums. Therefore it is assumed that activities occurring at the Mound after September 1958 related to storage activities and not burial (DOE, 1992).

References

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1997, *Proposed Action Memorandum for the Source Removal at the Mound Site IHSS 113, Revision 0,* RF/RMRS-96-0059, Rocky Flats Plant, Golden, CO, February.

RFP-1325.02 (REV. 5/97)
Previously RF-46522

CORRES. CONTROL
INCOMING LTR NO.

2692RF97

DUE DATE

ACTION

Department of Energy

ROCKY FLATS FIELD OFFICE
P.O. BOX 928
GOLDEN, COLORADO 80402-0928

MAY 13 1997

97-DOE-02487

DIST.	LTR	ENC
BACON, R.F.		
BENSUSSEN, S.J.		
BRAILSFORD, M.D		
BUHL, T.R.		
BURDGE, L		
CARD, R.G.		
COSGROVE, M. M.,		
COULTER, W.L.		
CRAWFORD, A.C..		
DERBY, S.		
DIETERLE, S.E.		
FERRERA, D.W.		
GERMAIN, A.L.		
HARDING, W.A.		
HARROUN, W.P.		
HEDAHL, T.G.	X	
HERRING, C.L.		
HILL, J.A.		
MARTINEZ, L.A.		
NORTH, K.		
OGG, R.N.		
PARKER, A.	X	
PHILLIPS, F.J.	X	
RHOADES, D.W.		
RUSCITTO, D.G.		
SANDLIN, N.B.		
[illegible]ARS, M.S.		
[illegible]ER, R. E.		
[illegible]OR, N.R.		
VOORHEIS, G.M.		
GIEBEN, A	X	
TYSON, A	X	
COR. CONTROL	X	X
ADMIN. RECORD		
PATS/T130G		

Reviewed for Addressee
Corres. Control RFP

5-14-97 DG
Date By

Ref Ltr. #

DE ORDER # 5700.1

Ms. Susan Chaki
Hazardous Materials and Waste Management Division
Colorado Department of Public Health and Environment
4300 East Cherry Creek Drive South
Denver, Colorado 80222-1530

Mr. Tim Rehder
U.S. Environmental Protection Agency, Region VIII
Attn: Rocky Flats Project Manager
999 18th Street, Suite 500, 8WM-C
Denver, Colorado 80202-2405

Dear Ms. Chaki and Mr. Rehder:

On April 10, 1997, staff from the U.S. Department of Energy, Rocky Flats Field Office (RFFO), Kaiser Hill, and Rocky Mountain Remediation Services (RMRS), conferred with Mr. Tim Rehder of the U.S. Environmental Protection Agency and Mr. Carl Spreng of the Colorado Department of Public Health and Environment regarding halting the excavation at the Mound Site remediation project. During this conference, held via telephone, both Mr. Rehder and Mr. Spreng concurred that halting the Mound excavation was appropriate in light of field conditions and the stated goals of the project. This letter serves to document that decision, and to provide the supporting rationale.

The parties agreed that cessation of excavation was appropriate based upon the following:

- the Mound Proposed Action Memorandum stated that excavation would proceed 2-3 feet into weathered bedrock, and the Mound excavation had already proceeded 5 feet into weathered bedrock;
- given the depth of the excavation, additional excavation would have required benching or shoring, adding considerably to the cost and effort required for additional excavation;
- the excavation had already gone below the depth of the groundwater table, leading to the conclusion that contamination still being encountered was associated with the groundwater plume; and,
- the Mound excavation had already removed the vast majority of the contaminants present in the subsurface, through the removal of approximately 700 cubic yards of soi

Kaiser-Hill's memorandum to RFFO further documenting these conditions is enclosed.

RMRS has proceeded with demobilization at the excavation site. Soil removed from the excavation is stockpiled awaiting treatment by thermal desorption. Contract negotiations with the treatment subcontractor are underway, and RFFO anticipates that thermal desorption of the contaminated soils will begin in June or July. We will notify you when treatment is about to begin.

Thank you for your assistance in resolving this matter. If you have any questions or comments regarding the Mound remediation project, please contact Norma Castañeda of RFFO at 966-4226, or John Rampe of RFFO at 966-6246.

Sincerely,

Gail S. Hill

Gail S. Hill, Acting Lead
Regulatory Liaison Group

Enclosure

cc (w/o Enclosure):

J. Legare, DOE/RFFO
P. Golan, DOE/RFFO
J. Kerridge, DOE/RFFO
R. Tyler, DOE/RFFO
J. Rampe, DOE/RFFO
N. Castañeda, DOE/RFFO
S. Slaten, DOE/RFFO
R. Greenberg, DOE/HQ
T. Hedahl, K-H
A. Sieben, K-H
A. Tyson, RMRS

PAC REFERENCE NUMBER: 900-119.1

IHSS Reference Number: 119.1, Operable Unit 1

Unit Name: West Scrap Metal Storage and Solvent Spill Area

Approximate Location: N748,000; E2,085,000

Date(s) of Operation or Occurrence:

September 1968 - November 1971

Description of Operation or Occurrence

This area was one of two sites used for scrap metal storage in the southeast portion of the 400 acre manufacturing area. PAC 900-119.1 was the western site located on a flat area just north of the Southeast Perimeter Road. In September 1968, arrangements were made to move a scrap metal pile (PAC 900-119.2) from its location near the lithium disposal pit (PAC 900-140) to a new area 200 yards to the west in an attempt to limit traffic through the area. Aerial photographs reveal the storage of material in piles and rows in both 1969 and 1970. Some of the material stored may have been in drums. The scrap metal was stored for eventual recycle offsite (DOE, 1992).

Physical/Chemical Description of Constituents Released

Pieces of scrap metal which came from various buildings on plantsite may have had residual oils and/or hydraulic coolants on them which could have dripped off into the soil. Higher than normal air samples in November 1971, were attributed to the bulldozing of the area during clean-up activities to disposition the scrap metal. Three radiological "hot spots" were found during a routine radiometric survey in August 1981 (DOE, 1992). Two additional radiological "hot spots" were identified during Phase III Final RFI/RI investigations in 1994 (DOE, 1995b).

Further investigation in 1994 during source removal activities (see below) show that the hot spot dimensions were determined to be approximately 10 inches in diameter and 12 inches deep, with plutonium activities ranging from 10 nanoCuries per gram (nCi/g) (surface) to 50 picoCuries per gram (pCi/g) (at 1 foot), (DOE, 1994a).

Response to Operation or Occurrence

The area south of the 903 Pad was cleaned up in December, 1971 and disturbed soil was re-vegetated in the following spring. Groundwater samples collected from monitoring wells installed in the area in 1974 had anomalous concentrations of uranium and nitrate. Additional test holes were drilled in April 1982 to attempt to locate buried materials which might have been contributing leachate into the well waters.

No buried debris was located but several of the test holes were maintained as test sites for water sampling during the three subsequent months (DOE, 1992).

A recovery well was located within the IHSS 119.1 in 1993 to extract volatile organic compound (VOC) contaminated groundwater localized in the southwest portion of the IHSS. The recovered groundwater was and continues to be sent to the Building 891 water treatment system which uses ultraviolet light with the addition of hydrogen peroxide to catalyze the breakdown of contaminants to innocuous chemicals (DOE, 1995a).

In 1994, an Accelerated Response Action (ARA) consisting of the removal of radionuclide contaminated soils ("hot spots") at five specific locations within IHSS 119.1 and one location within IHSS 119.2 was conducted. The "hot spots" were localized shallow contaminated soils that contained substantial activities of either plutonium/americium or uranium, as well as traces of several organic compounds. The ARA included excavation, containerization, storage, and disposal of twenty-one 55 gallon drums of radionuclide contaminated soil. The drums were disposed at the Envirocare facility in Utah which is permitted to accept mixed low-level wastes. The source removal of contaminants from these hot spot areas reduced potential risks by several orders of magnitude and are below 10^{-4} (DOE, 1995b).

In addition to the ARA, the proposed remedial action to be taken within IHSS 119.1 was agreed upon in 1995 through the Dispute Resolution process as described in the IAG. The selected remedial alternative for IHSS 119.1 was to excavate soils contaminated with VOCs above the RFCA Tier I Subsurface Soil Action Levels, treat these soil by thermal desorption, and return the treated soils to the excavation. The decision was documented in the CAD/ROD for OU 1 (DOE, 1997).

Additional sampling within IHSS 119.1 was conducted in June 1997 to support implementation of the selected remedial alternative (RMRS, 1997). Three geoprobe borings were located within each of the two source areas identified in the CAD/ROD. No significant VOC contamination was observed in any of these borings. In response, four additional geoprobe borings were placed in the two source areas. In the 51 samples collected for the 10 borings placed only one contaminant (tetrachloroethene) exceeded the detection limit and none of the sample results were above the RFCA Tier I Subsurface soil Action Levels (RMRS, 1997). Based on these findings an amendment to the CAD/ROD is being prepared that will modify the remedial action for the IHSS.

Fate of Constituents Released to Environment

No documentation was found which detailed the fate of the constituents released to the environment (DOE, 1992). This IHSS was studied in accordance with the IAG schedule as part of Operable Unit 1. The Final Phase III RFI/RI Report for Operable Unit 1 was issued in 1994 (DOE, 1994b). Removal of the Operable Unit No. 1 radiological "hot spots" within IHSS 119.1 reduced potential risk to human health and the environment by removing known "source areas " (DOE, 1996). The June 1997 sampling demonstrates that subsurface soil at IHSS 119.1 does not serve as a point source to groundwater contamination in the vicinity of IHSS 119.1.

Action/No Further Action Recommendation

The amended remedy to be taken at IHSS 119.1 will be agreed upon by the Agencies with the approved CAD/ROD amendment in Fiscal Year 1998.

Comments

CEARP interview notes reference areas south of the 903 Pad, south of Building 952, and east of Building 881 as areas which contained construction debris, scrap metal, paper, and other miscellaneous trash. The time frame for this activity was from 1960 to 1961. This area was identified in RCRA 3004(u) as being used for solvent storage. No documentation was found which supports this and retired RFP employees interviewed for the HRR (DOE, 1992) disputed that the area had ever received solvents. Scrap metal was stored in drums or on the ground. Areas were indicated with power poles to segregate types of scrap metal. Some of the scrap metal pieces may have been coated with solvents or other materials before being transported to the area (DOE, 1992).

References

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1994a, *Proposed Action Memorandum, Hot Spot Removal, Operable Unit No. 1*, Rocky Flats Environmental Technology Site, Rocky Flats Plant, Golden, CO, September.

DOE, 1994b, *Final Phase III RFI/RI Rocky Flats Plant 881 Hillside Area (Operable Unit No, 1)*, Department of Energy, Rocky Flats Plant, Golden, CO, June.

DOE, 1995a, *Operable Unit No. 1, 881 Hillside Area, Corrective Measures Study/Feasibility*, Department of Energy, Rocky Flats Environmental Technology Site, Golden, CO, February.

DOE, 1995b, *Accelerated Response Action Completion Report, Hot Spot Removal,* Rocky Flats Environmental Technology Site (Operable Unit No. 1), Rocky Flats Plant, Golden, CO, April.

DOE, 1996, *Annual Update for the Historical Release Report, August 1, 1995 through August 1, 1996*. RF/ER-96-0046, Rocky Flats Plant, Golden, CO, September.

DOE, 1997, *Corrective Action Decision/Record of Decision, Operable Unit 1: 881 Hillside Area, IHSS 119.1*, Department of Energy, Rocky Flats Environmental Technology Site, Golden, CO February.

RMRS, 1997, *Sampling and Analysis Plan for the Implementation of the IHSS 119.1 Source Removal Project*, RF/ER-95-0120, Rocky Flats Environmental Technology Site, Golden CO, April.

PAC REFERENCE NUMBER: 900-119.2

IHSS Reference Number: 119.2, Operable Unit 1

Unit Name: East Scrap Metal Storage and Solvent Spill Area

Approximate Location: N748,000; E2,085,500

Date(s) of Operation or Occurrence:

September 1968 - November 1971

Description of Operation or Occurrence

This area was one of two sites used for scrap metal storage in the southeast portion of the 400 acre manufacturing area. PAC 900-119.2 was the eastern site located on a flat area just north of the Southeast Perimeter Road. In September 1968, arrangements were made to move the scrap metal pile (PAC 900-119.2) from its location near the lithium disposal pit (PAC 900-140) to a new area 200 yards to the west in an attempt to limit traffic through the area. The area was located adjacent to a known Hazardous Disposal Area (PAC 900-140) and it was felt at the time that uninformed users of the scrap metal storage area were unnecessarily endangering themselves due to the close proximity of PAC 900-140. The area was located 60 feet north and 50 feet west of the fence marking the Hazardous Disposal Area. Aerial photographs reveal the storage of material in piles in both 1969 and 1970 (DOE, 1992).

Physical/Chemical Description of Constituents Released

Pieces of scrap metal which came from various buildings on plantsite may have had residual oils and/or hydraulic coolants on them which could have dripped off into the soil. Higher than normal air samples in November 1971, were attributed to the bulldozing of the area during clean-up activities to disposition the scrap metal (DOE, 1992).

Further investigation in late 1994 during Source Removal activities (see below) show that the hot spot dimensions were determined to be approximately 10 inches in diameter and 12 inches deep, with activities ranging from 10 nanoCuries per gram (nCi/g) (surface) to 50 picoCuries per gram (pCi/g) (at 1 foot) (DOE, 1994a).

Response to Operation or Occurrence

The area south of the 903 Pad was cleaned up in December, 1971 and disturbed soil was re-vegetated in the following spring. Groundwater samples collected from monitoring well installed in the area in 1974 had anomalous concentrations of uranium and nitrate (DOE, 1992).

In 1994, an Accelerated Response Action (ARA) consisting of the removal of radionuclide contaminated soils ("hot spots") at five specific locations within IHSSs 119.1 and one location within IHSS 119.2 was conducted. The hot spots were localized shallow contaminated soils that contained substantial activities of either plutonium/americium or uranium, as well as traces of several organic compounds. The ARA included excavation, containerization, storage, and disposal of twenty-one 55 gallon drums of radionuclide contaminated soil. The drums were disposed of at the Envirocare facility in Utah which is permitted to accept mixed low-level wastes. The source removal of contaminants from these hot spot areas reduced potential risks by several orders of magnitude and are below 10^{-4} (DOE, 1995).

Fate of Constituents Released to Environment

The area south of the 903 Pad was cleaned up in December, 1971 and disturbed soil was re-vegetated in the following spring. Groundwater samples collected from monitoring wells installed in the area in 1974 had anomalous concentrations of uranium and nitrate (DOE, 1992).

No documentation was found which detailed the fate of the constituents released to the environment (DOE, 1992). This IHSS was studied in accordance with the IAG schedule as part of Operable Unit 1. The Final Phase III RFI/RI Report for Operable Unit 1 was issued in 1994 (DOE, 1994b). Removal of the Operable Unit No. 1 "hot spot" within IHSS 119.2 reduced potential risk to human health and the environment by removing a known "source area" (DOE, 1995).

Action/No Further Action Recommendation

No Action for IHSS 119.2 was approved by the Agencies and is documented in the CAD/ROD for Operable Unit 1, 881 Hillside Area (DOE, 1997). The declaration statement from the CAD/ROD is included in Appendix A.

Comments

CEARP interview notes reference areas south of the 903 Pad, south of Building 952, and east of Building 881 as areas which contained construction debris, scrap metal, paper, and other miscellaneous trash. The time frame for this activity was from 1960 to 1961. No documentation could be found which detailed specific activities in this area at that time-frame. An aerial photograph dated 1964 does not indicate any ground disturbance in the area (DOE, 1992).

This area was identified in RCRA 3004(u) as being used for solvent storage. No documentation was found which supports this and retired RFP employees interviewed for the HRR (DOE, 1992) disputed that the area had ever received solvents. Scrap metal was stored in drums or on the ground. Areas were indicated with power poles to segregate types of scrap metal. Some of the scrap metal pieces may have been coated with solvents or other materials before being transported to the area (DOE, 1992).

References

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1994a, *Proposed Action Memorandum, Hot Spot Removal, Operable Unit No. 1*, Rocky Flats Environmental Technology Site, Rocky Flats Plant, Golden, CO, September.

DOE, 1994b, *Final Phase III RFI/RI Rocky Flats Plant 881 Hillside Area (Operable Unit No, 1)*, Department of Energy, Rocky Flats Plant, Golden, CO, June.

DOE, 1995, *Accelerated Response Action Completion Report, Hot Spot Removal,* Rocky Flats Environmental Technology Site (Operable Unit No. 1), Rocky Flats Plant, Golden, CO, April.

DOE, 1997, *Corrective Action Decision/Record of Decision Declaration, Operable Unit 1: 881 Hillside Area*, Department of Energy, Rocky Flats Environmental Technology Site, Golden CO April.

PAC REFERENCE NUMBER: 900-130

IHSS Reference Number: 130, Operable Unit 1

Unit Name: Contaminated Soil Disposal Area East of Building 881 (IAG Name: Radioactive Site - 800 Area Site #1)

Approximate Location: N746,000; E2,085,000

Date(s) of Operation or Occurrence

1969 - 1972

Description of Operation or Occurrence

Approximately 320 tons of plutonium-contaminated soil and asphalt from the May 1969 fire in Building 776 was buried under one to two feet of fill. Some of this material, or additional material, was from Central Avenue between Eighth Street and Tenth Street. This amounts to about 250 cubic yards of material (DOE, 1992).

In 1972, approximately 60 cubic yards of plutonium-infiltrated soil from the removal of concrete waste tanks near Building 774 (PAC 700-146) were placed in this same area and covered with 3 feet of soil (DOE, 1992).

Physical/Chemical Description of Constituents Released:

The amount of plutonium activity in the 1969 fire debris was estimated at 7.4 dpm/g. The total long-lived alpha activity was estimated at less than 250 dpm/g. The 60 cubic yards buried in 1972 were contaminated with 250 cpm plutonium (DOE, 1992).

Responses to Operation or Occurrence

Two to three feet of soil was placed over the debris after placement in the area. In 1972, approximately 10 cubic yards of potentially contaminated soil was placed over the area and covered with 3 feet of soil (DOE, 1992).

As part of the Phase III RFI/RI, of nine boreholes were drilled and sampled within the boundary of PAC 800-130 (IHSS 130) and one borehole was located downgradient (DOE, 1994).

Fate of Constituents Released to Environment

No documentation was found which detailed the fate of the constituents released to the environment (DOE, 1992). This IHSS was studied in accordance with the IAG schedule as part of Operable Unit 1. The Final Phase III RFI/RI Report for Operable Unit 1 was issued in 1994

(DOE, 1994). As summarized in the Final Phase III RFI/RI Report for Operable Unit 1, a total of nine boreholes were drilled and sampled within the boundary of PAC 800-130 (IHSS 130) and one borehole was located downgradient. The report noted limited organic and radionuclide contamination with respect to PAC 800-145; however, the contamination appears to be widespread and unreleated to waste disposal (DOE, 1994).

Action/No Further Action Recommendation

No Action for IHSS 130 (PAC 800-130) was approved by the Agencies and is documented in the CAD/ROD for Operable Unit 1, 881 Hillside Area (DOE, 1997). The declaration statement from the CAD/ROD is included in Appendix A.

Comments

RCRA 3004(u) mentions without detail that unknown quantities of scrap metal were buried in this area as well. Documentation exists from the same time period indicating an old scrap metal storage area was being cleared of debris. The location was given as south of 903 pad and east of Building 881. Aerial photographs reflect what may be these areas in the location of PAC 900-119.1 and PAC 900-119.2. These areas were cleared of debris and the debris may have been disposed of in this contaminated asphalt area but no documentation was found which substantiates this (DOE, 1992).

A July 1966 photograph shows significant ground disturbance in this same area. The area was used to store sand, gravel, and salt for road application (DOE, 1992).

References

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1994, *Final Phase III RFI/RI Rocky Flats Plant 881 Hillside Area (Operable Unit No, 1)*, Department of Energy, Rocky Flats Plant, Golden, CO, June.

DOE, 1997, *Corrective Action Decision/Record of Decision, Operable Unit 1: 881 Hillside Area, IHSS 119.1*, Department of Energy, Rocky Flats Environmental Technology Site, Golden CO February, 1997.

PAC REFERENCE NUMBER: 900-141

IHSS Reference Number: 141, Operable Unit 6

Unit Name: Sludge Dispersal

Approximate Location: N750,500; E2,086,500

Date(s) of Operation or Occurrence

1952 - Present

Description of Operation or Occurrence

All material entering the sanitary sewer system is processed and one of the process byproducts is sludge. Sludge produced in the wastewater treatment plant (Building 995) is placed in a series of gravel- and sand-lined drying beds until the solid to liquid ratio is greater than 43 percent by weight and is considered suitable for packaging and shipment offsite for disposal. The configuration of the beds has changed several times since 1952 but they have been in regular operation. There have been many incidents of the sludge in the beds overflowing toward East Perimeter Road. Because the beds were open to the atmosphere, sludge was noted to have become airborne and dispersed. The predominant direction of airborne sludge dispersal is to the east. In addition, the low-level sludge in the drying beds comes in contact with underlying soil which is predominantly fill material overlying claystone (DOE, 1992).

Wastes from the RFP sanitary sewer system enter the Building 995 treatment process which produces sludge. The chemical characteristics of the sludge are reflective of the chemistry of the waste in the sanitary sewer system. PAC 000-500 details routine and non-routine releases to the sanitary sewer system (DOE, 1992).

Several specific incidents have occurred when sludge overflowed from the drying beds or was dispersed by wind. A spill occurred on February 4, 1955, which extended to East Perimeter Road. The event occurred while sludge was being pumped from the digester to a drying bed. On December 15, 1972, a plutonium-contaminated sludge spill occurred affecting the area from the sludge drying beds to East Perimeter Road. In January 1982, sludge from three of the drying beds was blown out and dispersed during a windstorm. On February 1, 1991, one of the sludge drying beds overflowed and sludge spilled down the hillside south of the drying beds to South Walnut Creek (DOE, 1992).

Physical/Chemical Description of Constituents Released

The sludge from the February 1955 overflow was reported from analysis to have approximately 1.1×10^6 dpm/kg. The soil samples had an average contamination level of 3.1×10^5 dpm/kg. The

sludge which blew out of the sludge drying beds in January 1982 varied in radioactivity from near background to approximately 1.2 x 10^6 dpm/kg (DOE, 1992).

Responses to Operation or Occurrence

Soil sampling of the area impacted by the February 1955 overflow was performed by collecting clay and gravel from the area. The sludge which had spilled out of the beds was "largely" recovered. An extensive surface soil sampling program was conducted in the sludge drying bed area in June 1955. The response to each documented overflow release has been to collect and dispose of the sludge (DOE, 1992).

The sludge from the December 1972 overflow was controlled with fill material which was drummed and shipped for off-site disposal. Airborne activity in subsequent months was monitored. In June 1973, air samples collected on East Perimeter Road were unusually high after the area had been disturbed by construction equipment preparing the road for re-asphalting. A report of the incident recommended that care should be exercised relating to dust-producing construction activities in the area (DOE, 1992).

In July 1978, windblown sludge was identified as a long-standing problem and an investigation of using mesh cover for the beds followed. In 1985, metal buildings were constructed around the beds to reduce windblown dispersal (DOE, 1992).

This IHSS was studied as part of OU6, Walnut Creek Priority Drainage (DOE, 1996a).

Fate of Constituents Released to Environment

In July 1978, ambient air data indicated that the sludge drying beds were contributing a higher than normal concentration of plutonium in the air. No documentation was found that further detailed the fate of constituents released to the environment. According to the Historical Release Report (DOE, 1992), the information developed on this unit indicated that the location of IHSS 141 presented in the IAG was inaccurate (see Comments). Additionally, the sludge drying bed area is being investigated in a separate action (DOE, 1992).

Action/No Further Action Recommendation

As documented in the OU6 RFI/RI Report, IHSS 141 (PAC 900-141) was grouped with IHSSs 165 (PAC 900-165) and 152.6 (NE-156.2) as an Area of Concern (AOC) based on the results of the CDPHE conservative screen for purposes of the Human Health Risk Assessment (HHRA). These sources form a logical AOC because they are in close proximity and have chemical constituents in the same media (DOE, 1996a). The results of the HHRA for the AOC showed that for all current and future onsite receptors the cumulative hazard indices for noncarcinogenic health effects are 0.01 or less therefore no adverse noncancer health effects are expected under the exposure conditions evaluated. For all current and future onsite receptors the excess lifetime cancer risk was estimated at 4E-07 indicating negligible risk. Additionally, results of the Ecological Risk Assessment for the Walnut Creek Watershed did not indicate that IHSS 141 was

a source area (DOE, 1996a). IHSS 141 (PAC 900-141) is proposed for no further action. The recommendation for no further action is consistent with the criteria for recommending no further action decisions presented in RFCA (DOE, 1996b). The OU6 Corrective Action Decision/Record of Decision, which is under preparation, is expected to be consistent with this recommendation.

Comments

Based on the rational presented in the Historical Release Report (DOE, 1992), the western boundary of this PAC was extended from the area in the IAG to include the area of the sludge drying beds.

References

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1996a, *Final Phase I RFI/RI Report Walnut Creek Priority Drainage, Operable Unit 6*, RF/ER-95-0119.UN, Rev 0, Rocky Flats Environmental Technology Site, Golden, CO, February.

DOE, 1996b, *Final Rocky Flats Cleanup Agreement*, Department of Energy, Rocky Flats Environmental Technology Site, Golden, CO, July.

PAC REFERENCE NUMBER: 900-183

IHSS Reference Number: 183, Operable Unit 2

Unit Name: Gas Detoxification Area

Approximate Location: N748,500; E2,086,000

Date(s) of Operation or Occurrence

Approximately 1963 - Approximately 1983

Description of Operation or Occurrence

Building 952 was constructed in 1963 as a Toxic Gas Storage building. Industrial Hygiene managed the storage of gases. Since at least January 1967, bottles containing hazardous gases were transported from various buildings to Building 952 by firemen exercising extreme caution due to the nature of the gases. Typically, shipments consisted of one or two lecture-size gas bottles. Prior to January 1967, Plant Services personnel transported the bottles, often improperly. No reported incidents were found. Gases were stored for up to five years prior to disposal. Selected gases were detoxified at the site. The method of detoxification was selected based on the characteristics of the material. Others were packed and shipped to off-site vendors for disposal (DOE, 1992).

Physical/Chemical Description of Constituents Released

No documentation was found which detailed any specific releases to the environment at this site (DOE, 1992).

Responses to Operation or Occurrence

Selected gases were detoxified using various commercial neutralization processes available at the time. Neutralization processes included reaction with water, acid, caustic, carbon, or air. Byproducts were disposed of as process wastes. Upon completion of the neutralization process for each type of gas, the glassware used in the process was triple rinsed, crushed, and deposited in the Present Landfill (DOE, 1992).

Fate of Constituents Released to Environment

No documentation was found which detailed any release from IHSS 183 (PAC 900-183) (DOE, 1992). This IHSS was studied as part of OU2 (DOE, 1995).

Action/No Further Action Recommendation

As presented in the Historical Release Report and supporting reference material, past releases from IHSS 183 (PAC 900-183) are not known to have occurred (DOE, 1992). The reference material, which included records on the movement, storage and disposal of toxic gases, industrial hygiene status reports, and the RCRA 3004U waste management report, were re-evaluated to support the assertion that a release at IHSS 183 has not occurred (Hill, 1968a and 1968b; Piltingsrud, 1968; Hayden, 1981; Unknown, 1987). IHSS 183 was investigated as part of the OU2 RFI/RI and, for investigative purposes, was grouped with IHSS 140 (PAC 900-140) because of the close proximity of these two IHSSs to each other. Of the nine boreholes located within IHSS 140, one borehole (12791) was located near IHSS 183. Samples were collected and analyzed for VOCs, SVOCs, pesticides/PCBs, metals and radionuclides. Only methylene chloride (2 ppb) and acetone (15 ppb) were detected in borehole 12791. The concentrations of these chemicals are not elevated (i.e., these chemicals were not retained in the OU2 RFI/RI or the associated human health risk assessment as chemicals of concern) (DOE 1995). With respect to ecologic receptors, IHSS 183 was not identified as a source area in the Ecological Risk Assessment for the Woman Creek Watershed (DOE, 1996).

It is suspected that a release at IHSS 183 has not occurred. This is based on the fact that no documentation referencing a release has been found and that contamination was not detected in the borehole located near the IHSS. It is recognized that IHSS 183 (PAC 900-183) overlaps with IHSS 155 which will be addressed as a separate action. IHSS 183 is proposed as No Further Action.

Comments

This building is located within the 903 Lip Area (PAC 900-155) but not in the area of greatest soil contamination which was remediated in 1978. The bottles stored in the building and the floor of the building were found to be contaminated from being in the 903 Lip Area. Cleaning of the building was to be done when the contamination in the general area was controlled. The Hazardous Disposal Area (PAC 900-140) site was located adjacent and to the southeast of the gas storage building (DOE, 1992).

References

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1995, *Final Phase I RFI/RI Report 903 Pad, Mound, and East Trenches Area , Operable Unit 2*, RF/ER-95-0079.UN, Rocky Flats Environmental Technology Site, Golden, CO, October.

DOE, 1996, *Final Phase I RFI/RI Report Woman Creek Priority Drainage, Operable Unit 5*, RF/ER-96-0012.UN, Rev 0, Rocky Flats Environmental Technology Site, Golden, CO, April.

PAC REFERENCE NUMBER: 900-210

IHSS Reference Number: 210, Industrial Area Operable Unit

Unit Name: Building 980 Cargo Container, Unit 16

Approximate Location: N748,000; E2,085,000

Date(s) of Operation or Occurrence

1986 - May 1988

Description of Operation or Occurrence

Unit 16 is located southeast of Building 980 and was used for solid and liquid waste drum storage for oil, solvents, and paint waste. The steel cargo container met the requirements of 6 CCR 264.17 for hazardous waste storage (DOE, 1992). The area was used as a RCRA 90-day accumulation area. A small area beside the cargo container was enclosed by rope and used for additional storage. Material stored was nonradioactive containerized hazardous waste including automotive oils, solvents, paints, paint thinner, grease, gasoline, diesel fuel, and paper and rags contaminated with oils. These wastes were generated in the Building 980 construction contractor work area (DOE, 1992).

The cargo container had an inner catch basin. Steel drums were stored on roller-pallets and had three-foot aisle spacing. Periodic container inspection was performed (DOE, 1992).

Physical/Chemical Description of Constituents Released

No documentation was found of any specific releases of waste from the drums stored in the cargo container.

Responses to Operation or Occurrence

All hazardous waste was removed from the unit by May 31, 1988 (DOE, 1992).

Fate of Constituents Released to Environment

No documentation was found which details the fate of the constituents released if any. IHSS 210 (PAC 900-210) was studied in accordance with the IAG schedule for operable Unit 10

Action/No Further Action Recommendation

As documented in the OU 10 RFI/RI Report, IHSS 210 (PAC 900-210) was sampled for radionuclides, metals, and volatile organic compounds. There were no positive detections.

IHSS 210 (PAC 900-210) is proposed for no further action. The recommendation for no further action is consistent with the criteria for recommending no further action decisions presented in RFCA (DOE, 1996b).

Comments

None.

References

DOE, 1991, *Phase I RFI/RI Work Plan, Operable Unit 10, Other Outside Closures, Draft Final,* Rocky Flats Environmental Technology Site, Golden, CO, November.

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1995, *Technical Memorandum 1, Operable Unit 10, Other Outside Closures,* Rocky Flats Environmental Technology Site, Golden, CO, January

DOE, 1996, *Final Rocky Flats Cleanup Agreement*, Department of Energy, Rocky Flats Environmental Technology Site, Golden, CO, July.

SECTION 3.1

OPERABLE UNIT 3 (OFFSITE RELEASES)

Off-Site Releases

Past environmental studies have demonstrated that contaminants generated by historical RFP activities are present in some locations outside the RFP boundaries. These contaminants have been transported offsite through surface water and air pathways (DOE, 1992).

RFP Operable Unit No. 3 (OU3), Off-Site Releases, is comprised of known areas of off-site contamination due to RFP operations. OU3 is comprised of four IHSSs: IHSS 199 (Contamination of the Land's Surface), IHSS 200 (Great Western Reservoir), IHSS 201 (Standley Lake), and IHSS 202 (Mower Reservoir). These four IHSSs all are located downwind and down-gradient of RFP in relatively close proximity to the plant's eastern boundary. Although designated as separate IHSSs, each of these sites is essentially an off-site continuation of an on-site IHSS. IHSS 199 is, for practical intents and purposes, an off-site continuation of the 903 Lip Area (PAC 900-155). IHSS 200 incorporates off-site reaches of the Walnut Creek drainage and is therefore an off-site extension of PAC NE-142. IHSSs 201 and 202 incorporate off-site reaches of the Woman Creek drainage (PAC SE-142.10 and PAC SE-142.11), and also have potentially been impacted by airborne contaminants from the 903 Pad (see PAC 900-112 and PAC 900-155). For purposes of the HRR, the off-site IHSSs are not designated as separate PACs. However, they are discussed separately below because off-site IHSSs have been separately investigated and characterized in past studies (DOE, 1992).

The Phase I RFI/RI for OU3 (DOE, 1996) was completed July 11, 1996. Based on historical data and data collected in support of the RFI/RI, the only environmental media for which contaminants of concern were identified in OU3 were surface soils associated with IHSS 199 and sediments in Great Western Reservoir (IHSS 200). As a result, it was only necessary to estimate the risk associated with these two IHSSs. (DOE, 1992) Following the public comment period on the Proposed Plan, the Corrective Action Decision/Record of Decision (CAD/ROD) was finalized on June 3, 1997. The CAD/ROD, included in Appendix B, documents the selected remedy for OU 3 as No Action (DOE, 1997).

The following sections summarize the historical release information and site conditions as presented in the Historical Release Report (DOE, 1992) supplemented by information presented in the Phase I RFI/RI Report (DOE, 1996) and the OU3 CAD/ROD (Appendix B)(DOE, 1997).

IHSS 199 (Contamination of the Land's Surface)

IHSS 199, Contamination of the Land's Surface, targets off-site soil contamination as a result of RFP activities. The IHSS 199 boundary, therefore, is delineated by the extent of off-site contamination.

Past studies have focused almost exclusively on airborne plutonium releases from RFP, and in particular on the following most probable sources: 1) a September 11, 1957 fire in Building 771, 2) a May 11, 1969 fire in Building 776; (3) leaking drums of plutonium-contaminated lathe coolant at the 903 Pad (PAC 900-112); and, (4) chronic low-level stack effluent. Other possible

sources included the on-site burning of wastes, including waste oils contaminated with trace amounts of uranium (PAC 300-128, PAC 900-153, and PAC 300-171). Less plausible potential sources include a fire that breached the Building 444 exhaust filters, possibly releasing airborne beryllium to the environment (PAC 400-157.2), and wind stripping of waste water from the Solar Evaporation Ponds (PAC 000-101). Solar ponds water would possibly have contained inorganic ions and trace amounts of radionuclides and nonradioactive metals. Past studies have concluded that the great majority of the plutonium at IHSS 199 originated as windborne particulates from the 903 Pad, and have largely dismissed the contributions of the 1957 and 1969 fires and chronic stack emissions (DOE, 1992).

Also included within IHSS 199 are lands adjoining the eastern and southern RFP boundaries (the "lawsuit acreage") which were the subject of a 1975 lawsuit filed by the land owners against the United States and other defendants, alleging contamination of the land's surface by historical RFP releases. Several technical investigations and studies of the lawsuit acreage were conducted by the various parties to the lawsuit to provide supporting evidence in the case. A settlement agreement finalized in July 1985 required that RFP undertake remedial action on those portions of the land containing plutonium in surface soils in concentrations exceeding an action level adopted by the court of 0.9 picocuries per gram (pCi/g). Two contiguous tracts of land immediately east of RFP totaling 350 acres (the "remedy acreage"), are owned by the City of Broomfield and Jefferson County, and were targeted for remediation. Remediation consisted primarily of tilling to reduce surface concentrations and revegetating to stabilize the soil (DOE, 1992).

The nature and extent of residual contamination associated with IHSS 199 was delineated in the Phase I RFI/RI (DOE, 1996). Historical data as well as data collected to support RFI/RI conclusions were used to assess the risk posed by the IHSS. As summarized in the CAD/ROD, the highest calculated excess cancer risk for IHSS 199 was 3E-06. This risk estimate assumed a reasonable maximum exposure to a hypothetical resident (DOE, 1997).

IHSS 200 (Great Western Reservoir)

IHSS 200 encompasses Great Western Reservoir, off-site reaches of Walnut Creek (which formerly flowed into the reservoir from RFP), and downstream surface water features possibly impacted by outflow from the reservoir. Portions of Walnut Creek within the RFP boundaries (see PAC NE-142) are not included in IHSS 200 (DOE, 1992).

Great Western Reservoir is located approximately 2.5 kilometers from the RFP eastern boundary. The reservoir is owned by the City of Broomfield and is utilized solely for the city's municipal water supply. Great Western Reservoir receives most of its water via an irrigation ditch from Clear Creek. Clear Creek is south of RFP and is not believed to be impacted by plant activities. Until recently, Great Western Reservoir also received influent from Walnut Creek, which flows from RFP (see PAC NE-142). A chromic acid release at the RFP in 1989 (see PAC 000-500 and PAC NE-142) prompted construction of a Walnut Creek diversion around Great Western Reservoir, known as the Broomfield Diversion Ditch, which now prevents surface water flowing from RFP from reaching Great Western Reservoir (DOE, 1992).

During the operating history of RFP, various waste streams were discharged through the on-site A-series and B-series ponds to Walnut Creek (see PAC NE-142). These effluents were discharged in accordance with internal guidelines (in particular, USAEC guidelines in the early history of the RFP) and, increasingly during the past two decades, with State and Federal pollution discharge regulations. The effluents contained metals, radionuclides, and inorganic ions (especially nitrate) within concentration limits considered acceptable at the time. Contaminants from these discharges accumulated in varying amounts in the sediments of the on-site holding ponds, Walnut Creek, and Great Western Reservoir. Radioactive materials released from RFP may also have been transported to Great Western Reservoir as airborne particulates (fugitive dust) (DOE, 1992).

Available data from on-site RFP OUs, particularly OU 6 (Walnut Creek Drainage), provide an indication of contaminants other than plutonium which could conceivably have impacted Great Western Reservoir through surface water transport from RFP. Leakage from the Solar Evaporation Ponds (PAC 000-101) is known to have contaminated groundwater and surface water in the Walnut Creek drainage, primarily with nitrate and other inorganic ions. Inorganic ions, nonradioactive metals, VOCs, and uranium have been detected in the Walnut Creek holding ponds. Herbicides which have been applied in the past at various locations on RFP have also been detected in RFP surface water. Other potential RFP-derived contaminants in IHSS 200 other than plutonium and americium have not been extensively studied; however, a 1973 EPA study measured concentrations in Great Western Reservoir sediments of beryllium and of selected radionuclides other than plutonium. No significant variations in the concentrations of these potential RFP contaminants were observed throughout the reservoir or between Great Western Reservoir and Standley Lake (IHSS 201). An accidental release of tritium from RFP into Walnut Creek and Great Western Reservoir occurred in 1973 (see PAC 000-500 and PAC NE-142). Tritium concentrations in Great Western Reservoir water returned to approximately background levels by 1977. Tritium is one of the radionuclides routinely monitored in RFP surface water effluents. Tritium contamination in reservoir sediments has not been studied; however, tritium is not expected to concentrate in sediments because of its high mobility in the environment (DOE, 1992).

Numerous sampling programs have been conducted at Great Western Reservoir, focusing primarily on plutonium and americium contamination in reservoir bottom sediments. The results have shown that a discrete layer of sediment containing plutonium above the EPA estimated baseline (worldwide atmospheric fallout) level of less than or equal to 0.1 pCi/g is present throughout the bottom of the reservoir. Samples collected from Colorado Front Range reservoirs believed to be unaffected by RFP activities have corroborated this estimated baseline concentration. The highest concentrations of plutonium have been detected in the deepest areas of the reservoir. The plutonium-bearing sediment layer corresponds with historical RFP releases, and has been buried to varying depths by subsequent sedimentation. Sedimentation rates based on core samples vary from greater than 3.5 centimeters per year (cm/yr) in the eastern, deeper areas of the reservoir to less than 0.25 cm/yr in the shallowest areas (DOE, 1992).

Characterization samples at IHSS 200 were collected during the Phase I RFI/RI. The RFI/RI Report substantiated the findings from previous investigations concluding that waterborne

transport from RFETS was the most likely means of plutonium deposition to Great Western Reservoir sediments, while aeolian transport was the most significant pathway for contaminants to sediments in Mower Reservoir and Standley Lake. Comparing data gathered during the RFI/RI in 1992 to data gathered in 1983 and 1984, the RFI/RI finds that, in general, plutonium concentrations in sediments decreased from 10 to 30 percent in similar locations. The two data sets exhibit strongly similar vertical plutonium profiles; however, indicating that vertical migration of plutonium in reservoir sediments is not occurring (DOE, 1997). This conclusion is consistent with previous studies of plutonium behavior in RFP surface water environs have demonstrated that the clay fraction of typical RFP-area sediments has an extremely high affinity for plutonium. Related laboratory studies have shown that the adsorption of plutonium onto these sediments is rapid and essentially irreversible. The studies demonstrated that plutonium in surface water impoundments (e.g., reservoirs) is not readily transported from the impoundments. It has been previously concluded that no evidence of plutonium migration through the sediment column exists at Great Western Reservoir (DOE, 1992).

RFP has monitored and will continue to monitor Walnut Creek water quality immediately inside the RFP boundary since the plant's inception. IHSS 200 surface water quality is also extensively monitored by the City of Broomfield and CDH. Water samples from Great Western Reservoir and off-site reaches of Walnut Creek are routinely analyzed for gross alpha and beta radiation, selected radionuclides, VOCs, pesticides, herbicides, metals and base neutral acids. Monitoring is conducted to evaluate RFP compliance with applicable State and Federal water quality standards (DOE, 1992).

The nature and extent of contamination associated with IHSS 200 was delineated in the Phase I RFI/RI (DOE, 1996). Historical data as well as data collected to support RFI/RI conclusions were used to assess the risk posed by the IHSS. As summarized in the CAD/ROD, the highest calculated excess cancer risk for IHSS 200 was 9E-07. This risk estimate assumed a reasonable maximum exposure to a hypothetical resident (DOE, 1997).

IHSS 201 (STANDLEY LAKE)

IHSS 201 encompasses Standley Lake, off-site reaches of Woman Creek (which flows into the reservoir from RFP), and downstream surface water features possibly impacted by outflow from the reservoir. Portions of the Woman Creek drainage within RFP (see PAC SE-142.10 and PAC SE-142.11) are not included in IHSS 201 (DOE, 1992).

Standley Lake is a large reservoir located approximately 3 kilometers southeast of the RFP eastern boundary. Uses of the reservoir include municipal water supply and recreation. Approximately 67 percent of the water is used as water supply for the cities of Westminster, Northglenn, and Thornton. The remaining 33 percent is transported through irrigation ditches to agricultural areas northeast of the reservoir, primarily between Broomfield and Fort Lupton. Standley Lake receives approximately 96 percent of its water from Clear Creek via an irrigation ditch, but has also been fed by Woman Creek, which drains the southern side of RFP (DOE, 1992).

During the operating history of RFP, various waste streams were discharged to the Woman Creek drainage (see PAC SE-142.10 and PAC SE-142.11). These effluents were discharged in accordance with internal guidelines (in particular, USAEC guidelines in the early history of RFP), and, increasingly during the past two decades, with State and Federal pollution discharge regulations. The effluents contained metals, radionuclides, and inorganic ions within concentration limits considered acceptable at the time. Contaminants from these discharges accumulated in varying amounts in the sediments of the on-site holding ponds, Woman Creek, and Standley Lake. Radioactive materials released from RFP may also have been transported to Standley Lake as airborne particulates (fugitive dust) (DOE, 1992).

Prospective RFP sources of contaminants other than plutonium to Standley Lake, particularly VOCs and uranium, exist at OU 1 (881 Hillside) and OU 2 (903 Pad, Mound, and East Trenches). Herbicides, which have been applied in the past at various locations within RFP, have also been detected in RFP surface water (DOE, 1992).

Sampling programs at Standley Lake have focused primarily on plutonium and americium contamination in reservoir bottom sediments. The results suggest that a discrete layer of sediment containing plutonium above the EPA estimated baseline (worldwide atmospheric fallout) level of less than or equal to 0.1 pCi/g is present in some areas of the reservoir. As in Great Western Reservoir, the highest plutonium concentrations appear to exist in the deepest areas of Standley Lake. The plutonium-bearing sediment corresponds with historical RFP releases, which appear to have peaked in 1969. The affected sediments have been buried to varying depths by subsequent sedimentation. Sedimentation rates based on a core sample from the deeper area of the reservoir are estimated to be 3.4 cm/yr. (DOE, 1992) As summarized in the OU 3 Phase I RFI/RI, the maximum plutonium value in Standley Lake surficial sediments peaked at 0.55 pCi/g and averaged 0.03 pCi/g. The subsurface sediment maximum was 0.38 pCi/g. Additional sampling of IHSS 201 surface water was also conducted during the Phase I RFI/RI and concentrations were observed to be either below background or not detected (DOE, 1996; DOE, 1997).

Routine water quality monitoring programs similar to those described above for IHSS 200 are conducted at IHSS 201 by RFP, CDH, and the cities of Westminster, Thornton, and Northglenn. Similar water quality standards to those described for IHSS 200 apply to IHSS 201 (DOE, 1992).

Historical data as well as data collected to support RFI/RI conclusions were used to identify potential contaminants of concern associated with IHSS 201. None were identified and risk estimates were not deemed necessary for IHSS 201 (DOE, 1996).

IHSS 202 (Mower Reservoir)

IHSS 202 encompasses Mower Reservoir, off-site reaches of the irrigation ditch which feeds the reservoir from Woman Creek, and downstream surface water features possibly impacted by outflow from the reservoir (DOE, 1992).

As summarized in the Historical Release Report, little documentation exists for Mower Reservoir. Mower Reservoir is a small, privately-owned impoundment located just southeast of RFP. The

reservoir has historically been fed by Woman Creek via Mower Ditch, an irrigation ditch located in the RFP Buffer Zone. Mower Reservoir is used for agricultural purposes, primarily cattle watering and irrigation. It covers an area of approximately nine acres. Intermittent discharge from Mower Reservoir flows southeast from the reservoir, eventually discharging to Standley Lake (IHSS 201) (DOE, 1992).

In contrast to the extensive historical sampling data available for IHSSs 200 and 201, only very limited data have been collected to characterize Mower Reservoir. Mower Reservoir sediment samples collected in 1970 slightly exceeded EPA's expected plutonium baseline concentration of less than or equal to 0.1 pCi/g. Because the reservoir is not a public water supply, water quality is not monitored and has not previously been evaluated (DOE, 1992). Additional sampling of surficial sediments in the reservoir indicated a maximum plutonium value of 0.49 pCi/g with an average of 0.291 pCi/g. The subsurface sediment concentration maximum was 1.11 pCi/g (DOE, 1996; DOE, 1997).

RFP-derived contaminants in Mower Reservoir are believed to have been transported primarily as airborne particulates, and to a lesser degree by surface water through Woman Creek. Numerous investigations of IHSS 199 have shown elevated plutonium concentrations in surface soils around Mower Reservoir. It is expected that Mower Reservoir received similar amounts of plutonium through airborne transport as the nearby land surface (DOE, 1992). These conclusions were affirmed in the OU3 Phase I RFI/RI (DOE, 1996).

Historical data as well as data collected to support RFI/RI conclusions were used to identify potential contaminants of concern associated with IHSS 202. None were identified and risk estimates were not deemed necessary for IHSS 202 (DOE, 1996).

Action/No Further Action Recommendation

No Action for OU3 (i.e., IHSSs 199, 200, 201 and 202) was approved by the Agencies and is documented in the CAD/ROD for Operable Unit 3, The Offsite Areas (DOE, 1997) included as Appendix B.

References

DOE, 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden, CO, June.

DOE, 1996, *Phase 1, RFI/RI for Operable Unit 3, Offsite Releases,* Rocky Flats Environmental Technology Site, Golden, CO, July.

DOE, 1997, *Final Corrective Action Decision/Record of Decision Declaration, Operable Unit 3,* Department of Energy, Rocky Flats Environmental Technology Site, Golden, CO, July.

SECTION 4.0

ENVIRONMENTAL PROJECT STATUS (TO DATE)

Environmental Project Status

This Section briefly describes the "current" status of several Environmental Restoration projects underway. The projects listed below do not necessarily fall within the reporting period from August 1, 1996 - August 1, 1997 however, are expected to be included in the 1998 HRR Annual Update to the Historical Release Report.

- IHSS Reference Number: IHSS NW-170, 174a & 174b
  Unit Name: PU&D Storage Yard

  The Property Utilization and Disposal (PU&D) storage yard was used for storing empty drums and miscellaneous excess property from 1974 until 1994. Based upon historical use of the yard, the greatest potential for soil contamination exists within the easternmost third where scrap metal coated with oil and freon based lathe coolant was stored without prior decontamination. In addition, empty oil/solvent drums were stored at this location (IHSS NW-174a). Handling and transferring of hazardous materials associated with a dumpster (IHSS NW-174b) where also conducted. Several incidents involving releases to the environment are documented in the Historical Release Report (DOE, 1992).

  In accordance with the Interagency Agreement, the PU&D Yard was initially investigated as part of Operable Unit 10. Approximately 235 soil gas locations were sampled for Volatile Organic Analysis and 71 surface soil locations were sampled and analyzed for metals, semi-volatile organic compounds, pesticides and PCBs. These data and figures are documented in the Draft Final Technical Memorandum No.1 for Operable Unit 10, Vol.1, 1995. The data show that volatile organic compounds were present in sub-surface soils along the eastern third of the yard.

  In July, 1997, the IHSS boundary for IHSS NW-174b was relocated back to an area originally described in the HRR (DOE, 1992). Further review of aerial photographs and analytical data support the present location in this document (Plate 1) as being the correct location of the dumpster. The site can be easily identified currently as an area with a large oil stain centrally located in the yard.

  In August, 1997, a pre-remedial investigation of IHSSs 170, 174a and 174b was performed. Characterization of the PU&D Yard was required to confirm or disprove the potential presence of a Volatile Organic Compound (VOC) contaminant source suspected of impacting groundwater. The investigation consisted of 20 additional soil borings and 38 subsurface soil samples to be analyzed for VOCs. Six groundwater samples were also collected during the investigation. Preliminary data indicate that VOC levels are below RFCA Tier I subsurface soil action levels. Radiological data are in progress at the offsite laboratory.

- IHSS Reference Number: IHSS 900-108
  Unit Name: Trench T-1

Trench T-1 is located near the southeast corner of the Protected Area (PA) fence and North of Central Avenue. The HRR (DOE, 1992) describes the date of operation as being from November 1954 - December 1962. Approximately 125 drums of depleted uranium chips and lathe coolant from Building 444 were buried at this location.

In the summer of 1995, electromagnetic surveys and ground penetrating radar confirmed the presence of drums and/or metallic objects in the Trench 1 location. The surveys indicate that a majority of the metallic objects are located in the westernmost half of the trench.

A Proposed Action Memorandum (PAM) was approved by the Agencies in August of 1997 to remediate the site as part of a CERCLA Accelerated Source Removal Action. Field Implementation Documents are currently being prepared and tentative plans to begin mobilization are set for early 1998.

- IHSS Reference Number: IHSS 900-112, 155, and 140
  Unit Name(s): 903 Pad, 903 Lip Area, and the Hazardous Material Disposal Area

The 903 Pad, 903 Lip Area, and Hazardous Material Disposal Area is located at the southeast corner to the Industrial Area. Drums that contained radioactively-contaminated oils and VOCs were stored at this location from the summer of 1958 to January 1967. Approximately three fourths of the drums contained plutonium-contaminated liquids while most of the remaining drums contained uranium-contaminated liquids. Of the drums containing plutonium, the liquid was primarily lathe coolant and carbon tetrachloride in varying proportions. Also stored in the drums were hydraulic oils, vacuum pump oils, trichloroethene, percloroethylene, silicone oils, and acetone still bottoms (DOE, 1995).

Leaking drums were noted in 1964 during routine handling operations. The contents of the leaking drums were transferred to new drums, and the area was fenced to restrict access. When cleanup operations began in 1967, a total of 5,237 drums were at the drum storage site. Approximately 420 drums leaked to some degree. Of these, an estimated 50 drums leaked their entire contents. The total amount of leaked material was estimated at around 5,000 gallons of contaminated liquid containing approximately 86 grams of plutonium (DOE, 1995). Releases at the 903 Drum Storage Site (IHSS 112) are considered the primary source of radiological contamination in the surficial soil in this part of RFETS.

From 1968 through 1970, some of the radiologically contaminated material was removed, the surrounding area was regraded, and much of the area was covered by an imported base coarse material and an asphalt cap. However, during drum removal and cleanup activities, wind and rain spread plutonium-contaminated soils to the east and southeast from the 903 Pad area resulting in IHSS 155 (903 Pad Lip Area). Several limited excavations have removed some of the plutonium contaminated soils from the Lip Area (DOE, 1995) (Barker, 1982). However, results from the OU2 Phase II RFI/RI sampling and analysis confirm that radiologically contaminated soils remain.

Surface soils to the east and southeast of the Lip Area also exhibit elevated plutonium-239/240 and americium-241activities. This contamination is primarily attributed to wind dispersion from the 903 Pad with potential contributions from historical fires and stack effluent. Areas exhibiting elevated plutonium-239/240 and americium-241 activities east and southeast of the Lip Area are know as the Americium Zone.

A Sampling and Analysis Plan for the Characterization of the 903 Pad, 903 Lip Area, and Americium Zone (RMRS, 1997) has been prepared and is scheduled to be implemented in 1998 to further refine the volume of soils exceeding RFCA Tier I action levels to determine remedial alternatives.

SECTION 5.0

OTHER SIGNIFICANT EVENTS (TO DATE)

Other Significant Events

This Section briefly describes several events occurring at Rocky Flats during the reporting period which are considered significant and should be documented. The HRR Annual Updating process is an appropriate format for documenting events which are considered one-time or which may be useful in the future. These events are not considered a release to the environment

- IHSS Reference Number: Not Applicable
  Unit Name: Relocation Soil from Phase III Sewage Treatment Plant Construction

In May 1996, while excavating to install the Sewage Treatment Plant (STP) effluent storage tanks, soils were identified at above background levels for radionuclides. Prior to initiating the Phase III STP Upgrade project, it was determined that approximately 150 feet of 6" vitrified clay pipe, designated as part of the Original Process Waste Line (OPWL, IHSS 000-121), would require removal. The regulatory agencies were notified of these plans and concurred that the project would be handled as a construction project rather than as an accelerated cleanup action. A Proposed Action Memorandum (PAM) was therefore not required.

Extensive sampling in and around the pipe location was performed for radionuclides, metals, volatile organics, semi-volatile organics, PCBs and chlorides. Following receipt of analytical data, a hazardous waste determination was made in accordance with standing plant policy for construction projects which require excavation.

The spoils generated from the excavation near and within the immediate OPWL (approximately 150 cubic yards) were determined to be non RCRA hazardous, however were identified as radiologically contaminated soil in an area adjacent to the clay pipe location. Additional spoils generated from the project were identified as being above background. Spoils with radiological activity above the Table 2.2 contamination limits as stated in the DOE Radcon Manual were segregated and containerized as Low Level Waste. The remaining associated spoils with low radiological activity (but above background) were stockpiled in an area immediately north of the present landfill. The volume of this material is estimated to be approximately 4,000 cubic yards.

The highest isotopic concentrations detected from sampling of the waste containers in February of 1997 were for Americium 241 at 160 pCi/g. Plutonium 239 levels ranged from between 1.5 pCi/g (lowest) to 16 pCi/g (highest). Sampling of the containerized soil confirm that radionuclides do not exceed the Tier II action level as defined in Attachment 5 to the Rocky Flats Cleanup Agreement (RFCA) (DOE, 1996).

IHSS Reference Number: NW-170, 174a, & 174b
Unit Name: PU&D Yard Detonations of Unstable Reactive Chemicals

Detonation of unstable reactive chemicals was conducted on three occasions at the Property Utilization and Disposal (PU&D) Yard on the following dates:

December 28, 1996;
November 1, 1997;
November 27, 1997;

The types of chemicals regarded as unstable (see below) were permitted for disposal using detonation methods by the Colorado Department of Public Health and the Environment (CDPHE) and the Environmental Protection Agency (EPA). The detonations were conducted utilizing the procedures and policies set forth by the following organizations: Shift Operations, Jefferson County Sheriff's department, RFETS Part B permit, Radiological Engineering, Wackenhut Services, RFP Fire Department/Fire Protection, Environmental Operations, and the RFP Shift Superintendant.

A total of approximately 500 grams of benzoyl peroxide, 25 grams of 1-methyl 3-nitro1-nitrosoguanidine, 1 gallon of anhydrous ethyl ether, 2 gallons of methyl ethyl ketone, 4.4 kilograms of ammonium perchlorate , 11 gallons of kerosene, 45 grams of BZ alloy containing (Cs, NA, K) and 2.7 kilograms of red phosphorus were detonated on the three separate events. Air sampling and radiological surveys were conducted prior to and after each event and there were no reported injuries associated with the operations.

TABLES

TABLE 1
PACS IDENTIFIED IN QUARTERLY UPDATES

IHSS[1]	OU[1]	CPIR Cross-Reference[2]	PAC. NO & STATUS[3]	PAC NAME	Original Update #
NORTHEAST BUFFER ZONE					
142.6	BZ	NA	NE-1404	Diesel Spill at Pond B-2 Spillway	2
NA	BZ	NA	NE-1405	Diesel Fuel Spill at Field Treatability Unit	3
NA	BZ	NA	NE-1406	771 Hillside Sludge Release	4
NA	BZ	93-002	NE-1407	OU 2 Treatment Facility	4
NA	BZ	93-005	NE-1408	OU 2 Test Well *(formerly NE-1406)*	4
NA	BZ	93-007	NE-1409	Modular Tanks and 910 Treatment System Spill *(formerly 000-503)*	5
NA	BZ	NA	NE-1410 NFA	Diesel Fuel Spill at Field Treatability Unit	7
NA	BZ	NA	NE-1411 NFA	Diesel Fuel Overflowed from Tanker at OU 2 Field Treatability Unit	7
NA	BZ	NA	NE-1412	Trench T-12 Located in OU-2 East Trenches	10
NA	BZ	NA	NE-1413	Trench T-13 Located in OU-2 East Trenches	10
NORTHWEST BUFFER ZONE					
NA	BZ	NA	NW-1500	Diesel Spill at PU&D Yard *(formerly NW-175)*	2
NA	BZ	NA	NW-1501	Asbestos Release at PU&D Yard *(formerly NW-176)*	2
114	7	92-021	NW-1502	Improper Disposal of Diesel Contaminated Material at Landfill *(formerly NW-177)*	2
114	7	92-004	NW-1503 NFA	Improper Disposal of Fuel Contaminated Material at Landfill	7
114	7	94-002	NW-1504 NFA	Improper Disposal of Thorosilane Contaminated Material at Landfill	7
SOUTHWEST BUFFER ZONE					
NA	5	NA	SW-1701 NFA	Recently Identified Ash Pit	9
NA	5	NA	SW-1702	Recently Identified Ash Pit	9
000 AREA					
NA	IA	94-005	000-503 NFA	Solar Pond Water Spill Along Central Avenue	7

IHSS[1]	OU[1]	CPIR Cross-Reference[2]	PAC. NO & STATUS[3]	PAC NAME	Original Update #
100 AREA					
NA	IA	93-003	100-613	Asphalt Surface in Lay Down Yard North of Building 130 *(formerly identified as 000-501)*	4
300 AREA					
NA	IA	93-003	300-711 NFA	Ni-Cad Battery Spill Outside of Building 373	7
NA	IA	92-002	300-712 NFA	1/2 gal Antifreeze Spilled by Street Sweeper Outside of Building 373	7
NA	IA	94-006	300-713 NFA	Caustic Spill North of Building 331	8
NA	IA	94-012	300-714 NFA	Laundry Waste Water Spill From Tank T-803, North of Building 374	10
NA	IA	NA	300-715 NFA	Battery Acid Spill	Annual #2
400 AREA					
NA	IA	NA	400-811	Transformer 443-2, Building 443	2
NA	IA	93-009	400-812 NFA	Tank T-2 Spill in Building 460	6
NA	IA	94-001	400-813	RCRA Tank Leak in Building 460	7
NA	IA	94-007	400-814 NFA	Air Conditioner Compressor Release, Bld 444 Roof	8
NA	IA	94-008	400-815	RCRA Tank Leak in Building 460	8
500 AREA					
NA	IA	93-004	500-906	Asphalt Surface Near Building 559	4
172	IA	94-009	500-907	Tanker Truck Release of Hazardous Waste From Tank 231B	9
156.1, 186	IA	95-003	500-908 NFA	Oil Released from Air Compressor	12
158	IA	96-001	500-909 NFA	Release of Spent Photographic Fixer Solution	Annual #1
600 AREA					
152, 157.1, 172	IA	NA	600-1004	Central Avenue Ditch Cleaning Incident (formerly identified as 400-820)	6
NA	IA	NA	600-1005	Former Pesticide Storage Area	7

IHSS[1]	OU[1]	CPIR Cross-Reference[2]	PAC. NO & STATUS[3]	PAC NAME	Original Update #
700 AREA					
101	IA	95-002	700-1113 NFA	Water Released from 207C Solar Evaporation Pond	11
NA	IA	96-0004	700-1114 NFA	Release During Liquid Transfer Operations from Bldg. 774	Annual #2
NA	IA	NA	700-1115	Identification of Diesel Fuel in Subsurface Soils	Annual #2
800 AREA					
NA	IA	92-005	800-1212	Building 866 Sump Spill	5
900 AREA					
NA	IA	NA	900-1308	Gasoline Spill Outside of Building 980	6
NA	BZ	93-010	900-1309	OU 2 Field Treatability Unit Spill	6
NA	IA	92-023	900-1310	ITS Water Spill *(formerly identified as 000-502)*	2
NA	IA	NA	900-1311	Septic Tank East of Building 991	7
NA	IA	94-004	900-1312	OU-2 Water Spill	7
192	IA	NA	900-1313	Seep Area Near OU-2 Influent	9
101	IA	94-010	900-1314 NFA	Solar Evaporation Pond 207B Sludge Release	9
NA	IA	94-013	900-1315 NFA	Tanker Truck Release on East Patrol Road, North of Spruce Ave.	11
NA	BZ	NA	900-1316 NFA	Elevated Chromium (total) Identified During Geotechnical Drilling	10
176	IA	95-001	900-1317 NFA	Soil Released from Wooden Crate in 964 Laydown Yard	11
NA	BZ	96-0011	900-1318 NFA	Release of F001Listed Waste Water to Soil	Annual #2

[1]NA = Not applicable, IA = Industrial Area Operable, BZ = Buffer Zone Operable Unit.
Not all PACs are located in Individual Hazardous Substance Sites (IHSSs). Likewise, not all PACs are identified in RCRA Contingency Plan Implementation Reports (CPIRs). The Operable Unit designation, as referenced in this report is consistent with RFCA terminology and the Consolidated Operable Unit IHSS allocation.

[2]RCRA Contingency Plan Implementation Reports (CPIRs) are submitted to the Agencies and have unique identification numbers.

[3]PACs and IHSSs in this document were evaluated to establish No Further Action / proposed No Further Action status from comprehensive risk assessments, remedial actions taken, regulatory guidance or process knowledge.

TABLE 2
ORIGINAL POTENTIAL AREAS OF CONCERN
SUBMITTED IN HISTORICAL RELEASE REPORT - JUNE 1992

IHSS NO.	OU NO.[1]	PAC NO. & STATUS[2]	PAC NAME	PAGE
NORTHEAST BUFFER ZONE				
NA	BZ	NE-1400 NFA	Tear Gas Powder Release	NE-36
NA	BZ	NE-1401 NFA	NE Buffer Zone Gas Line Break	NE-37
NA	BZ	NE-1402 NFA	East Inner Gate PCB Spill	NE-38
NA	BZ	NE-1403 NFA	Gasoline Spill - Building 920 Guard Post	NE-39
SOUTHEAST BUFFER ZONE				
NA	BZ	SE-1600 NFA	Pond 7 - Steam Condensate Releases	SE-10
NA	BZ	SE-1601 NFA	Pond 8 - Cooling Tower Discharge Releases	SE-13
SOUTHWEST BUFFER ZONE				
NA	BZ	SW-1700 NFA	Fuel Spill into Woman Creek Drainage	SW-15
000 AREA				
NA	IA	000-500	Sanitary Sewer System	000-49
NA	BZ	000-501 NFA	Roadway Spraying	000-60
100 AREA				
NA	IA	100-600 NFA	Mercury Spill - Valve Vault 124-B, Building 124	100-8
NA	IA	100-601 NFA	Building 123 Phosphoric Acid Spill	100-10
NA	IA	100-602	Building 123 Process Waste Line Break	100-11
NA	IA	100-603	Building 123 Bioassay Waste Spill	100-13
NA	IA	100-604 NFA	T130 Complex Sewer Line Leaks	100-15
NA	IA	100-605 NFA	Building 115 Hydraulic Oil Spill	100-16

IHSS N0.	OU NO.[1]	PAC NO. & STATUS[2]	PAC NAME	PAGE
NA	IA	100-606 NFA	Building 125 TCE Spill	100-17
NA	IA	100-607	Building 111 Transformer PCB Leak	100-18
NA	IA	100-608 NFA	Building 131 Transformer Leak	100-20
NA	IA	100-609	Building 121 Security Incinerator	100-21
NA	IA	100-610 NFA	Asbestos Release - Building 123	100-22
NA	IA	100-611	Building 123 Scrubber Solution Spill	100-23
NA	IA	100-612 NFA	Battery Solution Spill - Building 119	100-25
300 AREA				
NA	IA	300-700 NFA	Scrap Roofing Disposal	300-25
NA	IA	300-701 NFA	Sulfuric Acid Spill - Building 371	300-26
NA	IA	300-702	Pesticide Shed	300-27
NA	IA	300-703 NFA	Building 331 North Area	300-28
NA	IA	300-704 NFA	Roof Fire, Building 381	300-29
NA	IA	300-705 NFA	Potassium Hydroxide Spill North of Building 374	300-30
NA	IA	300-706 NFA	Evaporator Tanks North of Building 374	300-31
NA	IA	300-707 NFA	Sanitizer Spill	300-33
NA	IA	300-708 NFA	Transformers North of Building 371	300-34
NA	IA	300-709 NFA	Transformer Leak 334-1	300-35
NA	IA	300-710 NFA	Gasoline Spill North of Building 331	300-36
400 AREA				
NA	IA	400-800 NFA	Transformer 443-1	400-40
NA	IA	400-801	Transformer, Roof of Building 447	400-41

IHSS N0.	OU NO.[1]	PAC NO. & STATUS[2]	PAC NAME	PAGE
NA	IA	400-802	Storage Area, South of Building 334	400-42
NA	IA	400-803	Miscellaneous Dumping, Building 460 Storm Drain	400-44
NA	IA	400-804	Road North of Building 460	400-45
NA	IA	400-805 NFA	Building 443 Tank #9 Leak	400-46
NA	IA	400-806 NFA	Catalyst Spill, Building 440	400-47
NA	IA	400-807	Sandblasting Area	400-48
NA	IA	400-808 NFA	Vacuum Pump Leak - Building 442	400-49
NA	IA	400-809 NFA	Oil Leak - 446 Guard Post	400-51
NA	IA	400-810	Beryllium Fire - Building 444	400-52
500 AREA				
NA	IA	500-900 NFA	Transformer Leak - 515/516	500-15
NA	IA	500-901 NFA	Transformer Leak - 555	500-17
NA	IA	500-902 NFA	Transformer Leak - 559	500-18
NA	IA	500-903 NFA	RCRA Storage Unit #1	500-19
NA	IA	500-904	Transformer Leak - 223-1/223-2	500-20
NA	IA	500-905 NFA	Transformer Leak - 558-1	500-22
600 AREA				
NA	IA	600-1000 NFA	Transformer Storage Building 662	600-18
NA	IA	600-1001	Temporary Waste Storage Building 663	600-20
NA	IA	600-1002 NFA	Transformer Storage - West of Building 666	600-24
NA	IA	600-1003 NFA	Transformers North and South of 661-675 Substation	600-25

IHSS N0.	OU NO.[1]	PAC NO. & STATUS[2]	PAC NAME	PAGE
700 AREA				
NA	IA	700-1100	French Drain North of Building 776/777	700-76
NA	IA	700-1101	Laundry Tank Overflow - Building 732	700-77
NA	IA	700-1102 NFA	Transformer Leak - 776-4	700-78
NA	IA	700-1103 NFA	Leaking Transformers - Building 707	700-80
NA	IA	700-1104 NFA	Leaking Transformers - Building 708	700-82
NA	IA	700-1105	Transformer Leak - 779-1/779-2	700-83
NA	IA	700-1106	Process Waste Spill - Portal 1	700-84
NA	IA	700-1107 NFA	Compressor Waste Oil Spill - Building 776	700-86
NA	IA	700-1108	771/774 Footing Drain Pond	700-87
NA	IA	700-1109 NFA	Uranium Incident - Building 778	700-90
NA	IA	700-1110 NFA	Nickel Carbonyl Burial West of Building 771	700-91
NA	IA	700-1111 NFA	Leaking Transformer - Building 750	700-92
NA	IA	700-1112 NFA	Leaking Transformer - 776-5	700-93
800 AREA				
NA	IA	800-1200	Valve Vault 2	800-28
NA	IA	800-1201	Radioactive Site South of Building 883	800-30
NA	IA	800-1202 NFA	Sulfuric Acid Spill, Building 883	800-31
NA	IA	800-1203 NFA	Sanitary Sewer Line Break Between Buildings 865 and 886	800-32
NA	IA	800-1204	Building 866 Spills	800-33
NA	IA	800-1205	Building 881, East Dock	800-35
NA	IA	800-1206 NFA	Fire, Building 883	800-36

IHSS N0.	OU NO.[1]	PAC NO. & STATUS[2]	PAC NAME	PAGE
NA	IA	800-1207 NFA	Transformer 883-4	800-37
NA	IA	800-1208 NFA	Transformer 881-4	800-38
NA	IA	800-1209 NFA	Leaking Transformers, 800 Area	800-39
NA	IA	800-1210 NFA	Transformer 865-1 and 865-2	800-40
NA	IA	800-1211 NFA	Capacitor Leak, Building 883	800-41
900 AREA				
NA	IA	900-1300 NFA	RO Plant Sludge Drying Beds	900-47
NA	IA	900-1301	Building 991 Enclosed Area	900-48
NA	IA	900-1302 NFA	Gasoline Spill	900-50
NA	IA	900-1303 NFA	Natural Gas Leak	900-51
NA	IA	900-1304 NFA	Chromic Acid Spill - Building 991	900-52
NA	IA	900-1305 NFA	Building 991 Roof	900-53
NA	IA	900-1306 NFA	Transformers 991-1 and 991-2	900-54
NA	BZ	900-1307	Explosive Bonding Pit	900-55

[1]The Operable Unit designation, as referenced in this report, corresponds to RFCA Consolidated Operable Unit allocation.

[2]PACs and IHSSs in this document were evaluated to establish No Further Action / proposed No Further Action status from comprehensive risk assessments, remedial actions taken, regulatory guidance or process knowledge.

TABLE 3
NEW PAC's AND PAC/IHSS REVISIONS IDENTIFIED IN THIS ANNUAL UPDATE (AUGUST, 1997)

IHSS[1]	OU[1]	CPIR Cross-Reference[2]	PAC. NO & STATUS[3]	PAC NAME	Original Update #
NORTHEAST BUFFER ZONE					
110	BZ	NA	NE-110 NFA	Trench T-3	HRR
111.1	BZ	NA	NE-111.1 NFA	Trench T-4	HRR
142.1	BZ	NA	NE-142.1 NFA	Pond A-1	HRR
142.2	BZ	NA	NE-142.2 NFA	Pond A-2	HRR
142.3	BZ	NA	NE-142.3 NFA	Pond A-3	HRR
142.4	BZ	NA	NE-142.4 NFA	Pond A-4	HRR
142.5	BZ	NA	NE-142.5 NFA	Pond B-1	HRR
142.6	BZ	NA	NE-142.6 NFA	Pond B-2	HRR
142.7	BZ	NA	NE-142.7 NFA	Pond B-3	HRR
142.8	BZ	NA	NE-142.8 NFA	Pond B-4	HRR
142.9	BZ	NA	NE-142.9 NFA	Pond B-5	HRR
156.2	BZ	NA	NE-156.2 NFA	Soil Dump Area between the A and B Series Drainages	HRR
167.1	BZ	NA	NE-167.1 NFA	Landfill North Area Spray Field	HRR
216.2	BZ	NA	NE-216.2 NFA	East Spray Field	HRR
216.3	BZ	NA	NE-216.3 NFA	East Spray Field	HRR
SOUTHEAST BUFFER ZONE					
142.10	BZ	NA	SE-142.10 NFA	Pond C-1	HRR
142.11	BZ	NA	SE-142.11 NFA	Pond C-2	HRR

IHSS[1]	OU[1]	CPIR Cross-Reference[2]	PAC. NO & STATUS[3]	PAC NAME	Original Update #
209	BZ	NA	SE-209 NFA	Surface Disturbance Southeast of Bldg. 881	HRR
SOUTHWEST BUFFER ZONE					
133.5	BZ	NA	SW-133.5 NFA	Incinerator Facility	HRR
133.6	BZ	NA	SW-133.6 NFA	Concrete Wash Pad	HRR
NA	BZ	NA	SW-1701 NFA	Recently Identified Ash Pit	HRR
300 AREA					
135	IA	NA	300-135 NFA	Cooling Tower Blowdown	HRR
151	IA	NA	300-151 NFA	Tank 262 Fuel Oil Spills	HRR
156.1	IA	NA	300-156.1 NFA	Building 371 Parking Lot	HRR
181	IA	NA	300-181 NFA	Building 334 Cargo Container Area	HRR
188	IA	NA	300-188 NFA	Acid Leak	HRR
212	IA	NA	300-212 NFA	Building 371 Drum Storage Area, Unit 63	HRR
400 AREA					
129	IA	NA	400-129	Building 443 Oil Leak	HRR
191	IA	NA	400-191 NFA	Hydrogen Peroxide Spill	HRR
600 AREA					
117.3	IA	NA	600-117.3 NFA	Chemical Storage - South Site	HRR
152	IA	NA	600-152 NFA	Fuel Oil Tank 221 Spills	HRR
164.1	IA	NA	600-164.1 NFA	Radioactive Slab from Bldg. 776	HRR
189	IA	NA	600-189 NFA	Nitric Acid Tank	HRR
NA	IA	NA	600-1001	663 Laydown Yard	HRR
700 AREA					
123.1	IA	NA	700-123.1 NFA	Valve Vault 7	HRR

IHSS[1]	OU[1]	CPIR Cross-Reference[2]	PAC. NO & STATUS[3]	PAC NAME	Original Update #
132	IA	NA	700-132	Radioactive Site - 700 Area, Site # 4	HRR
143	IA	NA	700-143	Bldg. 771 Outfall	HRR
NA	NA	NA	700-1102 NFA	Transformer Leak 776-4	HRR
NA	IA	96-0004	700-1114 NFA	Release During Liquid Transfer Operations from Bldg. 774	Annual #2
NA	IA	NA	700-1115	Identification of Diesel Fuel in Subsurface Soils	Annual #2
800 AREA					
102	1	NA	800-102 NFA	Oil Sludge Pit	HRR
103	1	NA	800-103 NFA	Chemical Burial	HRR
104	1	NA	800-104 NFA	Liquid Dumping	HRR
105.1	1	NA	800-105.1 NFA	Bldg. 881 Westernmost Out of Service Fuel Tanks	HRR
105.2	1	NA	800-105.2 NFA	Bldg. 881 Easternmost Out of Service Fuel Tanks	HRR
106	1	NA	800-106 NFA	Bldg. 881, Outfall	HRR
107	1	NA	800-107 NFA	Bldg. 881, Hillside Oil Leak	HRR
145	1	NA	800-145 NFA	Sanitary Waste Line Leak	HRR
147.2	IA	NA	800-147.2 NFA	Bldg. Conversion Activity Contamination Area	HRR
900 AREA					
109	BZ	NA	900-109 NFA	Trench T-2 - Ryan's Pit	HRR
113	BZ	NA	900-113 NFA	Mound Area	HRR
119.1	1	NA	900-119.1	West Scrap Metal Storage Area and Solvent Spill	HRR
119.2	1	NA	900-119.2 NFA	East Scrap Metal Storage Area and Solvent Spill	HRR
130	1	NA	900-130 NFA	Contaminated Soil Disposal Area East of Bldg. 881	HRR
141	IA	NA	900-141 NFA	Sludge Disposal	HRR
183	BZ	NA	900-183 NFA	Gas Detoxification Area	HRR

IHSS[1]	OU[1]	CPIR Cross-Reference[2]	PAC. NO & STATUS[3]	PAC NAME	Original Update #
210	IA	NA	900-210 NFA	Building 980 Cargo Container, Unit 16	HRR
NA	BZ	96-0011	900-1318 NFA	Release of F001 Listed Waste Water to Soil	Annual #2
OFFSITE RELEASES					
199	3	NA	OFFSITE AREA 1 NFA	Offsite Area 1	HRR
200	3	NA	OFFSITE AREA 2 NFA	Great Western Reservoir	HRR
201	3	NA	OFFSITE AREA 3 NFA	Standley Lake	HRR
202	3	NA	OFFSITE AREA 4 NFA	Mower Reservoir	HRR

[1]NA = Not applicable, IA = Industrial Area Operable, BZ = Buffer Zone Operable Unit.
Not all PACs are located in Individual Hazardous Substance Sites (IHSSs). Likewise, not all PACs are identified in RCRA Contingency Plan Implementation Reports (CPIRs). The Operable Unit designation, as referenced in this report is consistent with RFCA terminology and the Consolidated Operable Unit IHSS allocation.

[2]RCRA Contingency Plan Implementation Reports (CPIRs) are submitted to the Agencies and have unique identification numbers.

[3]PACs and IHSSs in this document were evaluated to establish No Further Action / proposed No Further Action status from comprehensive risk assessments, remedial actions taken, regulatory guidance or process knowledge.

APPENDIX A

OPERABLE UNIT 1 CAD/ROD

CORRECTIVE ACTION DECISION/RECORD OF DECISION DECLARATION

SITE NAME AND LOCATION

Rocky Flats Environmental Technology Site, Operable Unit 1: 881 Hillside Area, Jefferson County, Colorado

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action/corrective action for the Rocky Flats Environmental Technology Site (Rocky Flats) Operable Unit (OU) 1: 881 Hillside Area, located near Golden, Colorado. The selected remedial action was chosen in accordance with the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, the Colorado Hazardous Waste Act (CHWA) and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The Resource Conservation and Recovery Act (RCRA) is administered through the CHWA by the Colorado Department of Public Health and Environment (CDPHE). OU 1 was investigated and a remedial action was selected in compliance with the Federal Facility Agreement and Consent Order - Interagency Agreement (IAG) signed by the U.S. Department of Energy (DOE), the State of Colorado, and the U.S. Environmental Protection Agency (EPA) on January 22, 1991. The selected remedial action is also consistent with the Federal Facility Agreement and Consent Order - Rocky Flats Cleanup Agreement (RFCA) signed by DOE, the State of Colorado and EPA on July 19, 1996. RFCA is now the governing cleanup agreement for Rocky Flats, and the selected remedy for OU 1 will be implemented in accordance with RFCA. The remedial action selection is based on the administrative record file for OU 1, and the State of Colorado concurs on the selected remedy.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Corrective Action Decision/Record of Decision (CAD/ROD), may present a future threat to public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

OU 1: 881 Hillside Area is one of sixteen geographically defined OUs at Rocky Flats that are identified in the IAG. RFCA consolidates these sixteen operable units into a fewer number, but OU 1 remains as a separate operable unit due to the fact that it is farther along in the administrative process and is nearing completion. OU 1 is composed of eleven Individual Hazardous Substance Sites (IHSSs). The selected remedy presented in this CAD/ROD includes three primary components:

1. This action addresses the principal threat posed by OU 1 by excavating subsurface soil contamination at IHSS 119.1, a former drum and scrap metal storage area, thereby removing the current source of groundwater contamination. The major components of the selected remedial action at IHSS 119.1 (Soil Excavation and Groundwater Pumping) include:
   - Excavation of approximately one thousand to two thousand cubic yards of contaminated subsurface soils at IHSS 119.1;
   - Extraction and then ultraviolet/hydrogen peroxide and ion-exchange treatment of contaminated groundwater from the excavation; and

- Either thermal treatment and replacement of excavated soil into the original excavation, disposal of excavated soil in an on-site waste disposal cell, or off-site disposal of excavated soil.

2. Institutional controls will be maintained throughout the OU 1 area in a manner consistent with RFCA, the Rocky Flats Vision, and the Action Levels and Standards Framework (ALF) (Attachment 5 to RFCA). These documents recognize that the reasonably foreseeable future land use for the OU 1 area is restricted open space. The institutional controls will ensure that the restricted open space land use is maintained for the OU 1 area and that domestic use of groundwater within the OU 1 area is prevented. If the reasonably foreseeable future land use for the OU 1 area changes when final sitewide land use decisions are made, this remedy will be reexamined to ensure protection of human health and the environment. The specific mechanisms (for example, deed restrictions) to ensure the implementation and continuity of the necessary institutional controls have not been included in this CAD/ROD. Currently, these mechanisms are envisioned to be placed in the Final Sitewide CAD/ROD or in this CAD/ROD during one of the five-year reviews of this document. However, should the Final CAD/ROD not occur or not include these institutional control mechanisms, this OU 1 CAD/ROD will be revised to include them, if it does not already include them as a result of a five-year review. The institutional controls can also be removed at one of the above times, if it is deemed appropriate to do so by the parties.

3. Because of the groundwater and land use controls, the low amounts of contamination in OU 1 outside of IHSS 119.1, and the low levels of risk associated with the contamination, no remedial action will be taken at the remaining ten IHSSs in OU 1.

Any surface soil contamination at OU 1 will be addressed jointly with surface soil contamination at the 903 Pad, Mound and East Trenches area (formerly OU 2).

STATUTORY DETERMINATIONS

The selected remedy for OU 1 satisfies the statutory requirements of CERCLA Section 121. The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element. Because this remedy will result in hazardous substances remaining in groundwater, a review will be conducted within five years after commencement of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

Jessie Roberson, Manager
U.S. Department of Energy, Rocky Flats Field Office

Feb 13, 1997
Date

Max H. Dodson, Assistant Regional Administrator
Office of Ecosystem Protection and Remediation
U.S. Environmental Protection Agency, Region VIII

Feb 27, 1997
Date

Howard Roitman, Director
Hazardous Materials and Waste Management Division
Colorado Department of Public Health and Environment

Date

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Date

Howard Roitman, Director
Hazardous Materials and Waste Management Division
Colorado Department of Public Health and Environment

Date

DECISION SUMMARY

SITE NAME, LOCATION AND DESCRIPTION

The Rocky Flats Environmental Technology Site is located approximately sixteen miles northwest of downtown Denver, in northern Jefferson County, Colorado. A copy of a site location map is attached (Figure 1). Most Rocky Flats structures are located within the industrialized area of Rocky Flats, which occupies approximately four hundred acres and is surrounded by a buffer zone of approximately 6,150 acres. OU 1 is located adjacent to and on the south side of the Rocky Flats industrial area, on the hillside south and east of Building 881 and north of Woman Creek (Figure 2).

Geological Setting

Rocky Flats is located along the eastern edge of the southern Rocky Mountain region, immediately east of the Colorado Front Range. The site is located on a broad, eastward-sloping pediment that is capped by alluvial deposits of Quaternary age (i.e., Rocky Flats Alluvium). The tops of alluvial-covered pediments are nearly flat but slope eastward at fifty to two hundred feet per mile. At Rocky Flats, the alluvial-covered pediment surface is dissected by a series of east-northeast trending stream-cut valleys. The bases of the valleys containing Rock Creek, North and South Walnut Creeks, and Woman Creek lie fifty to two hundred feet below the elevation of the older pediment surface. These valleys incise into the bedrock underlying alluvial deposits, but most bedrock is concealed beneath colluvial material accumulated along the gentle valley slopes. The highest point in the immediate vicinity of OU 1 is Building 881, which is approximately six thousand feet above mean sea level. The lowest point is at Woman Creek, about 5,830 feet above mean sea level.

Surface Water

Rock Creek, North and South Walnut Creeks, and Woman Creek are intermittent streams that flow generally from west to east at Rocky Flats. Surface water within Woman Creek, which flows along the base of the Building 881 hillside south of OU 1, and which is not diverted to Mower Reservoir flows into Woman Creek Reservoir, which is part of the Standley Lake Protection Project. The water in Woman Creek Reservoir is detained and then pumped to Walnut Creek drainage downstream of Great Western Reservoir. The South Interceptor Ditch (SID) crosses OU 1 between the security area and Woman Creek.

Land Use

Land use within ten miles of Rocky Flats includes residential, commercial, industrial, parks and open space, agricultural and vacant, and institutional classifications. Most residential use within five miles of Rocky Flats is located northeast, east and southeast of Rocky Flats. Commercial development is concentrated near residential developments north and southwest of Standley Lake and around Jefferson County Airport, located approximately three miles northeast of Rocky Flats. Industrial land use within five miles of the site is primarily quarrying and mining operations. Natural resources associated with the quarrying and mining activities include sand, gravel and coal. Irrigated and non-irrigated croplands, producing primarily wheat and barley, are located north and northeast of Rocky Flats and in scattered parcels adjacent to the east boundary of the site. Several horse operations and small hay fields are located south of Rocky Flats. Much of the vacant land adjacent to Rocky Flats is rangeland.

OU 1

OU 1 is composed of eleven IHSSs, which are specific locations where solid wastes, hazardous substances, pollutants, contaminants, hazardous wastes, or hazardous

constituents may have been disposed or released to the environment within the Rocky Flats site at any time. Figure 2 shows the locations of these IHSSs and a description of each IHSS is provided in Table 1.

SITE HISTORY AND ENFORCEMENT ACTIVITIES

Rocky Flats is a government-owned, contractor operated facility that is part of the nationwide nuclear weapons complex. The site was operated for the U.S. Atomic Energy Commission (AEC) from its inception during 1951 until the AEC was dissolved in 1975. Responsibility for Rocky Flats was then assigned to the Energy Research and Development Administration (ERDA), which was succeeded by DOE in 1977. Until 1992 operations at Rocky Flats consisted of fabrication of nuclear weapons components from plutonium, uranium, stainless steel and beryllium. Building 881, which is adjacent to OU 1, was used for enriched uranium operations and stainless steel manufacturing. The laboratories in Building 881 also performed analyses of the materials generated in production. Parts made at the plant were shipped elsewhere for assembly. Support activities at Rocky Flats included chemical recovery and purification of recyclable transuranic radionuclides and research and development in metallurgy, machining, nondestructive testing, coatings, remote engineering, chemistry and physics. These activities resulted in the generation of radioactive, hazardous and mixed wastes. On-site storage and disposal of these wastes has contributed to hazardous and radioactive contamination in soils, surface water and groundwater. Originally the site was named the Rocky Flats Plant, but in 1994 it was renamed the Rocky Flats Environmental Technology Site to better reflect its new mission of environmental restoration and the advancement of new and innovative technologies for waste management, characterization and remediation.

On January 22, 1991, a Federal Facility Agreement and Consent Order (i.e., the IAG) was signed by DOE, EPA and the State of Colorado. Within the IAG, nine IHSSs were assigned to OU 1: 102, 103, 104, 105.1, 105.2, 106, 107, 119.1, 119.2, 130 and 145 (see Table 1 for a description of these IHSSs and Figure 2 for the location of each IHSS within OU 1). The IAG provided guidance and direction for investigating the OU 1 IHSSs. As per the IAG, draft and final Work Plans and a draft and final RCRA Facility Investigation/Remedial Investigation (RFI/RI) report were prepared and submitted to the regulatory agencies. The RFI/RI report for OU 1 was prepared for submittal of documentation and data necessary to determine if the risk from the OU 1 IHSSs warrants the need for remedial action.

During 1992, as an interim action, a French Drain was constructed across a portion of OU 1 to protect Woman Creek from contaminated groundwater present in OU 1. The French Drain, along with an extraction well, collects contaminated groundwater moving towards Woman Creek. The collected groundwater is transported to an ultraviolet/hydrogen peroxide and ion-exchange water treatment system located in Building 891. In addition, during 1994, plutonium contaminated surface soil "hot spots" that were located in IHSSs 119.1 and 119.2 were removed from OU 1. This hot spot removal was conducted under an Accelerated Response Action per the IAG.

The Proposed Plan and Draft Modification of the Rocky Flats RCRA Permit for OU 1 (Proposed Plan) was prepared and released for public comment in May 1996 pursuant to the IAG and consistent with the draft RFCA. On July 19, 1996, DOE, EPA and the State of Colorado signed the final RFCA, which has replaced the IAG to become the governing cleanup agreement for Rocky Flats. Pursuant to the "Operable Unit Consolidation Plan" in RFCA, OU 1 will continue through the CAD/ROD process with EPA as the lead regulatory agency.

HIGHLIGHTS OF COMMUNITY PARTICIPATION

The first Final Phase III RFI/RI report for OU 1 was submitted to EPA and CDPHE in November 1993 and the Revised Final Phase III RFI/RI report was submitted in June 1994. The Proposed Plan for OU 1 was released to the public in May 1996, and was made available in both the administrative record and in information repositories maintained at Front Range Community College, the EPA Superfund Records Center, CDPHE, the Standley Lake Library and the Citizens Advisory Board. The notice of availability for this document was published in the *Rocky Mountain News* on May 13, 1996. A public comment period on the Proposed Plan was held from May 13 to July 12, 1996. A public hearing was held on June 19, 1996. At this hearing, representatives from DOE gave a presentation that summarized the contamination and risks at OU 1, as well as the preferred remedial alternative for OU 1. DOE also responded to questions about OU 1. In addition, public comments on the Proposed Plan and Draft Permit Modification were received and recorded during the public hearing. This record, as well as responses to the written comments received during the public comment period, is included in the Responsiveness Summary, which is part of this CAD/ROD. This decision document presents the selected remedial action for OU 1: 881 Hillside Area at Rocky Flats, chosen in accordance with CERCLA, as amended by SARA and to the extent practicable, the NCP. The decision for OU 1 is based on the administrative record.

SCOPE AND ROLE OF OU 1

Because of the complexity of the Rocky Flats site, the site was divided into sixteen geographically defined OUs in the IAG. CAD/RODs have already been finalized and signed for three of these OUs (OU 11, OU 15 and OU [illegible]). In all three cases a No Action decision was determined to be appropriate. Although many of the remaining thirteen OUs have been consolidated in RFCA, OU 1 remains as an individual operable unit. The selected remedial action presented in this CAD/ROD includes addressing subsurface soil contamination at IHSS 119.1, a former drum and scrap metal storage area. This action addresses the principal threat posed by OU 1 by excavating contamination sources in subsurface soils, thereby removing the current source of groundwater contamination, and by extracting and treating contaminated groundwater contained at IHSS 119.1. Based on the results of the final RFI/RI, DOE has determined that the remaining IHSSs within OU 1 are already in a protective state with regard to human health and the environment. Thus, no further action relative to these remaining IHSSs will be taken. Any surface soil contamination at OU 1 will be addressed jointly with surface soil contamination at the 903 Pad, Mound and East Trenches area (formerly OU 2, which has been consolidated into the Buffer Zone OU in RFCA). Any additional groundwater associated with OU 1 will be managed consistent with the Integrated Water Management Plan. Surface water and suspended sediments transported from OU 1 have historically flowed into Woman Creek or the South Interceptor Ditch (SID). Since Woman Creek and the SID are being evaluated as part of OU 5: Woman Creek Priority Drainage, surface water and associated sediments originating from OU 1 will be addressed as part of OU 5.

SUMMARY OF SITE CHARACTERISTICS

Geology

Geologic units present at the 881 Hillside Area include the Rocky Flats Alluvium at the top of the hillside, colluvium and artificial fill along central portions of the hillside, and Woman

Creek Valley Alluvium at the base. These thin (three to eighteen feet) Quaternary age surficial units are underlain by thick (six hundred to eight hundred feet) Cretaceous claystones, siltstones and sandstones of the Laramie Formation. The uppermost portion of the Laramie Formation is disturbed as a result of slumping on the hillside and also contains numerous fractures primarily due to weathering. This portion of the Laramie Formation is often referred to as the weathered claystone and may be up to twenty-five feet thick in some areas.

Surface Features/Surface Water Hydrology

Several erosional and depositional processes have combined to produce gently rolling to moderately steep slopes on the 881 Hillside. The terrain has been recontoured in several areas at various times during the construction of Building 881, the placement of fill and waste materials in several IHSSs, road grading, and the construction of the SID and French Drain.

Surface water primarily occurs at OU 1 following precipitation and snow melt events after the soils have become saturated due to infiltration. Surface runoff generally flows south, where it is intercepted by the SID, and subsequently flows to the C-2 Pond where it is batched and sampled before being pumped to the Walnut Creek drainage.

Hydrogeology

Groundwater occurs under unconfined conditions within the unconsolidated Rocky Flats Alluvium, colluvium, fill, and weathered claystone section of the Laramie Formation. This interval is designated as the Upper Hydrostratigraphic Unit (UHSU). Below this, groundwater is limited to the more porous beds within the Laramie Formation and is usually confined. This deeper section of strata is designated as the Lower Hydrostratigraphic Unit (LHSU).

UHSU groundwater is not present across the entire 881 Hillside (OU 1). Groundwater in the unconsolidated material typically is confined to northwest-southeast trending erosion incisions in the bedrock surface, referred to as paleochannels, which are masked by the overlying materials. The extent of groundwater within these paleochannels varies with seasonal changes in precipitation rates. UHSU groundwater also occurs sporadically within the upper portion of the Laramie formation within fractures and along slump block glide planes. As previously discussed, a French Drain was installed between the 881 Hillside and Woman Creek to intercept this shallow unconfined groundwater, and it extends to a maximum depth of twenty-eight feet below top of bedrock. The French Drain acts as an effective hydraulic barrier to horizontal migration of UHSU groundwater into Woman Creek.

Vertical migration between the UHSU and the LHSU is limited by the extremely low hydraulic conductivity of the claystones within the Laramie Formation. The hydraulic conductivity of these claystones (1×10^{-8} cm/sec) is approximately three orders of magnitude less than that of the overlying unconsolidated sediments (1×10^{-5} cm/sec), and as a result the vertical component of migration is extremely small compared to the horizontal component. In addition, the porous saturated sandstones of the LHSU are laterally discontinuous, with intervening claystone aquitards effectively limiting horizontal migration within the LHSU.

Recharge to the UHSU is minimal, and occurs primarily through infiltration of precipitation. Infiltration rates range from approximately two inches per hour for initial infiltration to as little as one half inch per hour for final (saturated) infiltration. Discharge occurs largely through evapotranspiration and surface discharge at seeps and into the SID. Total volumes of UHSU groundwater at OU 1 varies annually and seasonally, but the Final

Phase III RFI/RI report (June 1994) estimated the volume to be approximately 5.0 to 5.8 acre-feet.

Flora /Fauna

Grassland habitats are dominant at OU 1, representing about 82% of the total area. Nine percent is either developed or disturbed; marsh habitat occupies 4%; woodland habitat constitutes 4%; and shrub habitats account for the remaining 1%. A restored wetlands was created to mitigate damages resulting from installing the French Drain. Wildlife species are typical of those in similar habitats throughout the foothills area. As a result of limited ephemeral surface water, aquatic species with short life cycles and small habitats, such as benthic macroinvertebrates, have developed as opposed to fish populations.

Site Contamination

A detailed methodology was developed during the Phase III RFI/RI for determining the nature and extent of contamination at OU 1. Using this methodology, analytes within the following chemical classes were analyzed: volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), metals, and radionuclides. The following media were assessed for the presence of contamination: surface soil, subsurface soil, groundwater, surface water/seeps, and sediments. Based on this analysis, VOCs, SVOCs, metals, and radionuclides were identified as contaminants at OU 1 (see Table 2). Note that the data in Table 2 does not reflect the 1994 surface soil hotspot removal.

From this and other data collected, the Phase III RFI/RI concluded that in OU 1 only IHSS 119.1 contains a significant source of contamination in the subsurface soil. The primary contaminants identified at IHSS 119.1 are as follows: carbon tetrachloride; 1,1-dichloroethene; tetrachloroethene; 1,1,1-trichloroethane; trichloroethene; and selenium. No radioactive contamination was identified in the subsurface soil at IHSS 119.1. Also, based on the data collected during the Phase III RFI/RI, the other IHSSs in OU 1 were not found to be contamination source areas and do not contribute significantly to groundwater contamination. Therefore, the other IHSSs do not warrant any further remedial action, and, as previously stated in the "Scope and Role of OU 1" section of this CAD/ROD, the selected remedial action for OU 1 addresses subsurface soil contamination and groundwater contamination at IHSS 119.1.

Groundwater in OU 1 is contaminated by VOCs and metals (see Table 2). Releases of VOCs within IHSS 119.1 are presumed to have occurred in the form of dense non-aqueous phase liquids (DNAPLs). This conclusion is based on the fact that drums at this IHSS contained unknown quantities and types of solvents, coupled with the presence of chlorinated solvent concentrations in groundwater at levels approaching 7% of the solubility limits of the substances. The presence of mobile or residual DNAPL at this location is inferred only, since DNAPL has not been directly observed, and maximum measured concentrations of VOCs in subsurface soil is less than 2.0 mg/l. Table 3 lists monitoring wells in the vicinity of IHSS 119.1 and their contaminant concentration range for the Contaminants of Concern (COCs) for the years 1987 through 1995. The locations of these wells are shown on Figure 3. Only two of the wells (974 and 4387) have concentrations exceeding 1% of the compound solubility.

The lateral extent of groundwater contamination is generally limited to an area north of the SID. The occurrence of contaminants in LHSU groundwater is limited to relatively low levels of VOCs (less than 100 µg/l) and localized occurrences of metals, particularly selenium (concentrations ranging from below background to fifteen times the background level of 80 µg/l).

A soil gas survey was conducted during early 1996 to more accurately define the extent and approximate volume of contaminated subsurface soil that will be excavated at IHSS 119.1. Based on this soil gas survey, two potential subsurface soil contamination source areas were identified (see Figure 3), resulting in an approximate total volume of subsurface soil to be excavated between one thousand and two thousand cubic yards.

Fate and Transport

In general, contaminant migration at the site was evaluated in terms of the identified pathways at OU 1. Migration of VOCs and metals in groundwater at IHSS 119.1 is restricted to northwest-southeast oriented channel features incised on the bedrock surface. The observed extent of groundwater contamination originating from IHSS 119.1 was compared with the predicted extent to confirm the accuracy of the hydrogeologic conceptual model. Contaminant transport rates were estimated by calculating groundwater seepage velocity and contaminant-specific retardation factors (see Table 3). The observed migration distance of VOC and metal contamination originating from IHSS 119.1 (approximately three hundred feet) falls within the predicted range. After implementation of the subsurface soil removal action presented in this CAD/ROD, the present source of this groundwater contamination will be eliminated.

Radionuclides and SVOCs in surface soils are susceptible to redistribution by wind or surface water erosion events. Surface soils at OU 1 were contaminated with windblown low-level radionuclides transported from the 903 Pad area, and any remaining surface soil contamination will be addressed jointly with surface soil contamination at the 903 Pad area. Surface water is intercepted by the SID and will be addressed as part of OU 5.

SUMMARY OF SITE RISKS

As part of the Phase III RFI/RI conducted for OU 1, a Baseline Risk Assessment (BRA) was prepared to identify any current or potential future risks to human health and the environment. The BRA evaluated health risks from surface soil, subsurface soil, groundwater, surface water, and sediments within the OU 1 boundaries.

The surface soil hot spot removal action conducted at OU 1 for plutonium, americium and uranium contamination reduced the risk from this contaminant group and medium by 100 times. The risk from surface soils was reduced to 1 in 100,000 (10^{-5}) after the OU 1 hot spot removal was completed. This contaminant group contributed the highest risk to a human receptor in the OU 1 BRA. With respect to subsurface soils and groundwater, the primary contaminants identified in the Phase III RFI/RI were: carbon tetrachloride; 1,1-dichloroethene; tetrachloroethene; 1,1,1-trichloroethane; trichloroethene; and selenium.

The BRA identified potential health risks from these contaminants associated with current and possible future exposure scenarios at OU 1. The scenarios originally examined in the OU 1 BRA are as follows: current on-site commercial/industrial; current off-site residential; future on-site commercial/industrial; future on-site ecological reserve; and future on-site residential. However, not all of these scenarios are considered valid or currently possible.

The Rocky Flats Future Site Use Working Group, consisting of participants from DOE, EPA, CDPHE, and major stakeholders, recommended in the June 1995 "Future Site Use Recommendations" report that the future on-site residential land use scenario not be considered. The commercial/industrial exposure scenario was recommended for use within the industrial area of the plant and the open space exposure scenario was recommended for

the buffer zone. These recommendations are consistent with the conceptual land uses in the ALF and with the Rocky Flats Vision. The OU 1 area lies on the border between these two anticipated land uses. DOE has not yet made a final determination regarding the future land uses for OU 1. This determination will be consistent with RFCA and the Rocky Flats Vision and will take into consideration the fact that the hillside at OU 1 has shown the potential for landslides and slumping. This would make the construction of structures at OU 1 complicated and problematic. In addition, as stated in the ALF, domestic use of groundwater will be prevented through institutional controls.

There are no health risks associated with the future open space park exposure scenario from OU 1 subsurface soil or groundwater since there are no exposure routes available from either medium. The carcinogenic risk calculated in the OU 1 BRA for the future on-site commercial/industrial worker in the industrial area from subsurface soils and groundwater is 2.4×10^{-4}. This risk is slightly above EPA's acceptable risk range of 10^{-4} to 10^{-6}.

The Phase III RFI/RI identified no significant environmental risk; therefore, environmental risks warrant no further examination.

In conclusion, actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this CAD/ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

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DESCRIPTION OF ALTERNATIVES

Six candidate remedial alternatives were compiled from the treatment technologies that passed a detailed screening process conducted during the Corrective Measures Study/Feasibility Study (CMS/FS), including the No Action alternative. A description of each remedial alternative is given below. The six remedial alternatives are: No Action (Alternative 0), Institutional Controls with the French Drain (Alternative 1), Groundwater Pumping and Soil Vapor Extraction (Alternative 2), Groundwater Pumping and Soil Vapor Extraction with Thermal Enhancement (Alternative 3), Hot Air Injection with Mechanical Mixing (Alternative 4), and Soil Excavation with Groundwater Pumping (Alternative 5). For Alternatives 2, 3, 4 and 5, the volume of soil to be remediated was estimated, from the results of a recent soil gas survey performed at OU 1, to be between one thousand and two thousand cubic yards of soil (approximately a fifty feet by fifty feet by twelve feet deep excavation). During implementation of the remedy, confirmatory soil sampling will be performed to determine where the excavation can be terminated, based on cleanup levels identified in the ALF.

Alternative 0: No Action

The No Action alternative is required by CERCLA as a baseline alternative with which to compare other alternatives. The No Action alternative uses results of the Baseline Risk Assessment to define exposure levels to human and environmental receptors at the site under existing conditions, and specifically excludes remedial activities.

Use of the existing French Drain groundwater collection system would be discontinued under this alternative. Groundwater would, therefore, flow toward Woman Creek. The only activity associated with the No Action alternative is groundwater monitoring to detect changes in contaminant concentrations or migration patterns. Monitoring would begin immediately and would continue until a determination could be made that monitoring is no longer required. Existing wells no longer deemed necessary would be abandoned as appropriate.

No remedial time frame is established for this alternative since the alternative relies solely on natural contaminant degradation and attenuation processes to meet Remedial Action Objectives (RAOs). A thirty year monitoring time frame is assumed, in accordance with EPA guidance. It is estimated that it will cost approximately $1.9 million to implement this remedial alternative and continue monitoring groundwater for thirty years.

Alternative 1: Institutional Controls with the French Drain

Alternative 1 seeks to achieve RAOs by restricting access to wells impacted by OU 1 contaminants through institutional controls, while continuing to treat groundwater collected by the existing French Drain at the Building 891 water treatment system. Institutional controls would also be employed to prevent domestic groundwater use at OU 1. Further degradation of groundwater would be minimized by continued containment and treatment of the groundwater. Subsurface contamination sources would eventually be depleted by dissolution to groundwater, although the length of time for this to occur would be quite extensive.

The existing French Drain and Building 891 treatment system would continue to operate until no longer deemed necessary based on contaminant concentrations in the groundwater. Groundwater monitoring would continue for as long as required to verify that contaminant concentrations in groundwater have been permanently reduced below appropriate limits. Wells no longer deemed necessary for monitoring would be abandoned as appropriate.

No remediation time frame is defined for Alternative 1 since the French Drain system is currently operational and would continue to operate until acceptable contaminant concentrations are achieved. Based on current operations of the existing French Drain system, it is reasonable to assume that due to the slow groundwater collection rate, operation of the French Drain system would be required for an extensive period of time before RAOs are achieved. Experience with similar remedial actions at similar sites suggests that extremely long time frames are required for complete contaminant depletion. For the purpose of preparing a cost estimate, a thirty year time frame for remedial activities is assumed, based on EPA guidance. Based on this time frame, the estimated cost for completion of Alternative 1 is $17.5 million.

Alternative 2: Groundwater Pumping and Soil Vapor Extraction

Alternative 2 seeks to achieve RAOs by dewatering the identified IHSS 119.1 source area using conventional pumping techniques, and by implementing a localized soil vapor extraction (SVE) system. Risk from contaminated groundwater would be eliminated by extraction and treatment, while further degradation of groundwater would be minimized by removal of contaminant sources through SVE.

SVE would enhance volatilization and subsequent contaminant recovery from saturated soils, unsaturated soils and groundwater at OU 1. SVE targets contaminants that have partitioned to the aqueous phase, have adsorbed onto subsurface soils, exist in a free phase or occupy soil pore spaces in a vapor phase. Discrete pools of groundwater located in IHSS 119.1 would be extracted via the existing French Drain and one to three additional recovery wells. Collected groundwater would be treated by the existing Building 891 water treatment system or other appropriate facility. These same areas, once desaturated, would be subjected to SVE to enhance the removal of any residual contaminants.

SVE can be significantly influenced by site geology and contaminant characteristics. Geological factors that can influence the success of SVE include depth to groundwater, subsurface soil/rock type and surface permeability. At OU 1, the subsurface soils contain large amounts of clay which would inhibit the effectiveness of this technology. Contaminants that are effectively recovered by SVE exhibit a vapor pressure of 1.0 mm of

mercury or more at 20 degrees Celsius and which have a dimensionless Henry's Law constant greater than 0.01. The contaminants identified at OU 1 would be amenable to recovery by SVE.

It is also assumed that the vapor extraction wells in IHSS 119.1 would be approximately two to six inches in diameter. The wells would be operated cyclically to enhance recovery and would be used in combination with a granular activated carbon (GAC) unit to treat extracted vapors. The existing French Drain and Building 891 treatment system would continue to operate during the remedial activities, but after remediation of the source is complete the French Drain would be decommissioned and groundwater collection and treatment would cease. Groundwater monitoring would be performed consistent with the Integrated Water Management Plan after completion of the remedial action.

The remediation time frame, which is considered to be the time until protection is achieved by the remedial action, is estimated to be approximately five years for Alternative 2. Based on this time frame and other technical information defining this alternative, the estimated cost for completion of Alternative 2 is $8.1 million.

Alternative 3: Groundwater Pumping and SVE with Thermal Enhancement

Alternative 3 seeks to achieve RAOs by combining SVE as described in Alternative 2 with thermal recovery enhancement techniques. Groundwater extraction and treatment would be employed to address groundwater contamination, while SVE with thermal enhancement would be used to remove contamination sources. This alternative considers two innovative treatment technologies that can effect an increase in subsurface soil temperatures and thus enhance SVE: radio frequency heating and electrical resistance (ohmic) heating. These technologies are discussed in detail in the OU 1 CMS/FS report. In general, these thermal enhancement techniques enhance the success of the SVE by increasing the temperature in the subsurface soil which allows more complete and faster volatilization, and thus recovery, of organic constituents in the soil. The increase in temperature of the subsurface soil also assists in dewatering the area by vaporizing pore space moisture.

As in Alternative 2, the existing French Drain and Building 891 treatment system would continue to operate until remediation of the contamination source is complete, at which time the French Drain would be decommissioned and groundwater collection and treatment would cease. Groundwater monitoring would be performed consistent with the Integrated Water Management Plan after completion of the remedial action.

The remediation time frame for Alternative 3 is estimated to be three years. Based on this time frame and other technical information defining this alternative, the estimated cost for completion of Alternative 3 is $7.5 million.

Alternative 4: Hot Air Injection with Mechanical Mixing

Alternative 4 seeks to achieve RAOs through an in-situ technology that combines hot air stripping with vigorous mixing of subsurface media. Contaminated groundwater at IHSS 119.1 would be remediated through extraction and treatment in the Building 891 facility, and the IHSS 119.1 subsurface soil contamination source would be addressed with hot air injection and mechanical mixing.

This technology operates under the same basic principles of SVE and thermal enhancement discussed previously, but combines these principles with vigorous mechanical mixing to increase the effectiveness of the subsurface soil treatment. The primary treatment system in this alternative would consist of a caterpillar mounted drill rig with specialized drilling equipment. The drill equipment is capable of delivering treatment reagents, such as hot air

or steam, via piping in a hollow drill bit shaft that has mixing/cutting blades four to twelve feet in diameter.

Groundwater extraction wells would be placed in previously treated soil columns. Dewatering of a small area prior to treating the initial soil column would be accomplished via an extraction well drilled with conventional drilling equipment. Extracted groundwater would be treated in the existing Building 891 treatment system. The treatment columns, or drill shafts, would overlap by thirty percent to ensure adequate treatment throughout the entire site. Four to six columns can be treated per day, depending on site conditions.

The existing French Drain and Building 891 treatment system would continue to operate during the remedial activities, but after remediation of the source is complete the French Drain would be decommissioned and groundwater collection and treatment would cease. Groundwater monitoring would be performed consistent with the Integrated Water Management Plan after completion of the remedial action.

The remediation time frame for Alternative 4 is estimated to be two years. Based on this time frame and other technical information defining this alternative, the estimated cost for completion of Alternative 4 is $4.3 million.

<u>Alternative 5: Soil Excavation with Groundwater Pumping</u>
Alternative 5 is intended to achieve RAOs through excavation of contaminated subsurface soils and contaminated groundwater beneath IHSS 119.1. Based on the report of a recent soil gas survey that was performed at IHSS 119.1 ("Sampling and Analysis Report - Identification and Delineation of Contaminant Source Area for Excavation Design Purposes", April 1996), the estimated volume of soil that will be excavated from IHSS 119.1 is one thousand to two thousand cubic yards (approximately fifty feet by fifty feet by twelve feet deep).

Contaminated groundwater would be extracted from the excavation and treated in the Building 891 water treatment system. The excavated subsurface soils would either be treated on-site with a thermal desorption unit and returned to the excavation, disposed in an on-site disposal cell, or disposed off-site.

The existing French Drain and Building 891 treatment system would continue to operate during the remedial activities, but after remediation of the source is complete the French Drain would be decommissioned and groundwater collection and treatment would cease. Groundwater monitoring would be performed consistent with the Integrated Water Management Plan after completion of the remedial action.

The remediation time frame for Alternative 5 is estimated to be four to six months. Based on this time frame and other technical information defining this alternative, the estimated costs for completion of Alternative 5, depending on how the excavated soil is managed, is as follows: if the soil is treated on-site and returned to the excavation the cost is approximately $3.5 million; if the soil is disposed off-site the cost is approximately $3.9 million; and if the soil is disposed in an on-site disposal cell without treatment the cost is approximately $3.3 million.

SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

Threshold Criteria

Overall Protection of Human Health and the Environment: Alternative 5 provides the best overall protection of human health and the environment by providing the largest reduction in exposure potential within the shortest amount of time through removal of the contamination source. Alternatives 2, 3 and 4 provide the next best level of overall protection of human health and the environment, based on the fact that they are designed to reduce exposure potential through in place remediation of the contamination source at IHSS 119.1. However, these alternatives involve technologies that are not proven to be effective in the clay soils that are present at IHSS 119.1. Therefore, they would not be as thorough in removing the contamination source as Alternative 5, and they also involve longer remediation timeframes. Alternative 1 protects human health and the environment by collecting and treating contaminated groundwater, as well as by implementing certain institutional controls to reduce exposure to the contaminants, but it does not address the contamination in the subsurface soil and, therefore, is not as protective as the previously discussed alternatives. Finally, Alternative 0 offers the least amount of protection to human health and the environment because it does not involve any source removal, containment or other controls.

Compliance with Applicable or Relevant and Appropriate Requirements (ARARs): The ARARs that have been identified and analyzed for each alternative for the contaminants of concern at IHSS 119.1 are as follows:

- Classifications and Numeric Standards (5 CCR 1002-8, 3.8, So. Platte River Basin)
- Colorado Basic Standards for Surface Water (5 CCR 1002-8, 3.1, Segment 4a of Big Dry Creek):

carbon tetrachloride	0.25 µg/L
1,1-dichloroethene	0.057 µg/L
tetrachloroethene	0.8 µg/L
1,1,1-trichloroethane	200 µg/L
trichloroethene	2.7 µg/L
selenium	20 µg/L (acute); 5 µg/L (chronic)

- Colorado Hazardous Waste Regulations (6 CCR 1007-3 Parts 264 and 268)
- Colorado Air Pollution Control Regulations (5 CCR 1001-5, Regulation 7)
- Colorado Nongame, Endangered or Threatened Species Conservation Act (CRS 33-2-101).

The State contends that 5 CCR 1002-8, 3.12 (Site Specific Water Quality Classifications and Standards for Ground Water) and 5 CCR 1002-8, 3.11 (Basic Standards for Ground Water) are ARARs. DOE disagrees with this contention. Both parties reserve their respective rights to raise this issue and supporting arguments in any relevant forum. The parties do not anticipate that this disagreement will ripen into a formal dispute because 5 CCR 1002-8, 3.12 adopts the standards set forth in 5 CCR 1002-8, 3.1 and 3.8, and these standards are consistent with the enforceable standards set forth in the ALF. In addition, 5 CCR 1002-8, 3.11 contains standards which are generally consistent with or less stringent than the standards set forth in 5 CCR 1002-8, 3.1 and 3.8.

Alternatives 2, 3, 4 and 5 are expected to meet all of the above identified ARARs, while Alternatives 0 and 1 are expected to meet all ARARs except that they may not meet the Colorado Basic Standards for Surface Water. Therefore, Alternatives 0 and 1 rank low under this criterion.

Primary Balancing Criteria

Long-Term Effectiveness and Permanence: Alternative 5 provides the highest level of long-term effectiveness and permanence since it removes both groundwater contamination and subsurface soil contamination sources in IHSS 119.1, and thereby prevents any further contamination of groundwater. Alternatives 2, 3 and 4 also remove groundwater contamination, but are not as effective at removing subsurface soil contamination sources because the technologies used in these alternatives have not been proven effective in the clay soils at IHSS 119.1. Alternative 1 provides even less long-term effectiveness and permanence since it only removes groundwater contamination, but not subsurface soil contamination sources. Alternative 0 provides the lowest level of long-term effectiveness and permanence since it does not treat or remove any contamination at IHSS 119.1.

Reduction of Toxicity, Mobility, or Volume Through Treatment: Alternative 5 provides the highest reduction of mobility because it removes the primary source of contamination and treats contaminated groundwater, thereby preventing any further migration of contaminants. In addition, if the excavated soil is treated, as discussed in the "Description of Alternatives" section, Alternative 5 also provides the highest reduction of toxicity and volume through treatment. Alternatives 2, 3 and 4 provide the next highest level of toxicity, mobility and volume reduction since they involve groundwater treatment as well as [illegible] in-place treatment of the subsurface soil contamination source. Alternative 1 provides less reduction of toxicity, mobility and volume through treatment because it treats only contaminated groundwater and does not address the subsurface soil contamination. Alternative 0 ranks lowest in this category because it treats neither groundwater nor subsurface soil contamination, and thus provides no reduction in toxicity, mobility or volume through treatment.

Short-Term Effectiveness: This criterion evaluates community, environmental and site worker protection during the implementation of the remedy. It also evaluates the effectiveness and reliability of protective measures during implementation and the time until RAOs are achieved.

Alternatives 0 and 1 rank highest under the community, environmental and site worker protection during implementation portion of this criterion because they involve no disturbance of the existing site and little or no worker involvement. Alternatives 2, 3, 4 and 5 involve some site disturbance, but the disturbance is not expected to create a significant impact on the community, the environment or site workers. Alternative 3 has the potential to present increased hazards to site workers due to the heating of the subsurface soil.

For the effectiveness and reliability of protective measures during implementation and for the time until RAOs are achieved, Alternative 5 ranks the highest. Excavation has been proven to be the most effective and reliable of the technologies presented here when applied to clay soils. In addition, DOE anticipates that it will take only four to six months for RAOs to be achieved once implementation of Alternative 5 has begun. The amount of time until RAOs are achieved for Alternatives 2, 3 and 4, once implementation of the alternative has begun, is five years, three years and two years, respectively. Alternatives 0 and 1 are the least effective and reliable since they do not address the subsurface soil contamination

source. Also, the amount of time until RAOs are achieved for these two alternatives is unknown, but likely to be quite extensive, since they rely on natural degradation of the contaminants.

Implementability: This criterion evaluates the technical and administrative feasibility of implementing the alternatives including the availability of materials and services needed during implementation, as well as the ability to monitor the effectiveness of the remedy.

Alternative 1 is the most easily implementable because it represents the current condition at OU 1. The only additional work that it would involve would be to implement institutional controls at OU 1 and perform groundwater monitoring. Alternative 0 is the next most easily implementable alternative because it involves only decommissioning the French Drain and performing groundwater monitoring. Alternative 5 is the next most implementable alternative. Excavation has been proven to be effective and implementable in clay soils, and the equipment necessary to perform the excavation is readily available. Also, the effectiveness of Alternative 5 can be easily monitored.

Alternatives 2, 3 and 4 use intrusive treatment methods that may pose technical problems, and are, therefore, less implementable than the other alternatives. For example, soil vapor extraction (Alternatives 2 and 3) cannot be reliably conducted in clay soils. Alternative 3 is even more difficult to implement than Alternative 2 because it is still an experimental technology. Alternative 4 is the most difficult option to implement because of the sloping, unstable hillside that the drill rig would have to work on, and because of the limited supply of the specialized equipment that is needed.

Cost: This criterion evaluates the capital cost for each alternative, long-term operation and maintenance (O&M) expenditures required to sustain it, and any closure costs occurring after the completion of remediation. Future expenditures are adjusted to present worth amounts by discounting all costs to a common base year using present worth cost analysis.

Alternative 0 is the least costly since it involves only decommissioning the French Drain and performing groundwater monitoring for thirty years. The total estimated cost of Alternative 0 is $1.9 million. Alternative 5 is the next least costly alternative, with the following estimated costs of completion: $3.3 million if the excavated soil is placed directly into an on-site waste disposal cell, $3.5 million if the excavated soil is treated on-site with a thermal desorption unit and placed back into the original excavation, and $3.9 million if the excavated soil is disposed off-site. The cost estimates are based on an excavation volume of 1000 to 2000 cubic yards of soil (50 feet by 50 feet by 12 feet deep excavation), which was estimated as the appropriate soil excavation volume in the recent soil gas survey at IHSS 119.1. These cost estimates include all costs of soil excavation, handling and management of the soil, operation of the French Drain and groundwater treatment plant for one year (or until the soil has been excavated), and groundwater monitoring for thirty years.

Alternative 4 is more costly than Alternatives 0 and 5, with an estimated total cost of $4.3 million. This estimate is based on the same volume of soil as Alternative 5 (1000 to 2000 cubic yards), and includes all costs of performing the hot air injection and mechanical mixing, operation of the French Drain and groundwater treatment plant for two years, and groundwater monitoring for thirty years.

Alternative 3 is more costly than the previously discussed alternatives, with an estimated total cost of $7.5 million, which is also based on a soil volume of 1000 to 2000 cubic yards for treatment. This cost estimate includes all costs of performing the soil vapor extraction with thermal enhancement, operation of the French Drain and groundwater treatment plant

for three years, and groundwater monitoring for thirty years. Alternative 2 is even more costly, with an estimated total cost of $8.1 million. Again, this cost estimate is based on a soil volume of 1000 to 2000 cubic yards for treatment. It includes all costs of performing the soil vapor extraction, operation of the French Drain and groundwater treatment plant for five years, and groundwater monitoring for thirty years.

Alternative 1 is the most expensive alternative, with an estimated total cost of $17.5 million, which is based on the long-term operation of the French Drain and the water treatment plant for thirty years and groundwater monitoring for thirty years.

Modifying Criteria

State Acceptance: This criterion addresses the State's comments and concerns regarding the appropriateness of the selected remedy. The State of Colorado was represented on the Dispute Resolution Committee that selected the preferred remedial alternative for OU 1 and agrees with the selection. The State has no outstanding, significant comments or concerns with the selected remedy.

Community Acceptance: This criterion evaluates the selected remedy in terms of issues and concerns raised by the public through the public involvement process. At the public hearing for the OU 1 Proposed Plan on June 19, 1996, DOE received one comment from the public that was supportive of the preferred remedial alternative. During the public comment period for the OU 1 Proposed Plan, DOE received one set of written comments from the public, which, in general, expressed concern for funding and timing of the selected remedy, and requested clarification on several issues in the Proposed Plan. These comments are addressed in the attached Responsiveness Summary.

Anticipated Damages to Natural Resources: Alternatives 2, 3, 4 and 5 will not result in any irreversible damages to natural resources and will improve the quality of soil and groundwater by excavation and treatment. Alternative 1 will not result in any irreversible damages to natural resources and will improve the quality of groundwater by treatment. Alternative 0 will not result in any irreversible damages to natural resources, but will continue to degrade the quality of groundwater since the alternative does not involve any remedial activity. Measures to control and reduce the risk of damages to natural resources will be considered prior to beginning the remedial activity.

THE SELECTED REMEDY

The selected remedy for OU 1 includes three primary components:

1. Excavating subsurface soil contamination at IHSS 119.1, a former drum and scrap metal storage area, thereby removing the current source of groundwater contamination. The major components of the selected remedial action at IHSS 119.1, described in detail below, include:
   - Excavation of approximately one thousand to two thousand cubic yards of contaminated subsurface soils at IHSS 119.1;
   - Extraction and then ultraviolet/hydrogen peroxide and ion-exchange treatment of contaminated groundwater from the excavation; and
   - Either thermal treatment and replacement of excavated soil into the original excavation, disposal of excavated soil in an on-site waste disposal cell, or off-site disposal of excavated soil.

This portion of the selected remedy for OU 1 was chosen by the Dispute Resolution Committee (DRC) on August 25, 1995, as part of the dispute resolution process that is defined in the IAG, which was the governing cleanup agreement at the time of the decision. At that time, the DRC was composed of DOE's Assistant Manager for Environmental Restoration, EPA's Federal Facilities Branch Chief, and CDPHE's Program Manager for the Hazardous Waste Control Program. In choosing the remedial action for IHSS 119.1, the DRC was interested in controlling groundwater contamination through source removal. The DRC determined that Alternative 5, Soil Excavation with Groundwater Pumping, is the most appropriate remedial action for IHSS 119.1. This remedial action includes excavation of approximately one thousand to two thousand cubic yards of contaminated subsurface soils at IHSS 119.1; extraction and then ultraviolet/hydrogen peroxide and ion-exchange treatment of contaminated groundwater at IHSS 119.1; either thermal treatment and replacement of excavated soil into the original excavation, disposal of excavated soil in an on-site waste disposal cell, or off-site disposal of the excavated soil; and groundwater monitoring consistent with the Integrated Water Management Plan.

The comparative analysis of alternatives shows that Alternative 5 rates best for overall protection of human health and the environment; compliance with ARARs; long-term effectiveness and permanence; and reduction of toxicity, mobility, or volume through treatment. Alternative 5 rates higher than the other alternatives for short-term effectiveness, and rates good for implementability and anticipated damages to natural resources. Alternative 5 is expected to take the least amount of time to achieve protection at IHSS 119.1 (four to six months), and is the least expensive alternative except for Alternative 0, which is to perform no remedial action. In addition, Alternative 5 satisfies the CERCLA statutory preference for remedies that employ treatment as a principal element and achieves the Remedial Action Objectives set for OU 1.

The principal components of the IHSS 119.1 remedial action selected to meet these RAOs and remediation goals are described below:

Excavation of soil: Excavation of contaminated subsurface soils will begin at IHSS 119.1 in the two contamination source areas identified during the recent soil gas survey. The location of these two areas can be found on Figure 3. From the soil gas survey results, it is estimated that the amount of soil that will be excavated is approximately one thousand to two thousand cubic yards. During the excavation, sampling will be performed to confirm the point at which all contaminated subsurface soil has been removed, in accordance with the ALF. In addition, during implementation of the selected remedy, DOE will perform confirmatory soil sampling downgradient of IHSS 119.1 to verify that a contamination source does not exist there. A detailed sampling and analysis plan for both of these confirmatory sampling activities will be prepared as part of the Remedial Design for OU 1. A detailed soil excavation plan will also be prepared as part of the Remedial Design.

Groundwater extraction and treatment: Groundwater will be extracted from the excavation and will be transferred to the existing Building 891 ultraviolet/hydrogen peroxide and ion-exchange water treatment system for final treatment and discharge. After all contaminated subsurface soil has been excavated and all contaminated groundwater has been extracted from the excavation, the French Drain system will be decommissioned and its use will be discontinued. The final details of the groundwater extraction and the decommissioning of the French Drain will be presented in the Remedial Design for OU 1.

Handling and management of excavated soil: DOE is considering three options for managing the excavated soil: on-site treatment and placement back into the original excavation, disposal in an on-site waste disposal cell, or off-site disposal. DOE's preferred method of managing the excavated soil is to treat the soil on-site in a thermal desorption unit to levels that will be identified and approved in the Remedial Design. The treated soil would then be placed back into the original excavation. Again, the final details of how the excavated soil will be handled and managed will be prepared as part of the Remedial Design and will be in accordance with RFCA.

Groundwater monitoring: DOE anticipates that groundwater monitoring will be performed at IHSS 119.1, consistent with the Integrated Water Management Plan, after the remedial action is complete. The details of this groundwater monitoring will be presented in the Remedial Design.

It is possible that changes to the remedial activities described above may be made as a result of the remedial design and construction processes. Any such changes, in general, would reflect modifications resulting from the engineering design process.

2. Institutional controls will be maintained throughout the OU 1 area in a manner consistent with RFCA, the Rocky Flats Vision, and the ALF. These documents recognize that the reasonably foreseeable future land use for the OU 1 area is restricted open space. The institutional controls will ensure that the restricted open space land use is maintained for the OU 1 area and that domestic use of groundwater within the OU 1 area is prevented. If the reasonably foreseeable future land use for the OU 1 area changes when final sitewide land use decisions are made, this remedy will be reexamined to ensure protection of human health and the environment. The specific mechanisms (for example, deed restrictions) to ensure the implementation and continuity of the necessary institutional controls have not been included in this CAD/ROD. Currently, these mechanisms are envisioned to be placed in the Final Sitewide CAD/ROD or in this CAD/ROD during one of the five-year reviews of this document. However, should the Final CAD/ROD not occur or not include these institutional control mechanisms, this OU 1 CAD/ROD will be revised to include them, if it does not already include them as a result of a five-year review. The institutional controls can also be removed at one of the above times, if it is deemed appropriate to do so by the parties.

3. Because of the groundwater and land use controls, the low amounts of contamination in OU 1 outside of IHSS 119.1, and the low levels of risk associated with the contamination, no remedial action will be taken at the remaining ten IHSSs in OU 1.

Implementing the selected remedy will not result in any irreversible damages to natural resources. Wetlands will not be injured; flood elevations will not be affected; soil and groundwater will be temporarily disturbed during excavation activities, but will not be permanently impacted; and no permanent displacement or loss of wildlife will result from the implementation of the selected remedy.

The selected remedy will achieve the Remedial Action Objectives set for OU 1, which were identified in the CMS/FS report as follows:

- Prevent the inhalation of, ingestion of, and/or dermal contact with VOCs and inorganic contaminants in OU 1 groundwater that would result in a total excess cancer risk greater than 10^{-4} to 10^{-6} for carcinogens, and/or a Hazard Index greater than or equal to one for non-carcinogens.

- Prevent migration of contaminants from subsurface soils to groundwater that would result in groundwater contamination in excess of potential groundwater ARARs for OU 1 contamination.
- Prevent migration of contaminants in OU 1 groundwater from adversely impacting surface water quality in Woman Creek.

These RAOs were selected to address the primary risk exposure pathways identified for OU 1, which are groundwater and subsurface soil pathways. The preliminary remediation goals (PRGs) for these RAOs dealing with groundwater and subsurface soils were identified in the CMS/FS report by examining both risk-based and ARAR-based values. The exposure route of groundwater ingestion resulted in the highest potential risk to a future on-site resident, so the Colorado Basic Standards for Groundwater, found in 5 CCR 1002-8, 3.11.5 and 3.11.6 were selected as appropriate PRGs for OU 1.

Subsequent to the selection of PRGs in the CMS/FS report, however, RFCA was finalized and is currently the governing cleanup agreement for Rocky Flats. The remediation goals in RFCA are based on the protection of surface water and are specified in the ALF. Therefore, the remediation goals for the contaminants at OU 1 are based on the ALF. RFCA also identifies points of compliance for all remedial activities conducted at Rocky Flats, which will be used for the remediation of OU 1.

DOCUMENTATION OF SIGNIFICANT CHANGES

The OU 1 Proposed Plan for Rocky Flats was released for public comment on May 13, 1996. The Proposed Plan identified Alternative 5, Soil Excavation with Groundwater [illegible] Pumping, as the preferred remedial alternative. DOE reviewed all written and verbal comments submitted during the public comment period. Upon review of these comments, it was determined that no significant changes to the remedy, as it was originally identified in the Proposed Plan, were necessary.

RESPONSIVENESS SUMMARY

OVERVIEW

The Proposed Plan for OU 1 was available for public review and comment from May 13, 1996, through July 12, 1996. In addition, a public hearing was held on June 19, 1996, at which oral and written comments were solicited. This Responsiveness Summary provides a summary of the comments on the OU 1 Proposed Plan that were received during the public comment period, as well as DOE's responses to the public's concerns. All comments received during the public comment period were considered in the final selection of the remedial alternative for OU 1.

SUMMARY OF COMMENTS RECEIVED DURING PUBLIC COMMENT PERIOD AND DOE RESPONSES

DOE solicited written and oral comments from the public on the OU 1 Proposed Plan during the public comment period and at the public hearing. A summary of the comments that were received and DOE's responses are provided below:

Comment: A member of the community at the public hearing stated that the selection of the preferred remedial alternative was logical and looked like it would move Rocky Flats forward toward cleanup and closure.

Response: No response necessary.

Comment: A written comment was received that expressed concern over the apparent lack of funding for the implementation of the selected remedy, considering that the remediation of IHSS 119.1 is ranked number 12 on the Environmental Restoration (ER) Ranking in RFCA. The commenter was concerned that the remedial action must be conducted with fifteen months of completing the Remedial Investigation/Feasibility Study (RI/FS), according to CERCLA.

Response: First, while DOE is faced with significant budget cuts that will affect the activities that can be completed at Rocky Flats in FY97, final decisions on site priorities and funding for FY97 have not yet been made. The ER Ranking is intended to be a guide to funding and remediating the top priority IHSSs on-site, based on various factors including available funding, timing and project status. The IHSSs do not have to be remediated in the exact order that they appear on the ranking list. Therefore, DOE is not certain that this remedial action will not be funded in FY97. Second, the section of CERCLA quoted in the written comment (CERCLA Section 120(e)(2)) refers to the entire site, not specifically to any particular operable unit. In addition, cleanup at Rocky Flats has been governed by an enforceable agreement (first the IAG and now RFCA) since 1991. EPA has said that DOE is in compliance with CERCLA time frames as long as it is in compliance with this enforceable agreement. Therefore, the remedial action presented in this CAD/ROD does not have to be implemented within fifteen months of the final CAD/ROD.

Comment: A written comment was received that expressed concern over the management of the excavated soils in Alternative 5. Because three options were listed for the management of the soils, the commenter was concerned that a complete evaluation of the

alternatives could not have been accomplished. Also, the commenter questioned the option of on-site disposal of the excavated soil and stated that more detail should be given on the management of the excavated soil.

Response: Although three options are presented in the Proposed Plan for managing the excavated soil, the fundamentals of Alternative 5, as compared to the other alternatives under the nine criteria required by CERCLA, are the same under each option, and the comparison results are also the same. For example, regardless of the method of handling the excavated soil, provided it is in compliance with all applicable laws and regulations, Alternative 5 is still overall the most protective of human health and the environment, based on the removal of the contamination source in the subsurface soil. The evaluation of alternatives was not dependent on the method of managing the excavated soil to show that Alternative 5 is the most appropriate alternative. In addition, separate cost estimates were provided in the Proposed Plan for each different option of soil management under Alternative 5. In all three cases Alternative 5 is the least expensive alternative, other than the No Action alternative.

The intent of the on-site disposal option for the excavated soil is to dispose of the soil in a permitted on-site waste disposal cell, if such a unit exists on-site at the time that this remedial action is performed. Both the disposal unit and the soil would meet all applicable requirements before on-site disposal would occur. If such a disposal unit does not exist on-site, one of the other two options will be employed. As stated in the CAD/ROD, it is currently DOE's preference to treat the excavated soil on-site in a thermal desorption unit and place it back into the excavation, provided that the treated soil meets soil put-back requirements established by RFCA. The details for managing the excavated soil, including necessary treatment, required permits, and applicable laws and regulations, will be included in the Remedial Design, along with all of the details of implementing the selected remedy.

Comment: A written comment was received that questioned whether a health assessment by the Agency for Toxic Substances and Disease Registry (ATSDR) has been or will be performed at Rocky Flats.

Response: A health assessment by ATSDR is scheduled for Rocky Flats by the year 2002. This is based on available resources at ATSDR and the prioritized needs of the whole DOE complex for health assessments to be performed. DOE is using the results of the Baseline Risk Assessment for OU 1, which includes a Public Health Evaluation and an Environmental Evaluation, to move forward with this remedial action.

Comment: Written comments were received that expressed concern over vague language in the Proposed Plan regarding the conclusions in the RFI/RI on the extent of contamination and the need for remedial action at OU 1.

Response: The RFI/RI report, which is available for review in the Administrative Record and public reading rooms, does definitively determine the need for further remedial action at each IHSS in OU 1 and presents in detail the information used to make those determinations. The RFI/RI concluded that only IHSS 119.1 contributes significantly to groundwater contamination and contains subsurface soil contamination at levels that warrant a remedial action. Based on the data contained in the report, the RFI/RI also concluded that the remainder of the IHSSs at OU 1 are already in a protective state (i.e., do not contribute significantly to groundwater contamination and do not contain contamination at levels that warrant a remedial action). Due to the limited scope of the Proposed Plan, a summary of these conclusions and data was presented and references were made to the

RFI/RI in the Proposed Plan, rather than repeat in detail the information already presented in the RFI/RI report. For the characterization of IHSS 104, the Proposed Plan only referred to a review of documentation. However, conclusions on the characterization of IHSS 104 were also based on investigation data, as presented in the RFI/RI report.

Comment: A written comment was received that expressed concern over the requirement in the IAG to incorporate actions that are completed pursuant to CERCLA authority into the Rocky Flats RCRA permit.

Response: RFCA now requires that CDPHE incorporate only final corrective action decisions into the Rocky Flats RCRA permit in order to satisfy the requirement to include a corrective action element in the permit. In addition, RFCA states that activities required under any concurrence CAD/ROD (where both EPA and CDPHE concur with the CAD/ROD) will not require permits.

Comment: Written comments were received that questioned whether RCRA listed hazardous wastes were disposed at OU 1, based on the contaminants of concern that were identified in the Proposed Plan. The commenter questioned whether the excavated soil should be handled as a RCRA listed hazardous waste.

Response: Based on the RFI/RI, DOE does not have any information to indicate that spent solvents, which would have been RCRA listed hazardous wastes, were disposed at OU 1. Rather, the VOCs listed in the Proposed Plan were identified as contaminants of concern based on sampling and analysis of the groundwater and soil that was conducted at OU 1 during the RFI/RI. DOE cannot conclusively say that the VOC contaminants are the result of the disposal of spent solvents (i.e., RCRA listed hazardous waste), therefore, the RCRA hazardous waste listing does not apply to the contaminants, and the soil does not contain a listed hazardous waste.

The Remedial Design will describe in detail how the excavated soil will be managed. At this point, it is anticipated that the excavated soil, which itself is not a waste, would be considered environmental media containing hazardous constituents that exhibit a hazardous waste characteristic for VOCs. The excavated soil would be treated in a thermal desorption unit. Following this treatment, the soil would be sampled and analyzed to verify the successful removal of VOCs from the excavated soil. At that point, the excavated soil would no longer contain hazardous constituents that exhibit a hazardous waste characteristic. Therefore, land disposal restrictions (LDR) and minimum technological requirements (MTR) would not apply to the excavated soils.

Comment: A written question was received concerning the levels of radioactivity that must be met before placement of soils contaminated with radionuclides is allowed.

Response: Information from the RFI/RI for OU 1 indicates that radionuclide contamination is not expected in the subsurface soils at OU 1. However, as required by RFCA, a working group consisting of representatives from DOE, EPA and the State of Colorado are working on developing site specific radionuclide clean-up and put-back levels for soil. The proposal by this working group will be available for public comment from September 1, 1996, through October 4, 1996. A final decision on this issue is expected to be made by October 18, 1996.

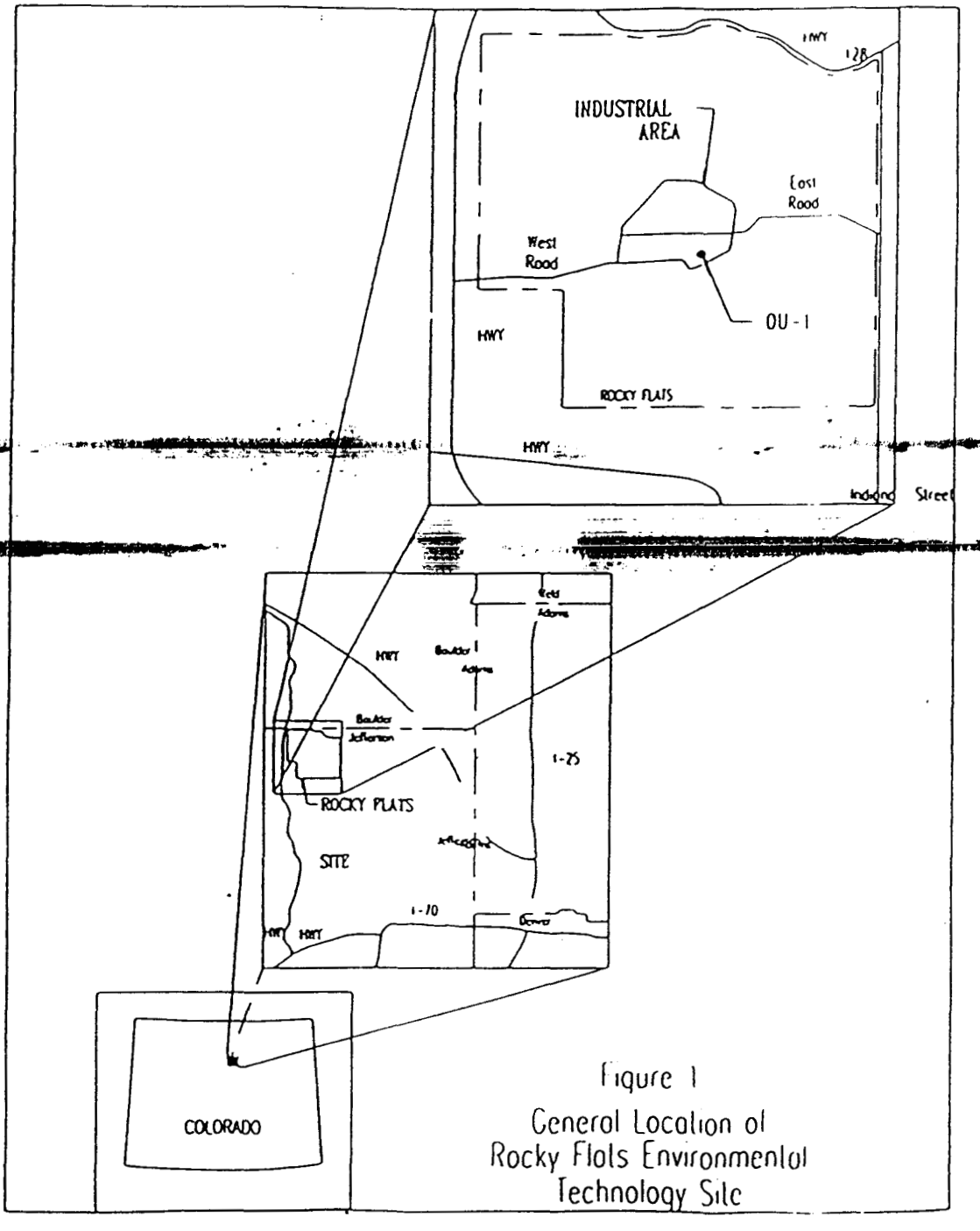

Figure 1
General Location of
Rocky Flats Environmental
Technology Site

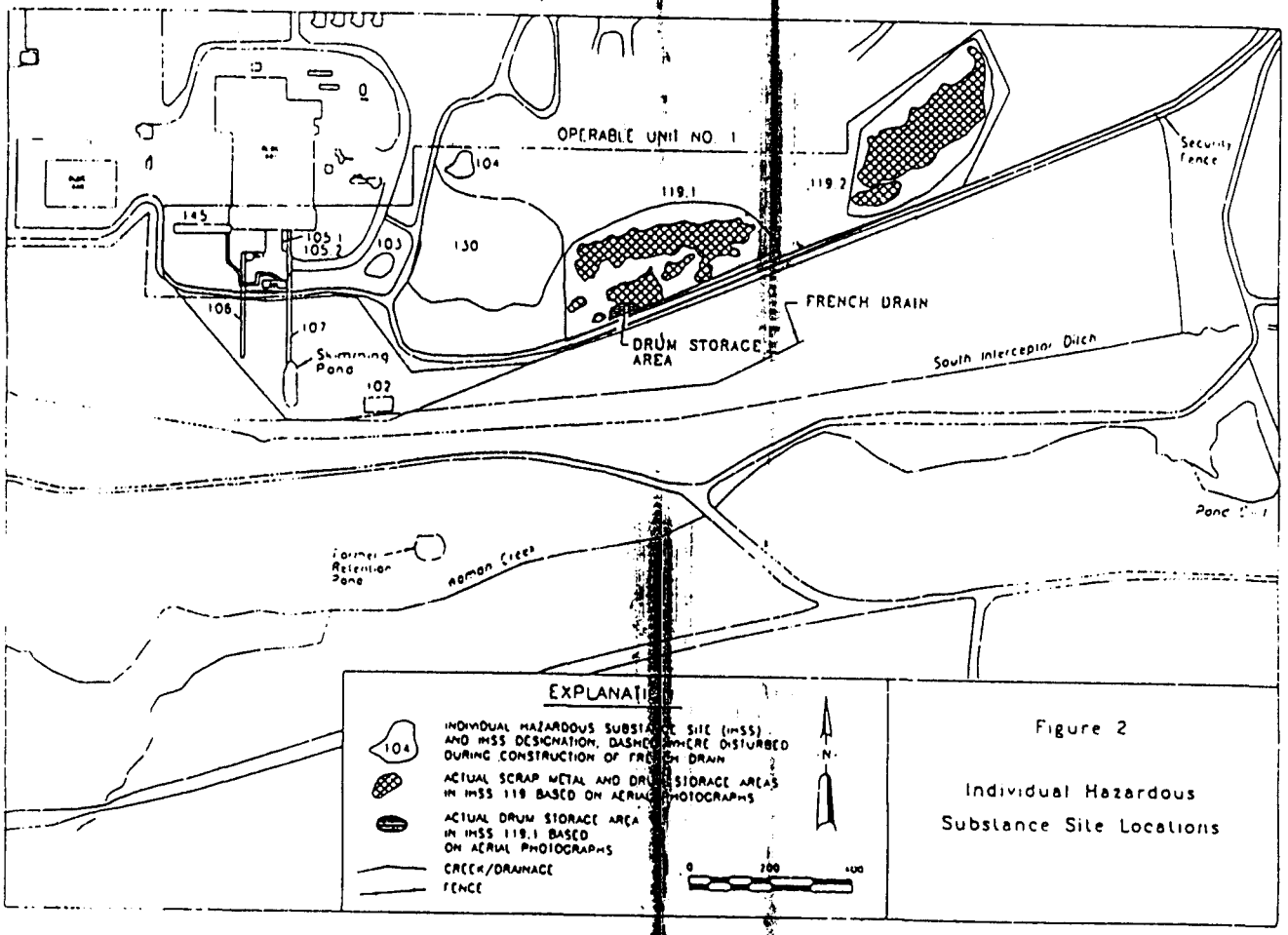

Figure 2

Individual Hazardous Substance Site Locations

Table 1
Individual Hazardous Substance Site Descriptions

IHSS Number	IHSS Name	Description
102	Oil Sludge Pit Site	Approximately 40 x 70 ft^2. area located approximately 180 feet south of Building 881 where 30 to 50 drums of non-radioactive oily sludge were emptied in the late 1950s. The sludge was from the cleaning of two No. 6 fuel oil tanks, designated as IHSSs 105.1 and 105.2, and was backfilled when disposal operations ceased
103	Chemical Burial Site	Approximately 50 feet in diameter (2,000 $ft.^2$), the pit is circular is shape, and is located approximately 150 feet southeast of Building 881 on 1963 aerial photographs. Area was reportedly used to bury unknown chemicals.
104	Liquid Dumping Site	Reportedly a former (pre-1969) liquid waste disposal pond in area east of Building 881 - no exact location or dimensions of pit - location is uncertain due to poor quality of 1965 aerial photograph. Approximate dimensions are 50 x 50 ft^2.
105.1, 105.2	Out-of-Service Fuel Oil Tank Sites	Located immediately south of Building 881, these were storage tanks for No. 6 fuel oil. Suspected leaks in 1972. Tanks closed in place through filling with asbestos-containing material and cement. IHSS 107, the Hillside Oil Leak Site, may have been caused by leakage from these tanks.
106	Outfall Site	Overflow line from the sanitary sewer sump in Building 887. The outfall was used for discharge of untreated sanitary wastes in the 1950s and 1960s. Due to concern about discharges from the outfall entering Woman Creek, spill retention ponds and an interceptor ditch were built in 1955 and 1979, respectively, to divert the outfall water to Pond C-2.
107	Hillside Oil Leak Site	Site of 1972 fuel oil spill from Building 881 foundation drain outfall. A concrete skimming pond was built below the foundation drain outfall to contain the oil flowing from the foundation drain, and an interceptor ditch was constructed to prevent oil-contaminated water from reaching Woman Creek.
119.1, 119.2	Multiple Solvent Spill Sites	Former drum storage areas east of Building 881 along the southern perimeter road. IHSS 119.1 is the larger western drum and scrap metal storage area, and appears to have contained mostly drums in the southern part of the IHSS and mostly scrap metal in the northern part, although material was moved around frequently as documented by aerial photographs. IHSS 119.2 is the smaller eastern drum and scrap metal storage area and appears to have contained mostly scrap metal. The drums contained unknown quantities and types of solvents and wastes. The scrap metal may have been coated with residual oils and/or hydraulic coolants
130	Radioactive Site - 800 Area #1	Area east of Building 881. Used between 1969 and 1972 to dispose of soil and asphalt contaminated with low levels of plutonium and uranium. IHSS 130 is referred to as the Contaminated Soil Disposal Area East of Building 881 in the HRR to better match the history of waste disposal; the site is included in the discussion of the 900 area at RFETS in that report. IHSS 130 contains approximately 320 tons or 250 cubic yards which came from three sources: 1) plutonium-contaminated soil and asphalt, placed in September of 1969, 2) road asphalt and soil rad contaminated by leaking drum in transit and 3) 60 cu. yds. of plutonium-contaminated soil removed from around the Building 774 process waste tanks in 1972.
145	Sanitary Waste Line Leak	Six-inch cast-iron sanitary sewer line that originates at the Building 887 lift station and that leaked on the hillside south of Building 881. The line had conveyed sanitary wastes and low-level radioactive laundry effluent to the sanitary treatment plant from about 1969 to 1973.

Table 2: Summary of Contaminants at OU1

	Surface Soil	Subsurface Soil	Groundwater	Surface Water/ Seeps	Sediments
Inorganic Analytes					
Selenium			X		
Vanadium			X		
Plutonium	X*	X*		X**	X**
Americium	X	X*		X**	X**
Uranium	X*	X*			
Volatile Organic Compounds					
1,1,1-Trichloroethane		X	X	X	X
Trichloroethene		X	X	X	
Tetrachloroethene		X	X	X	
Carbon Tetrachloride		X	X		
1,2-Dichloroethane		X	X	X	
Chloroform		X	X		
1,1-Dichloroethene		X	X	X	
1,2-Dichloroethene			X	X	
cis-1,2-Dichloroethene			X		
1,1,2-Trichloroethane			X		
1,1-Dichloroethane			X	X	
Toluene		X	X	X	X
Total Xylenes		X	X	X	
Semivolatile Organic Compounds					
Polynuclear Aromatic Hydrocarbons	X	X			X
Aroclor-1254	X				X
Aroclor-1248	X				

* Presence in these media is based on hot spot data.

** Presumed to be present as a contaminant of these media because of the widespread nature of the contamination originating from an off-site source.

Table 3: Summary of VOC Concentrations in Groundwater, IHSS 119.1, 1987-1995

Well No.	Compound	Range of Concentrations (ug/L)
0974	CCL_4	5U - 2,800
	1,1-DCE	500U - 48,000
	TCA	1,220 - 30,250
	PCE	430 - 13,200
	TCE	1,500 - 72,000
1074	CCL_4	2,500E - 5,000
	1,1-DCE	42J - 120
	TCA	50U - 390
	PCE	100U - 49
	TCE	790 - 3,600
0487	CCL_4	46 - 2,600
	1,1-DCE	2U - 12
	TCA	3.2 - 20
	PCE	14 - 590
	TCE	220 - 9,500
4387	CCL_4	40U - 2,100
	1,1-DCE	1,400 - 11,000
	TCA	1,700 - 20,000
	PCE	61 - 7,590
	TCE	100 - 15,540
37891	CCL_4	0.2U
	1,1-DCE	0.2U
	TCA	0.1U
	PCE	0.1U - 7.1B
	TCE	0.1U - 1.3
37991	CCL_4	0.1U - 0.2
	1,1-DCE	0.2U
	TCA	0.1U
	PCE	0.1U - 16
	TCE	0.1U - 3.3
32591	CCL_4	0.1
	1,1-DCE	0.68 - 6
	TCA	0.4 - 2
	PCE	1 - 3
	TCE	5U - 1100

Note: Well 0587 had 12 ug/L TCE on (8/92), well 33491 had 1 ug/L TCE (11/94), and wells 33691, and 38291 were not sampled. U=not detected at or above method detection limit, B=appeared in method blank, E=estimated value, and J=estimated value.

Summary of VOC Physical Characteristics

Compound	Solubility (mg/L)	Specific Density (20°) (g/cc)	Log K_{ow}, Octanol Water Coefficient	Henry's Law Constant (atm-m^3/mol)
CCL_4	800	1.59	2.83	0.0302
1,1-DCE	400	1.22	2.13	0.021
TCA	1360	1.34	2.47	0.018
PCE	150	1.62	2.60	0.0153
TCE	1100	1.46	2.53	0.0091

Compiled from Cohen, R.M., Mercer, J.W., and Mathews, J., 1993. DNAPL Site Evaluation: C.K. Smoley, Publisher.

APPENDIX B

OPERABLE UNIT 3 CAD/ROD

CORRECTIVE ACTION DECISION/ RECORD OF DECISION

OPERABLE UNIT 3
THE OFFSITE AREAS
Rocky Flats Environmental Technology Site

Prepared by:
U.S. Department of Energy
Rocky Flats Field Office
Golden, Colorado

April 1997

CORRECTIVE ACTION DECISION/RECORD OF DECISION DECLARATION

SITE NAME AND LOCATION

Rocky Flats Environmental Technology Site, Operable Unit 3: Offsite Areas, Jefferson County, Colorado.

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action/corrective action for the Rocky Flats Environmental Technology Site (RFETS) Operable Unit (OU) 3: Offsite Areas, located near Broomfield and Westminster, Colorado. The selected remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986. The selected remedy was also chosen in accordance with the Colorado Hazardous Waste Act (CHWA). The Resource Conservation and Recovery Act (RCRA) is administered in Colorado through the CHWA, by the Colorado Department of Public Health and Environment (CDPHE). To the extent practicable, the selected remedy is also consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

OU 3 was investigated and a remedy was selected in compliance with the Federal Facility Agreement and Consent Order - Interagency Agreement (IAG), signed by the U.S. Department of Energy (DOE), the State of Colorado and the U.S. Environmental Protection Agency (EPA) on January 22, 1991. The selected remedy is also consistent with the Federal Facility Agreement and Consent Order - Rocky Flats Cleanup Agreement (RFCA), signed by DOE, the State of Colorado and EPA on July 19, 1996. RFCA now governs cleanup at Rocky Flats. The remedy selection is based on the administrative record for OU 3, and CDPHE and the EPA agree with the remedy selected.

OU 3 is one of sixteen OU's at Rocky Flats originally identified in the IAG, and is the only one not located within the RFETS boundaries. The RFCA consolidated many of the original sixteen OU's, but OU 3 remained separate, owing both to its unique geographic location and to the fact that investigations and administrative activity for OU 3 were nearly completed when RFCA was signed. OU 3 is comprised of four Individual Hazardous Substance Sites (IHSS's): Contamination of the Land Surface (IHSS 199), Great Western Reservoir (IHSS 200), Standley Lake (IHSS 201) and Mower Reservoir (IHSS 202).

DESCRIPTION OF THE SELECTED REMEDY

The selected remedy for OU 3 is no action. Based upon the Baseline Risk Assessment and the Environmental Risk Assessment contained in the RCRA Facility Investigation/Remedial Investigation (RFI/RI) Report of June 1996, DOE, the lead agency under CERCLA for OU 3, concludes that no action is appropriate for OU 3. The RFI/RI Report concludes that all IHSS's within OU 3 are already in a state protective of human health and the environment. The NCP provides for the selection of a no action remedy when an OU is in such a protective state. Therefore, no remedial action regarding OU 3 or any of its constituent IHSS's is warranted.

DECLARATION STATEMENT

DOE, in consultation with CDPHE and EPA, has determined that no remedial action is necessary for OU 3 to be protective of human health and the environment. No hazardous substances, pollutants or contaminants will remain within the boundaries of OU 3 above levels that allow for unlimited use and unrestricted exposure, as these levels have been calculated in the OU 3 RFI/RI Report. Since no national health-based standards have been

promulgated for the radioactive contaminants remaining in OU 3, this Corrective Action Decision/Record of Decision will be reviewed in five years, consistent with CERCLA Section 121(c), to ensure consistency with such a national standard, if one is later promulgated. Since the conclusions contained in this Corrective Action Decision/Record of Decision are in part dependent upon calculated radiation exposure levels, the Corrective Action Decision/Record of Decision will additionally be reviewed if necessary, consistent with CERCLA Section 121(c), to ensure consistency with any revisions to those calculated levels that may result from new regulations, or improved calculation methods or modelling parameters.

Jessie Roberson, Manager
U.S. Department of Energy, Rocky Flats Field Office

April 14, 1997
Date

Max H. Dodson
Assistant Regional Administrator
Office of Ecosystem Protection and Remediation
U.S. Environmental Protection Agency, Region VIII

Date

Howard Roitman, Director
Hazardous Materials and Waste Management Division
Colorado Department of Public Health and the Environment

May 30, 1997
Date

Jessie Roberson, Manager
U.S. Department of Energy, Rocky Flats Field Office

April 14, 1997
Date

Max H. Dodson
Assistant Regional Administrator
Office of Ecosystem Protection and Remediation
U.S. Environmental Protection Agency, Region VIII

June 3, 1997
Date

Howard Roitman, Director
Hazardous Materials and Waste Management Division
Colorado Department of Public Health and the Environment

Date

_____ _____
Jessie Roberson, Manager Date
U.S. Department of Energy, Rocky Flats Field Office

_____ _____
Max H. Dodson Date
Assistant Regional Administrator
Office of Ecosystem Protection and Remediation
U.S. Environmental Protection Agency, Region VIII

_____ _____
Howard Roitman, Director Date
Hazardous Materials and Waste Management Division
Colorado Department of Public Health and the Environment

DECISION SUMMARY

Site Name, Location and Description

Rocky Flats Environmental Technology Site

The Rocky Flats Environmental Technology Site (RFETS) is located about sixteen miles northwest of downtown Denver, Colorado, in northernmost Jefferson County, west of the Cities of Broomfield and Westminster, Colorado (Figure 1). RFETS occupies approximately 6,535 acres of land owned by the federal government. Most of this land (~6,100 acres) is vacant buffer zone surrounding a 385-acre industrial area where most buildings and other structures are located, and where manufacturing activities at RFETS historically took place.

RFETS is located along the eastern edge of the southern Rocky Mountains, immediately east of the Colorado Front Range. The site is located on a broad, eastward-sloping pediment capped by Quaternary alluvial deposits known as the Rocky Flats Alluvium. The pediment surface is dissected by several east to northeast trending stream valleys, the bases of which lie up to two hundred feet below the top of the older pediment surface. In places, these valleys cut into the underlying bedrock, but in most places the bedrock is hidden beneath colluvium that has collected along the valley slopes. RFETS elevations range from about 5,800 feet to about 6,000 feet above mean sea level.

The main surface water features at RFETS are Rock Creek, North and South Walnut Creeks, and Woman Creek. These creeks are ephemeral/intermittent in nature, except in reaches of Walnut Creek that receive discharges from the RFETS sewage treatment plant. North and South Walnut Creeks and Woman Creek are impounded in places along their lengths by three series of holding ponds (the A-, B-, and C-series ponds, respectively). The purpose of these ponds is to retain water in the event of an industrial discharge from RFETS. Water from Pond C-2, located in the Woman Creek drainage and which drains water from the 881 Hillside south of the industrial area, was pumped to the Walnut Creek diversion ditch and routed around Great Western Reservoir. Following completion of the Standley Lake Protection Project, C-2 water is now released directly to Woman Creek.

Land use within ten miles of RFETS (including Operable Unit 3) includes residential, agricultural, industrial, parks and open space, vacant and institutional classifications. Most residential use is located northeast, east and southeast of RFETS. Commercial development occurs near Jefferson County Airport, located about three miles northeast of RFETS, and north and southwest of Standley Lake. Quarrying and mining for sand, gravel and coal take place on RFETS or within five miles of the site. Irrigated and non-irrigated croplands, producing primarily winter wheat and barley, are located primarily northeast and southeast of the site. Much of the vacant land around RFETS is rangeland.

Operable Unit 3

Operable Unit 3 (OU 3) is composed of four Individual Hazardous Substance Sites, or IHSS's. IHSS's are specific locations where hazardous substances, solid wastes, pollutants, contaminants, hazardous wastes or hazardous constituents may have been disposed of or released to the environment from Rocky Flats at any time in the past. The four IHSS's that comprise OU 3 are: IHSS 199, Contamination of the Land Surface; IHSS 200, Great Western Reservoir; IHSS 201, Standley Lake; and IHSS 202, Mower Reservoir. Their locations are shown in Figure 1.

Site History and Enforcement Activities

The Rocky Flats Environmental Technology Site (RFETS) is a government-owned, contractor operated facility that is part of the nationwide nuclear weapons manufacturing complex. RFETS began operation in 1951 under the Atomic Energy Commission, until it was dissolved in 1975. The Energy Research and Development Agency assumed responsibility for Rocky Flats until 1977, when the Department of Energy was created. Prior to 1992, RFETS engaged in the production of nuclear and non-nuclear components of atomic weapons, using plutonium, uranium, beryllium and stainless steel as the primary materials. In 1992, the nuclear production mission was suspended, and by 1995, all production at RFETS had ceased. RFETS has been rededicated to a mission of environmental cleanup and safe management of nuclear materials remaining on site.

Portions of OU 3, primarily as a result of accidental releases from RFETS in the past, contain low-level deposits of radionuclides. Migration via wind-borne dispersal or surface water runoff from the RFETS 903 Pad area is a likely source for some of the observed radionuclides in the OU 3 IHSS's. The deposits of radionuclides at the 903 Pad, located near the RFETS inner east gate, resulted from the storage of numerous 55-gallon drums containing lathe coolants and plutonium. These drums were stored at the 903 Pad from 1958 to 1968, during which time the drums corroded and the lathe coolant and plutonium leaked onto surrounding soils. The drums and surrounding surface soil were removed from the 903 Pad area in 1969 and an asphalt cap was subsequently placed over the entire 903 Pad area.

Reconstruction of the RFETS surface water holding ponds between 1970 and 1973 is also a primary source for some of the deposits of radionuclides observed in IHSS 200. Prior to 1979, process wastewater from decontamination operations and the laundry plant effluent were channeled through a series of ponds located along South Walnut Creek, before the stream left RFETS and entered Great Western Reservoir. The holding pond reconstruction may have resulted in the resuspension of sediments containing radionuclides that were ultimately transported downstream into Great Western Reservoir.

Other potential sources of radionuclides were considered in the RFI/RI Report, and by previous researchers, but are probably less significant than the two aforementioned sources. These other sources include possible low-level air emissions during the early years of Plant operation; a fire in Building 771 on September 11, 1957; and a fire in Building 776 on May 11, 1969.

In 1975, suit was filed naming former RFETS contractors Rockwell International and Dow Chemical Company and the United States as defendants in an action claiming that land immediately east of RFETS (land east of Indiana Street that is within the geographic area of OU 3) had been damaged by the release of radionuclides from RFETS. The suit was settled in December 1984. As part of the settlement, Jefferson County acquired 250 acres of the land in question and the City of Broomfield acquired 100 acres. The City of Westminster has subsequently acquired Jefferson County's interest in the land. The settlement also called for the land in question (known as the "Remedy Lands") to be tilled and then revegetated by seeding in an effort to reduce the surface concentrations of radionuclides. Tilling did successfully reduce the surface concentrations of radionuclides, but revegetation has proven difficult. There have been no other requests to till and revegetate the land since Jefferson County's 1986 request.

On January 22, 1991, the Department of Energy, the U.S. Environmental Protection Agency and the Colorado Department of Health signed the Federal Facility Agreement and Consent Order, also known as the Interagency Agreement or IAG. The IAG divided

RFETS and the surrounding lands into sixteen OU's, and specified that OU 3 be divided into the four IHSS's shown in Table 1. OU 3 was investigated pursuant to the guidance set forth in the IAG, and the RCRA Facility Investigation/Remedial Investigation (RFI/RI) Report was released in August 1996.

On July 19,1996, DOE, EPA and CDPHE signed the Rocky Flats Cleanup Agreement (RFCA), which superseded the IAG. RFCA consolidated many of the OU's at RFETS into two larger OU's: the Buffer Zone and the Industrial Area. OU 3 remained separate under RFCA, owing both to its unique geographic location and to the fact that investigations and administrative actions at OU 3 had been nearly completed at the time RFCA was signed.

Highlights of Community Participation

DOE submitted the final RFI/RI Report for OU 3 to EPA on July 11, 1996, following resolution of final comments by EPA, CDPHE, the City of Broomfield and the City of Westminster. Regulatory approval to release the OU 3 Proposed Plan for public comment was granted on August 7, 1996. The Proposed Plan was released for public comment on August 7, 1996. A public hearing on the OU 3 Proposed Plan was held on September 18, 1996, at the Arvada Center for the Arts and Humanities in Arvada, Colorado. Citizen comments received at the public hearing were recorded; responses to those comments are included in the attached Responsiveness Summary. The public comment period for the OU 3 Proposed Plan ended on October 11, 1996. Written comments on the Proposed Plan were received from the City of Westminster and the City of Broomfield. Responses to these written comments are also included in the attached Responsiveness Summary.

The Scope and Role of OU 3

The IAG established OU 3 as one of sixteen original Operable Units at RFETS; it is the only one of these sixteen OU's that addresses past releases of hazardous substances off RFETS property. The selected remedy in this Corrective Action Decision/Record of Decision (CAD/ROD) is no action. Based upon the results of the OU 3 RFI/RI Report, the IHSS's within OU 3 have been determined to be in a protective state with regard to human health and the environment. Therefore, no remedial action regarding these IHSS's is warranted.

The CAD/ROD, and the RFI/RI report upon which the CAD/ROD and the OU 3 Proposed Plan are based, consider past releases of hazardous substances within the IHSS's in OU 3, the risks that these releases pose to human health and the environment, and the need for action, if any, based upon those risks. The CAD/ROD does not consider potential future releases from RFETS, nor does it consider ongoing monitoring or pollution prevention programs that serve to detect or prevent such future releases. Numerous such programs are currently in place at RFETS, mandated by Federal or State law, or by enforceable compliance agreements. None of these programs is a condition of this CAD/ROD. However, examples of such programs include:

- Point source discharge and stormwater monitoring, for non-radiological parameters, conducted under the Site's National Pollutant Discharge Elimination System (NPDES) permit, issued pursuant to the Clean Water Act ;

- Groundwater and surface water monitoring (including stations at the RFETS boundary) for a range of parameters, including plutonium-239/240 and americium-241, conducted pursuant to RFCA requirements;

- Monitoring for radionuclide air emissions to demonstrate compliance with National Emissions Standards for Hazardous Air Pollutants, required by the Clean Air Act;

- Regular inspection and maintenance of RFETS hazardous waste storage and treatment facilities, required by the Site's permit issued under the Colorado Hazardous Waste Act;

- Maintenance of a Spill Prevention, Control and Countermeasures/Best Management Plan, required by the Site's NPDES permit; and,

- Procedures to Prevent Hazards and a Contingency Plan, contained in the Site's hazardous waste permit, issued pursuant to the Colorado Hazardous Waste Act.

RFETS is continuing to commission a panel of experts to conduct basic research on the environmental chemistry of actinides. While again not a condition of this CAD/ROD, the panel is expected to provide information on the potential for actinide migration at RFETS. In turn, this information will be used to guide future remedial and management actions at RFETS, and help to prevent or mitigate the possibility of off site releases.

Summary of OU 3 Site Characteristics

Geology and Hydrogeology

Surficial geology in OU 3 is characterized by Quaternary Age unconsolidated deposits of four types: pediment and terrace alluvium, slope-wash colluvium and loess, landslide deposits and valley-fill alluvium. Recognized pediment and terrace alluvium formations in OU 3 include the Verdos Alluvium (weakly cemented boulders, cobbles and coarse sands, located around Standley Lake and Great Western Reservoir), the Slocum Alluvium (cobble gravel and clayey coarse sand with mica, found along Woman Creek and the Smart Ditch), and the Louviers Alluvium (red- to yellow-brown sand, pebbles and cobbles in a clayey silt to sandy matrix, found along Woman Creek). Slope-wash colluvium of Pleistocene age occurs along valley sides on Woman and Walnut Creeks in the western reaches of OU 3 near the RFETS boundary, and Pleistocene loess deposits are found along the higher alluvial terraces south of Standley Lake. Landslide deposits of Pleistocene and Holocene age are most abundant in the Rock Creek drainage. Well records from private wells in OU 3 suggest that in general, surficial deposits in the area range from 15 to about 50 feet in thickness, although landslide deposits along Rock Creek can be up to 100 feet thick.

Bedrock geology in OU 3 is marked by two regional sedimentary formations, the Arapahoe Formation and the Laramie Formation. Both are Cretaceous-age deposits formed by outwash from the Front Range of the Rocky Mountains. The Arapahoe Formation, the uppermost bedrock formation in OU 3, contains primarily claystones and silty claystones as well as some siltstones and sandy conglomerates. The Arapahoe Formation lies unconformably beneath the land surface, and weathering penetrates the Formation to depths between 10 and 40 feet. In the vicinity of RFETS, the Arapahoe Formation has a thickness of up to 50 feet. The Laramie Formation underlies the Arapahoe Formation and consists of two main units, an upper, primarily claystone unit, and a lower unit containing coals and sandstones. The Laramie Formation has a total maximum thickness of about 800 feet, of which the upper unit is 600 to 800 feet thick and the lower unit is about 300 feet thick. The Laramie Formation is underlain by the Fox Hills Sandstone, a regionally important aquifer in the Denver Basin. Recharge to the Laramie-Fox Hills Aquifer takes place along a narrow outcropping west of RFETS along the base of the Front Range.

At RFETS, groundwater in the Rocky Flats Alluvium (the uppermost unit at RFETS, generally absent from OU 3) is recharged by surface precipitation or man-made sources, and flows laterally along the top of the Arapahoe formation, expressing itself as seeps along the upper reaches of Woman, Walnut and Rock Creeks. The low transmissivities of the Arapahoe and Upper Laramie formations effectively preclude deep vertical migration of groundwater (and any associated contaminants) from the shallow aquifer at RFETS. There is , therefore, no direct connection between the shallow groundwater at RFETS and groundwater in OU 3.

While there are numerous private wells known to have been drilled in OU 3, limited information is available in the form of drilling records held by the Colorado Department of Water Resources. Based upon these records, wells in OU 3 were completed in sandstone deposits within (presumably) the Arapahoe or upper Laramie Formations, at depths ranging from 35 to 275 feet.

Surface Water Features

Four main drainages traverse OU 3: Big Dry Creek, Woman Creek, Walnut Creek and Rock Creek. Of these, only Woman Creek and Walnut Creek have significant possibilities of having been affected by activities at RFETS. Woman Creek flows eastward across RFETS and into OU 3, south of the RFETS industrial area. The Woman Creek drainage contains two impoundments on RFETS. Pond C-1 is a small (1.7 million gallon), on channel pond with little retention capability. Pond C-2 is a larger (22.6 million gallons), off-channel pond that collects water from the south side of the RFETS industrial area via the South Interceptor Ditch. Water from Pond C-2 was previously pumped to the Walnut Creek drainage, where it flowed into the diversion ditch around Great Western Reservoir, but is now pumped directly to Woman Creek.

Woman Creek flowed into Standley Lake until November of 1995, when Woman Creek Reservoir, part of the Standley Lake Protection Project, was completed. The Standley Lake Protection Project was constructed by the City of Westminster using grant funds provided by DOE.

Walnut Creek also flows eastward from RFETS into OU 3, and has two main branches (North and South Walnut Creek) which merge before the creek crosses the RFETS east boundary. The two branches of Walnut Creek on RFETS are impounded by two series of holding ponds (A-1 through A-4 on North Walnut Creek and B-1 through B-5 on South Walnut Creek). On RFETS, Walnut Creek drains the majority of the industrial area, and receives discharges from the RFETS sewage treatment plant. Walnut Creek flowed directly into Great Western Reservoir until 1989, when the City of Broomfield constructed a diversion ditch around the reservoir to lower Walnut Creek.

OU 3 contains four significant surface water impoundments: Great Western Reservoir, Standley Lake, Mower Reservoir and Woman Creek Reservoir. Great Western Reservoir is a 3,200 acre-foot capacity reservoir, located about 1/2 mile east of the RFETS east boundary. It was originally constructed as an irrigation supply reservoir, but which now serves as one of the primary drinking water supplies for the City of Broomfield. The primary source of water to Great Western Reservoir is from Clear Creek, delivered via the Church Ditch.

The Great Western Reservoir Replacement Project was begun in 1991 by the City of Broomfield, and is being funded primarily through a DOE grant. This Project will provide an alternate water supply (from the Windy Gap Project) for the City of Broomfield, as well as transmission and treatment facilities for the new water supply. With the completion of

this Project, expected by the end of 1997, Great Western Reservoir will no longer be used as a drinking water supply, and is expected to revert to its original use as an irrigation supply reservoir.

Standley Lake is a 43,000 acre-foot reservoir which supplies drinking water to the Cities of Westminster, Northglenn, Thornton and Federal Heights as well as irrigation water. Standley Lake is located about 2 miles southeast of the RFETS eastern boundary. Its primary source of water is also from Clear Creek, delivered via the Farmers' Highline Canal, Croke Canal and the Church Ditch.

Mower Reservoir is a relatively small (about 45 acre-feet) agricultural reservoir located between Standley Lake and Great Western Reservoir, about 1,400 feet east of the RFETS east boundary. Mower Reservoir is fed by Mower Ditch, which transports water from Woman Creek from a point within the RFETS boundary. Mower Reservoir was privately owned until December 1995, when it was purchased by the City of Westminster. This purchase was funded by DOE as a Supplemental Environmental Project (SEP) pursuant to the Tolling Agreement, which was appended to the IAG. The Tolling Agreement allowed DOE to fund SEP's in lieu of penalties for violations of the IAG.

Woman Creek Reservoir is an 850-acre-foot detention reservoir that captures and holds Woman Creek flows until they are pumped to the Walnut Creek drainage downstream of Great Western Reservoir. The purpose of Woman Creek Reservoir is to capture any contaminated water that might leave RFETS via Woman Creek. Woman Creek Reservoir is designed to capture flows up to the anticipated 100-year flood on Woman Creek, and is compartmentalized so as to allow for the sequential capture, testing and release of water from Woman Creek.

Terrestrial and Aquatic Ecology

OU 3's terrestrial ecology has been extensively altered by human activity, especially grazing, agriculture and construction, such that essentially no undisturbed areas remain. The dominant plant community is short-to-mid-grass prairie that has been moderately to heavily grazed. Along the drainages in OU 3 are sparse stands of cottonwoods, mesic grasslands and occasional wetlands along some stream bottoms. Mower Reservoir and the ditch leading to it contain the most well-developed stands of riparian vegetation in the OU 3 study area.

Despite the dissected habitat, a variety of animals reside in, or wander through, OU 3. Notable residents include bull snakes, rattlesnakes, a variety of hawks, black-tailed prairie dogs, coyote and mule deer. Bald eagles are locally common around Standley Lake, especially in winter, and a breeding pair there fledged one young in the spring of 1996.

The Preble's meadow jumping mouse (*Zapus hudsonius preblei*) is a species that occurs in several stream drainages at RFETS, and which is a candidate for listing as an Endangered Species under the Endangered Species Act. Some marginal habitat for this mouse has been identified in OU 3, along the drainages and around the reservoirs. DOE has not conducted any trapping to specifically confirm or deny the presence of Preble's meadow jumping mouse in OU 3. Trapping conducted by Jefferson County Open Space failed to find the mouse in OU 3 east of RFETS, however.

There are both lotic and lentic aquatic habitats in OU 3. The biotic community in streams is limited to a few, opportunistic species because of low, highly variable stream flows. Of the reservoirs in OU 3, Great Western has the least diverse fish assemblage, consisting primarily of carp, suckers and minnows. Mower Reservoir is stocked with smallmouth

bass. Standley Lake is open for recreation and contains a variety of stocked game fish, including rainbow trout, walleye, catfish and yellow perch. Mower Reservoir is the only one of the three with substantial amounts of emergent and submerged aquatic vegetation. Woman Creek Reservoir has been designed and will be operated to discourage the establishment of fish populations or any other type of aquatic community.

Population and Land Use

Over 2.2 million people live within a 60-mile radius of Rocky Flats. The OU 3 RFI/RI Report estimated that, in 1994, approximately 10,800 people lived within a five-mile radius of RFETS. Most of these people lived in subdivisions located either in Broomfield or in Westminster, especially northeast, east and south of Standley Lake. The nearest school to RFETS is Witt Elementary School, about 2.7 miles to the east. The population near RFETS is projected to increase substantially in coming years, with nearly 18,000 persons expected to live within five miles of RFETS in 2005 and about 24,000 persons expected to live in that area by the year 2015.

Land use in OU 3 immediately east of RFETS, covering most of the lands around and between Great Western Reservoir and Standley Lake is open space. The use of these lands is controlled through zoning restrictions and perpetual land use restrictions contained in existing City of Broomfield and City of Westminster deeds of ownership. These restrictions make the development of these lands for residential or commercial use very unlikely. These lands include the land which was the subject of the 1975 lawsuit and 1984 settlement agreement, and the portions of IHSS 199 which exhibit the highest soil concentrations of radionuclides in OU 3.

Eastward, beyond the open space lands immediately to the east of RFETS, commercial and recreational development continues to take place at Interlocken, north of the Jefferson County Airport. Further commercial development is anticipated south of the airport, and immediately south of RFETS at Jefferson Center Properties. Continued suburban expansion is also anticipated in the area south and southeast of RFETS, primarily around Standley Lake, and in western Arvada along the 64th Street corridor.

The Nature and Extent of Contamination in OU 3

Contaminants of Concern

The RFI/RI evaluated sampling data in OU 3. Based on these data, DOE, EPA and CDPHE selected Contaminants of Concern (COC's) for OU 3. COC's are those chemicals that may contribute significantly to human health risks and which in turn were fully evaluated in the Human Health Risk Assessment in the RFI/RI Report. COC's were selected according to the toxicity of a given chemical, the frequency of detection in the sampling, a preliminary screening of the risk posed by the chemical and comparisons of concentrations in OU 3 to background concentrations (Background soil and sediment concentrations were determined using data from the Rock Creek Drainage. Reservoir and stream sediments are not directly comparable to one another, owing to the differences in flow regimes. However, a study conducted by DOE in 1994 to determine regional background concentrations of hevy metals and radionuclides demonstrated that concentrations of these substances in the Rock Creek samples were representative of background, and that their use for comparison purposes was appropriate.). COC's were selected by IHSS and by individual environmental medium within each IHSS. Plutonium-239/-240 and americium-241 in soil in IHSS 199, and plutonium-239/-240 in surface sediment in Great Western Reservoir (IHSS 200) are the only COC's identified for OU 3.

Soils in OU 3 (IHSS 199)

Three data sets were used in the RFI/RI Report to define the nature and extent of hazardous substances in surface soil in IHSS 199. These were the RFI/RI data set (144 samples collected from 61 ten-acre plots in OU 3), the Remedy Lands data set (47 surface soil samples collected from tilled and untilled portions of the Remedy Lands east of RFETS), and the Rock Creek data set. The Rock Creek data set was used to determine background concentrations of plutonium and americium, against which the other soil data sets were compared. Surface soils in OU 3 were not analyzed for other hazardous substances in OU 3, including beryllium and heavy metals. Surface soil sampling for beryllium and heavy metals in OU 2, immediately upwind of OU 3, showed that no metals were present there at levels above background, leading to the conclusion that additional sampling in OU 3 was not warranted.

The Rock Creek data set indicated that upper-bound background values (the mean plus two standard deviations) were 0.09 picoCuries per gram (pCi/g) for plutonium-239/-240 and 0.04 pCi/g for americium-241. Based on these results, 19 of the 61 samples in the RFI/RI data set and all of the surface soil samples in the Remedy Lands data set had levels of plutonium-239/-240 and/or americium-241 that were above background levels. The highest surface soil level for plutonium-239/-240 (6.468 pCi/g) was recorded in sample U1A from the remedy lands data set. Sample U1A was taken from a location approximately 1,800 feet east of the RFETS east gate, and about 1,500 feet south of the western end of Great Western Reservoir. The highest value of americium-241 (0.52 pCi/g) occurred in sample plot PT14192, located across Indiana Street from the RFETS east gate. The arithmetic mean of all values in both the RFI/RI data set and the Remedy Lands data set is 0.057 pCi/g for plutonium-239/-240 and 0.017 pCi/g for americium-241.

The RFI/RI report also included a more comprehensive appraisal of the source, extent and distribution of plutonium-239/-240 and americium-241 at and around RFETS. This appraisal considered numerous surface soil data sets collected by a number of researchers on and off RFETS. About 750 surface soil sample points were available to researchers, who used statistical techniques to plot isopleths of plutonium-239/240 and americium-241 soil concentrations in OU 3. This analysis indicated the presence of a plume of elevated concentrations of plutonium and americium in soils extending directly east of the 903 Pad at RFETS, eastward past the RFETS east gate. The analysis also indicates that soil levels drop quickly east of RFETS, and return to background two to three miles east of the RFETS property boundary. Finally, this analysis suggests that windblown dispersal of contaminants from the 903 Pad is the primary source of plutonium and americium in surface soils in OU 3.

To determine the nature and extent of hazardous substances in subsurface soils in OU 3, the RFI/RI included excavation and sampling of eleven trenches, primarily located immediately east of the RFETS boundary. In each trench, ten soil samples were collected along a profile 96 centimeters deep. In all cases, maximum plutonium and americium levels occurred at the soil surface (to 3 cm deep), and decreased rapidly with depth. The arithmetic means for both plutonium and americium in soils below 10 cm deep were less than calculated background concentrations.

Sediments in Great Western Reservoir (IHSS 200), Standley Lake (IHSS 201) and Mower Reservoir (IHSS 202)

The RFI/RI gathered data from 120 samples of surface sediments in the reservoirs and streams in OU 3 as well as 155 subsurface sediment samples from the reservoirs. Additionally, the RFI/RI included data from 114 sediment samples gathered from Standley

Lake and Great Western Reservoir in 1983 and 1984. Surface and subsurface reservoir sediments were analyzed for heavy metals and radiological parameters, and sediments from Mower Reservoir were additionally analyzed for volatile organic compounds. These data were compared to background values for stream sediments. This comparison concluded that plutonium was the only hazardous substance in reservoir sediments that was elevated above background values, and that levels of plutonium were elevated in at least some sediment samples from all three reservoirs.

Concentrations of plutonium in surface sediments were highest in Great Western Reservoir, reaching 3.3 pCi/g, and averaging 0.27 pCi/g. Plutonium levels in Standley Lake peaked at 0.55 pCi/g, and averaged 0.03 pCi/g. The maximum plutonium value in Mower Reservoir was 0.49 pCi/g, with an average of 0.291 pCi/g.

In subsurface sediments, plutonium concentrations were again highest in Great Western Reservoir, reaching a maximum of 4.3 pCi/g at a sediment depth of approximately 18 inches. This sample was taken at the deepest portion of the reservoir, just west of the dam, at a maximum water depth of about 40 feet. A sample taken at this spot during the 1983-1984 sampling had a plutonium activity of 5.3 pCi/g, also at a depth of about 18 inches. The maximum plutonium value in Standley Lake subsurface sediments was 0.38 pCi/g at a sediment depth of about 18 inches, and the maximum plutonium value in Mower Reservoir subsurface sediments was 1.11 pCi/g at a depth of about 6 inches.

The RFI/RI Report concludes that waterborne transport from RFETS was the most likely means of plutonium deposition to Great Western Reservoir sediments, while aeolian transport was the most significant pathway for contaminants to sediments in Mower Reservoir and Standley Lake. Comparing data gathered during the RFI/RI in 1992, to data gathered in 1983 and 1984, the RFI/RI report finds that, in general, plutonium concentrations in sediments decreased from 10 to 30 per cent in similar locations. The two data sets exhibit strongly similar vertical plutonium profiles, however, indicating that vertical migration of plutonium in reservoir sediments is not occurring.

Plutonium is retained as a COC only in surface sediments in Great Western Reservoir because of the reservoir's somewhat uncertain future in light of the imminent completion of the Great Western Reservoir Replacement Project. Thus, the RFI/RI's Human Health Risk Assessment considers a residential scenario for Great Western Reservoir in the unlikely event that the reservoir is drained at some future time and the land is released for building residences. Such a scenario is not considered likely for either Standley Lake or Mower Reservoir, which in any event have lower plutonium sediment activities than Great Western Reservoir.

Other Environmental Media: Surface Water, Groundwater and Air

As mentioned previously, the only environmental media for which COC's were identified in OU 3 were surface soils and Great Western Reservoir surface sediments. However, the RFI/RI gathered and considered a substantial amount of data from other environmental data, including surface water, groundwater and air.

Surface water sampling concentrated on the three reservoirs in OU 3 and included sampling for radionuclides, metals, major ions, pesticides and volatile organic compounds (the latter being sampled only in Mower Reservoir). Fifteen samples were collected during the RFI/RI from Great Western Reservoir, fourteen samples were collected from Standley Lake, and thirteen samples were collected from Mower Reservoir; samples were collected from July to October 1992. All constituents in all reservoirs were either within background levels or were not detected. The mean plutonium activities for surface water in Great

Western Reservoir, Standley Lake and Mower Reservoir were 0.002, 0.002 and 0.005 pCi/l, respectively. Maximum observed plutonium values for Great Western Reservoir and Standley Lake were 0.005 and 0.009 pCi/l; the highest surface water activity for plutonium was observed in Mower Reservoir, at 0.03 pCi/l. All plutonium activities recorded during the RFI/RI were less than site-specific standards set by the Colorado Water Quality Control Commission (0.03 pCi/l for Great Western Reservoir and Standley Lake, and 0.15 pCi/l for Mower Reservoir).

Two groundwater wells were installed during the RFI/RI, one downstream of Great Western reservoir and one downstream of Standley Lake. These wells evaluated the potential interactions between reservoirs and downgradient groundwater. The only radiological constituents that exceeded the maximum background values were uranium-235 and uranium-238 in individual samples in the well downgradient of Standley Lake. However, the mean values for these and all other radionuclides in both wells were less than the upper-bound mean background values (that is, the 95% upper confidence level, based upon the arithmetic mean of the data).

Groundwater was not extensively monitored in OU 3, apart from the two aforementioned wells. Extensive groundwater monitoring at RFETS, including alluvial wells at the site boundary, has shown that hazardous substances are not migrating off site via shallow groundwater. The Upper Laramie Formation, which underlies RFETS, is sufficiently impermeable and robust so as to provide protection for the regional Laramie-Fox Hills Aquifer. Thus, no mechanism for the off site transport of hazardous substances via the regional aquifer exists.

The evaluations of inhalation risk from plutonium in the RFI/RI report were performed using data from the Radioactive Air Monitoring Program (RAAMP), and yielded a risk of approximately 1 x 10-6. However, data from the RAAMP were found to have great uncertainties associated with them, owing to the detection limit of the samplers being used. Therefore, RAAMP data were supplemented with ultra-high volume air samplers, which decreased detection limits and the uncertainties encountered in RAAMP samplers. Ultra-high volume sampling yielded average results for plutonium that were approximately 100 times lower than those provided by the RAAMP sampling (1.9 picoCuries of plutonium per cubic meter of air, on average). Wind tunnel studies were also performed to determine the potential for resuspension of particulates in OU 3. The RFI/RI Report concluded that, over the vast majority of OU 3 (that is, undisturbed terrestrial areas), resuspension of particulates from surficial soils and sediments is limited and occurs only rarely. A higher potential for resuspension was observed at disturbed, unvegetated sites such as reservoir shorelines.

Contaminant Fate and Transport

The properties of plutonium and americium, the two COC's identified for OU 3, are such that physical, rather than chemical or biotic, factors predominate in determining methods of transport and the ultimate fate of these two contaminants. The physical factors that have in the past and which continue to determine the distribution of plutonium and americium in OU 3 are:

> 1) Adsorption -- the binding of the contaminant to particulates, often clays, caused by electrical attraction at the molecular level, which often results in reduction in environmental mobility;

2) Waterborne transport -- the movement of particles and any associated contaminants by moving water (fluvial processes), and their subsequent re-deposition in reservoirs (through lacustrine processes); and,

3) Windborne transport -- the dislodging, transport and subsequent deposition of particles and associated contaminants during high winds.

Plutonium and americium in general do not manifest chemical behavior in the environment that influences their transport or fate. Similarly, there is no known biotic mechanism that would serve to concentrate plutonium or americium in living organisms, nor do concentrations of these elements increase at higher levels of the food chain.

In soils and in surface waters in OU 3 and elsewhere where there are oxidizing conditions, plutonium is present as plutonium dioxide colloids, which are in turn strongly adsorbed onto clay particles. Strongly reducing environments (those with little or no free oxygen) may lessen the affinity of plutonium for clay particles, but the RFI/RI report concluded that this does not significantly affect the mobility of plutonium in OU 3. Basic conditions, above a pH of 9, may also increase the solubility of plutonium, but these conditions were not encountered in OU 3.

Waterborne particulate transport was most significant in OU 3 in transporting sediments from ponds in the Walnut Creek drainage to Great Western Reservoir. Waterborne transport may have also been responsible for movement of some plutonium from soils at RFETS and in OU 3 into the drainages and thence to the three reservoirs. Once in the reservoirs, particles containing plutonium settled out and were deposited in reservoir sediments. There is believed to be no mechanism for transport of plutonium is surface water downstream of the reservoirs in OU 3, based upon stream sediment samples taken from Walnut Creek downstream of Great Western Reservoir, and from Big Dry Creek downstream of Standley Lake.

As mentioned previously, airborne transport of particulates from the 903 Pad at RFETS was the most likely source of plutonium deposition onto surface soils in OU 3, and was probably a source for radionuclides in reservoir sediments as well. Since plutonium shows an affinity for fine particles such as clays, the particles that are most likely to be transported by wind are likely to contain elevated plutonium levels as compared to the soil itself.

Summary of Site Risks

Human Health Risk Assessment

Following the selection of COC's the RFI/RI Report evaluated the risks posed by these contaminants in the Human Health Risk Assessment (HHRA), one portion of the Report's Baseline Risk Assessment. The HHRA calculated the exposure to COC's under various scenarios, considered the potential toxic effects of the COC's, and then calculated the risks posed by the COC's in OU 3 under each exposure scenario. Risks were then reported as the probability of an individual developing cancer as a result of exposure to OU 3 contamination under one of the scenarios that were evaluated.

The two scenarios evaluated were recreational and residential exposure. The recreational exposure anticipates occasional recreational use of the area (hiking, biking, picnicking, etc.), and assumes that an individual may be exposed to OU 3 contaminants through ingestion and inhalation of soils and through external radiation. The residential exposure scenario assumes exposure pathways through the ingestion of vegetables, milk, and meat raised on the contaminated property, as well as through soil ingestion and inhalation, and

through external radiation. The residential scenario results in higher contaminant exposures, and thus higher calculated risks, than the recreational scenario, primarily due to the much greater exposure times in the residential scenario.

The residential exposure scenario was applied to plutonium and americium in surface soils (IHSS 199) and to plutonium in sediments in Great Western Reservoir (IHSS 200). In IHSS 199, it was assumed that current deed restrictions on property held by Broomfield and Westminster would be lifted, allowing for residential development. In IHSS 200, it was assumed that Great Western Reservoir would be drained and subsequently used for residential development. While both scenarios are considered unlikely, they were evaluated because of the long half-lives of the contaminants involved, the uncertainties surrounding land use planning assumptions far into the future, and because of concerns expressed by local communities. Both scenarios calculated risks associated with reasonable maximum exposures, a set of assumptions that maximizes the individual's presumed exposure to the contaminant, as well as central tendency, a set of assumptions believed to be more representative of the exposures that would be incurred by the average person.

For IHSS 199, risks from both plutonium and americium were calculated and were assumed to be additive. For IHSS 200, only the risks associated with plutonium were calculated, as plutonium was the only COC there. In both IHSS's, the highest contaminant concentration(s) was used in risk calculations. The RFI/RI Report also calculated radiation doses that would be expected as a result of the recreational and residential scenarios described above.

Excess lifetime cancer risk (that is, the incremental additional cancer risk that is incurred through exposure to COC's at OU 3 or any other contaminated site) is calculated by multiplying the average daily chemical intake over a lifetime of exposure by the contaminant's individual slope factor. For radionuclides, slope factors are the average risk per unit intake or exposure for an individual in a stationary population with mortality rates typical of those in the United States in 1970. EPA guidelines indicate that excess lifetime cancer risks which are within or below the one in ten thousand (1 x 10-4) to one in one million (1 x 10-6) range are considered protective of human health.

For IHSS 199, the highest calculated excess cancer risk, assuming reasonable maximum exposures (RME) under a residential exposure was three in one million (3 x 10-6). Using central tendency, the risk under a residential exposure scenario was two in ten million (2 x 10-7). For the recreational exposure, the excess cancer risk was five in one hundred million (5 x 10-8) using the RME, and three in one billion (3 x 10-9) using central tendency.

For IHSS 200, the highest calculated excess cancer risk employing RME and the residential exposure was nine in ten million (9 x 10-7); the corresponding risk using central tendency was six in one hundred million (6 x 10-8). Using the recreational scenario, the highest risk using RME was one in one hundred million (1 x 10-8), and the risk using central tendency was eight in ten billion (8 x 10-10).

The highest calculated radiation doses for IHSS's 199 and 200 occurred using the RME, assuming a residential exposure scenario. The highest Total Effective Dose Equivalent (TEDE, which incorporates both internal and external radiation dose) for IHSS 199 for an adult was 0.12 millirem per year (mrem/yr); the corresponding TEDE for IHSS 200 is .0065 mrem/yr. These calculated doses can be compared with those recently adopted as part of the RFCA Soil Action Levels Framework, which specifies an action be taken at RFETS at a soil radiation dose level in excess of 85 mrem/year. The doses calculated from plutonium-239/240 and americium-241 in OU 3 can also be compared to those received

from natural background (including radon and cosmic rays) and man-made sources (such as medical x-rays). The average radiation dose in the U.S. is estimated to be about 300 mrem/yr, while the average dose in Colorado may be as much as 700 mrem/yr, owing to the state's higher altitude and relative abundance of naturally occurring radionuclides.

As part of the Baseline Risk Assessment, a qualitative aanalysis of uncertainties was performed. Some of the uncertainties inherent in the Baseline Risk Assessment are as follows:

- Environmental sampling in OU 3 may not have accurately characterized the amounts or distribution of hazardous substances in OU 3, which could lead to either an overestimation or an underestimation of risk posed by these substances.

- The degree to which exposure models fully reflect the activities and processes that may lead to contact with hazardous substances in environmental media cannot be fully estimated, and this may lead to an overestimation or an underestimation of risk.

- Specific land use assumptions, including development of the area now occupied by Great Western Reservoir, residential development of the Remedy Lands within IHSS 199, and reliance on homegrown meat, milk and vegetables by future residents within OU 3 may not take place. This would serve to overestimate the exposure to hazardous substances in OU 3, and thereby overestimate risk.

- No loss of hazardous substances due to leaching or erosion was considered. Since these processes would lower the concentrations of these substances, this would lead to an overestimation of risk.

- Basic uncertainties exist when applying risk factors to radiation dose or radionuclide uptake. These uncertainties relate to the model used for determining the health effects of radiation exposure, which are based on average risk per unit intake for an individual. These uncertainties could overestimate or underestimate risk.

- A final source of uncertainty is the extrapolation of risks from high doses of radiation (for example, those sustained by atomic bomb survivors or uranium miners) to much lower doses, such as those calculated for OU 3. This uncertainty could overestimate or underestimate risk.

DOE submitted the RFI/RI Report to the Agency for Toxic Substances and Disease Registry (ATSDR), a part of the federal Center for Disease Control, for the purposes of obtaining a Health Consultation. The purpose of the Health Consultation was to obtain an independent evaluation as to whether COC's had been adequately identified in OU 3, the risks to human health posed by releases of hazardous substances in OU 3, and whether the proposal for no remedial action in OU 3 was appropriate considering these risks. The ATSDR concluded that the COC selection process was based on reasonable assumptions, and that none of the constituents present in OU 3 posed public health concerns. Further, the ATSDR Health Consultation stated that no additional activities are needed in OU 3 in order to ensure the public's health.

Ecological Risk Assessment

The Ecological Risk Assessment (ERA) portion of the RFI/RI Report's Baseline Risk Assessment considered plutonium and americium as Potential Contaminants of Concern (PCOC's) for soils in IHSS 199 and in sediments of all three reservoirs. The ERA included field studies of the abundance and distribution of plants and animals in the aquatic

and terrestrial ecosystems within OU 3, collection and analysis of tissue samples for radionuclides, and calculation of hazard quotients using calculated exposures and literature-derived No Adverse Effect Levels. Field and laboratory work showed no indications of adverse effects from plutonium or americium on the ecology of OU 3. The highest calculated hazard quotient for OU 3 was 0.02, for plutonium in Great Western Reservoir sediments. Hazard quotients of less than 1.0 indicate no potential adverse ecological effects.

Conclusions

The excess cancer risks calculated in the HHRA portion of the RFI/RI Report, resulting from exposure to COC's in OU 3, are all within or well below the EPA guidance for protection of human health. Radiation exposures calculated for OU 3 resulting from contamination there were extremely small as compared with both the soil action levels negotiated for RFETS, and as compared with average background radiation doses. The ERA portion of the RFI/RI Report found no actual or predicted adverse effect on OU 3's ecology as a result of the contamination there.

Conditions in OU 3 pose no unacceptable or significant risks to human health or the environment; future unacceptable or significant exposures will not occur there as a result of past contamination. DOE concludes, therefore, that no action is necessary in OU 3 for the protection of human health or the environment.

Implementation of the no action remedy will not result in any irreversible damage to natural resources. Wetlands will not be injured; flood elevations will not be affected; groundwater will not be affected; and no permanent displacement or loss of wildlife will occur from implementation of the selected remedy. Low levels of hazardous substances will remain in soils and reservoir sediments in OU 3, but at concentrations so low that they pose no threat to human health and the environment, and will not compromise natural resource values. In areas where tilling has taken place under the 1985 Settlement Agreement, there has been substantial damage to the existing plant communities. This damage was subsequently corrected, albeit with some difficulty over the course of several years.

Explanation of Significant Changes

DOE released the Proposed Plan for OU 3 for public comment on August 7, 1996, and held a public hearing on the Proposed Plan on September 18, 1996. The Proposed Plan identified no action as the preferred remedial alternative. DOE reviewed all written comments received during the public comment period, and verbal comments received at the public hearing. Following review of these comments, DOE determined that no significant changes to the remedy, as originally identified in the Proposed Plan, were necessary.

RESPONSIVENESS SUMMARY

Overview

DOE released the OU 3 Proposed Plan for public review and comment on August 7, 1996, and the comment period extended through October 11, 1996. DOE held a public hearing on the OU 3 Proposed Plan on September 18, 1996, at which oral and written comments were solicited. This Responsiveness Summary provides a summary of DOE responses to public comments received during the comment period. DOE considered all comments received in the final selection of the remedial alternative for OU 3.

The following responsiveness summary identifies commentors and their affiliation, if any. Verbatim comments appear in quotes; comments that have been paraphrased or summarized are so noted.

Comments Received During the Public Comment Period and DOE Responses

Commentor #1: Mr. Tom Settle, City of Westminster, Colorado

Comment #1: "Westminster feels it is premature to come to a final decision and closure on this area. It is our belief that the possibility remains for contamination to move off-site during the cleanup process within the site boundaries. We suggest that this process be held open or allowed to be re-visited at some point in the future, after all cleanup is done. It makes sense to us that cleanup decisions be made starting with the worst areas and then moving outward to ensure that the overall cleanup is most effective."

Response to Comment #1: DOE disagrees that issuance of a no-action CAD/ROD is premature, given the extensive investigations into conditions in OU 3 and the assessment of the risks posed by historic releases of hazardous substances. The RFI/RI Report and the CAD/ROD for OU 3, however, deal only with past releases of hazardous substances, and not the potential for future releases by activities at RFETS. DOE recognizes that there is a possibility, however slight, of the off-site release of hazardous substances during cleanup or other site activities. In such a situation, DOE would respond according to its obligations under the RFCA and according to the statutory mandates contained in CERCLA. DOE is obligated by Federal and State law and by legally binding agreements to maintain an environmental monitoring system designed to detect and help avoid any such releases. In addition, cleanup projects at RFETS will incorporate project-specific environmental monitoring as appropriate, and plans for these projects will be available for public review and comment.

With regard to the suggestion that the process be allowed to be revisited following the completion of all cleanup, DOE intends to issues a Sitewide CAD/ROD following completion of Site cleanup. Among other issues, this document is intended to address any continuing risks posed by the Site to the off-site environment following cleanup.

DOE does not disagree that it makes sense to pursue the cleanup of the most highly contaminated areas at RFETS first. DOE, in consultation with EPA and CDPHE, has developed a priority listing of all IHSS's at RFETS, with the intent to help guide cleanup planning and project selection. Other factors, including budget, IHSS accessibility and the ability to combine similar projects also affect the selection and sequencing of cleanup projects at RFETS. DOE has chosen to pursue a CAD/ROD for OU 3 at this time because

the data in the RFI/RI Report support one, and because DOE is obligated to share its findings on OU 3 with the public, and to act on these findings.

Comment #2: "An important part of the entire cleanup process is establishing the standards by which the decisions are made. The U. S. Environmental Protection Agency (EPA) is in the process of establishing a nationwide soils standard. Since the OU 3 areas are entirely separated from the plant site, we would urge the application of the new final standard to the OU 3 evaluation process to reinforce to the public that the decisions are appropriate. The final OU 3 Record of Decision (ROD) would have to be delayed in order to accommodate this request. An alternative would be to specify in the ROD that there should be a review of the OU 3 findings based on the new standard when it is promulgated by EPA."

Response to Comment #2: The decision to undertake no action at OU 3 was made based upon an extensive evaluation of the data generated by the RFI/RI, the identified Contaminants of Concern, and the risks posed by past releases of hazardous substances in OU 3. DOE does not believe that it is necessary to delay a CAD/ROD for OU 3 in order to await promulgation of a nationwide soils standard for radionuclides. However, DOE is mindful that a nationwide soils standard, had one been available, would have been an important consideration in the OU 3 CAD/ROD process. Therefore, the OU 3 CAD/ROD will be re-examined at such time as a nationwide soils standard for plutonium and/or americium is promulgated for consistency with such a standard, or on a five-year basis, consistent with CERCLA Section 121. This will be noted in the OU 3 CAD/ROD Declaration.

Comment #3: "In regards to Standley Lake, it is our opinion that the sampling of the reservoir was not done adequately to truly characterize the potential effects of the radiological contaminants which have been deposited there. There are still unanswered questions as to the quantity of Plutonium or Uranium constituents which may be released into the water column during periods of oxygen deficiency at the bottom of the reservoir. These periods can occur twice per year in Standley Lake and can be quite severe, both in oxygen levels and duration. The reduction of other metals back into the water column has already been well documented. Similar problems in Pond C-2 have been discussed in public meetings at various times in the past."

Response to Comment #3: The sampling of surface water in Standley Lake did not detect plutonium or uranium in the water column at concentrations that would be indicative of the remobilization of these contaminants as a result of reducing conditions at or near the bottom of Standley Lake. The RFI/RI Report concludes that, even under reducing conditions, the adsorption of plutonium onto clay particles is not fully reversible. In addition to the water sampling results referenced in the RFI/RI Report, monthly sampling of these constituents in Standley Lake confirms their continued presence at very low levels, consistently below site-specific water quality standard promulgated by the Colorado Water Quality Control Commission. While Standley Lake may experience regular periods of oxygen deficiency at depth, DOE believes that the large body of water quality data available from Standley Lake does not support the hypothesis that uranium or plutonium are being remobilized from sediments in quantities that pose any concern to human health or the environment.

Commentor #2: Mr. Tim Holeman, City of Broomfield (note: the following are responses to written comments submitted by Mr. Holeman on behalf of the City)

Comment #1: "In light of DOE's use of conservative health risk scenarios and the risk associated with draining and dredging the reservoir, Broomfield believes that leaving the sediments untouched in the short-term is consistent with its short-term future use of the reservoir as a water reuse facility."

Response to Comment #1: DOE did not specifically evaluate a scenario in which Great Western Reservoir would be used for water reuse, as such a plan had not been developed at the time that the RFI/RI Report was being written. DOE did strive to employ the most conservative foreseeable use scenarios in evaluating the risks posed by Great Western reservoir sediment contamination. DOE cannot comment specifically on Broomfield's plans for future reservoir uses. The RFI/RI Report considered that Great Western Reservoir would be retained as a drinking water source. Even under this conservative scenario, no constituents were identified as Contaminants of Concern, because of the low concentrations of hazardous substances found in the waters of Great Western Reservoir, and the correspondingly low risks posed by these substances.

Comment #2: "Broomfield is not satisfied that leaving residual plutonium in the sediment, particularly the shoreline sediment, is an appropriate long-term solution. Regular review of sediment contamination levels and remedial alternatives should be a condition of a no-action alternative."

Response to Comment #2: DOE believes that leaving contaminated sediments in place in Great Western Reservoir is not inconsistent with any future use scenario because of the low risks that these sediments have been calculated to pose. Therefore, that review of remedial alternatives is not appropriate. The undertaking of any remediation is not supported by the findings of the RFI/RI Report. However, DOE believes that it is appropriate to re-examine a no action alternative for OU 3 at such time as a national standard for radioactive soil contamination is promulgated by the EPA. If a nationwide standard is set such that remediation would be required in OU 3, the feasibility of various remedial alternatives would be examined at that time.

Comment #3: "Broomfield believes that additional feasibility research into alternatives to 'no action' should be conducted. For instance, are there cost effective ways to remove 'hot spots' in the bottom of the reservoir, on the shoreline, and on the hillside? In the absence of a formal feasibility under CERCLA, DOE should conduct a future review of plutonium health risk and the prospects of using innovative technology to remove even residual quantities of plutonium - particularly along the Great Western Shoreline. What activities is DOE undertaking to locate innovative soil washing techniques?"

Response to Comment #3: As stated earlier, based upon the results of the RFI/RI Report, the risks posed by OU 3 are so low that evaluation of remedial alternatives is unwarranted. With regard to health risk evaluation, DOE has asked the Agency for Toxic Substances and Disease Registry (an agency of the federal Center for Disease Control) to provide DOE with an independent review of the OU 3 RFI/RI Report conclusions in the form of a Health Consultation. This Health Consultation is attached, and supports the RFI/RI Report's conclusion that no action is appropriate in OU 3. With regard to innovative technologies, such as soil washing, to remove residual plutonium in soils, DOE is planning to investigate technologies that would make removal of on-site soils effective and efficient. In the event that soil standards are promulgated at some future time, and a review of the no action alternative in this CAD/ROD indicates that remedial action is necessary to protect human health and the environment, the results of the on-site technology selection process would be available to assist in such a circumstance.

Comment #4: "Future cleanup activities upstream could substantially alter the long-term prospect of plutonium loading in the Walnut Creek Drainage and the reservoir. DOE should conduct additional modeling and documentation of the prospect for future loading. Ongoing studies regarding plutonium mobility and transport must be evaluated to document

the likelihood of mass loading on an annual basis. Additional analysis of the plutonium solubility will also impact sediment loading issues?"

Response to Comment #4: There are no current or future plans to conduct modeling of future plutonium loadings into Great Western reservoir. DOE does plan, however, to conduct monitoring of off-site discharges to determine concentrations of plutonium and other contaminants in waters leaving RFETS. Such monitoring will be conducted pursuant to the requirements of the RFCA, as well as other statutory and regulatory requirements. DOE will also conduct environmental monitoring, as appropriate, in conjunction with individual on-site cleanup actions.

Comment #5: "Recent alterations in DOE's process water management program - particularly the Interceptor Trench waters - have substantially changed the assumptions made in the RI regarding releases into Great Western. DOE should reassess its assumptions regarding downstream release in light of new budget priorities and the release of the Ten Year Plan."

Response to Comment #5: The RFI/RI Report considers the risks posed by past releases of hazardous substances in OU 3 and determines the need for action, if any, based upon those risks. The RFI/RI Report for OU 3 makes no assumptions regarding ongoing alterations to the RFETS water management program. Ongoing water management at RFETS is governed by a number of statutory controls and regulatory agreements. Of particular note is the RFETS Integrated Water Management Plan, being prepared pursuant to the RFCA. The City of Broomfield (along with other entities such as EPA, CDPHE, the U.S. Fish and Wildlife Service and the Cities of Westminster, Thornton and Northglenn) has been an active participant in the development of this Plan. The RFETS Integrated Water Management Plan will be reviewed annually.

Comment #6: "As DOE undertakes key CERCLA/RCRA decision-making processes, the potential impacts to the Walnut Creek Drainage and Great Western remain unclear. DOE should document the specific future decision-making points where it will re-evaluate the wisdom of a 'no-action' alternative. For instance, will the final CAD/ROD for the entire site include off-site OU's? What is the process of a five-year review anticipated under CERCLA? What is the impact of EPA's future promulgation of a soil radiation standard?"

Response to Comment #6: Section 121(c) of CERCLA (42 USC 9621), which provides for the five-year review process, states: "If the President selects a remedial action that results in any hazardous substances, pollutants or contaminants remaining at the site, the President shall review such remedial action no less often than each 5 years after the initiation of such remedial action to ensure that human health and the environment are being protected by the remedial action being implemented." Consistent with this Section, the OU 3 CAD/ROD will be reviewed in light of a soil radiation standard promulgated at some future time. If a future standard is sufficiently stringent such that additional action at OU 3 may be required, DOE will evaluate such additional actions consistent with its responsibilities under CERCLA and the RFCA, and the action ultimately selected would be subject to public review prior to implementation. The final CAD/ROD for the entire site will consider the potential impacts of on-site activities to off-site areas in reaching a final decision.

Comment #7: "DOE should demonstrate that existing levels of residual plutonium or potential future releases into the soil and sediments of the reservoir do not jeopardize the value and usefulness of this important City asset."

Response to Comment #7: The RFI/RI Report concludes that the risks posed by residual levels of contamination in OU 3, even under very conservative use scenarios, justify taking no action there. DOE believes that this conclusion is appropriate, well-documented, and protective of human health and the environment. As stated previously, the RFI/RI Report does not consider potential future releases of hazardous substances in OU 3.

Comment #8: "How will a 'no action' level impact the 1985 lawsuit settlement between landowners and DOE, and the third party beneficiary including the City, regarding soils cleanup? The City is not convinced that the proposed action meets the spirit and intent of the 1985 settlement."

Response to Comment #8: The RFI/RI Report meets the spirit and intent of the 1985 settlement by determining the risks posed by past releases of hazardous substances in OU 3. The RFI/RI Report demonstrates that these past releases pose so little risk to human health and the environment that no remedial action is warranted.

Commentor #3, Ms. Paula Elofson-Gardine, Environmental Information Network (NOTE: the following comments were submitted as oral comments during the public hearing on September 18, 1996. They have been excerpted and summarized from the public hearing transcripts.)

Comment #1: With the very high winds that we have here, in excess of 100 miles per hour, our contention is that the majority of releases have been blown far beyond the perimeter monitors and far out into the communities. So we feel that a lot of the sampling that has gone on too close to the Plant has not tracked past releases well.

Response to Comment #1: Figure 4-6A of the RFI/RI Report shows concentrations of plutonium in suface soils at RFETS and in OU 3. This Figure uses the "Exhaustive Data Set," that is, the data set that incorporates the findings of historic studies as well as data collected specifically for the RFI/RI Report. Figure 4-6A illustrates that the highest surface soil levels of plutonium occur near the 903 Pad at RFETS, and that levels drop quickly and significantly to the east and south of RFETS. For the most part, samples taken two to three miles from RFETS had plutonium contents that were below the calculated background levels of 0.09 pCi/g. Based upon these data, DOE believes that plutonium distribution in OU 3 soils has been well-defined. DOE also believes that there has been no off-site release of plutonium that has been sufficiently large so as to warrant remedial action.

Comment #2: I haven't seen much tracking of americium, which is a daughter product of plutonium. We would like to see a much broader aerial gamma survey done of the whole area, for example, parts of Westminster, such as Countryside, Walnut Creek, perhaps a little farther out to the south of Standley Lake, Leyden, and northwest Arvada. We feel that these areas have been overlooked for decades and are the maximally exposed communities from the major accidents and releases at the facility.

Response to Comment #2: Figure 4-6B in the RFI/RI Report shows concentrations of americium in surface soils at RFETS and in OU 3. Similar to the plutonium data referred to in the foregoing response, Figure 4-6B shows the highest concentrations of americium in soils near the 903 Pad at RFETS, with levels dropping quickly east and south of there. Levels of americium in surface soils drop to below background (calculated at 0.04 pCi/g) within two to three miles of RFETS. DOE believes that these data adequately define the distribution of americium in OU 3, and that additional aerial gamma surveys for americium are not needed. As with plutonium, DOE believes there are no off-site levels of americium in soils that warrant remedial action.

Comment #3: We feel that since there is still remediation to occur at the Site, in addition to dismantling or tearing down buildings, there is still a great risk to the community of migration of contaminants off site, and that this is not well addressed in terms of recontamination of OU 3. This should be pursued as an alternative risk pathway workup with respect to OU 3 RI/FS and the final decision.

Response to Comment #3: The OU 3 RFI/RI, and the CAD/ROD, address only past releases of hazardous substances to OU 3. RFETS has a number of environmental monitoring and pollution prevention programs, which are mandated by law or by enforceable agreement, designed to help detect and avoid any future releases; these programs are referenced in the CAD/ROD. Future remedial actions at RFETS, as well as building demolition, will incorporate project-specific environmental monitoring that will be designed to detect and avoid releases from these projects.

THIS TARGET SHEET REPRESENTS AN
OVER-SIZED MAP / PLATE FOR THIS DOCUMENT:
(Ref: 97-DOE-0542; RF/RMRS-97-073.UN)

Annual Update for August 1, 1996 through August 1, 1997 Historical Release Report (HRR)

Plate 1:

Individual Hazardous Substance Sites by Consolidated Operable Unit

As of August 1997

Map ID: 97-0179-IOU

September 23, 1997

CERCLA Administrative Record Document, Sw-A-002435

U.S. DEPARTEMENT OF ENERGY
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

GOLDEN, COLORADO

THIS TARGET SHEET REPRESENTS AN
OVER-SIZED MAP / PLATE FOR THIS DOCUMENT:
(Ref: 97-DOE-0542; RF/RMRS-97-073.UN)

Annual Update for August 1, 1996 through August 1, 1997 Historical Release Report (HRR)

Plate 2:

No Further Action Individual Hazardous Substance Site and Potential Areas of Concern

(Including Proposed NFAs)
As of August 1997

Map ID: 97-0171-NFA

September 25, 1997

CERCLA Administrative Record Document, Sw-A-002435

U.S. DEPARTEMENT OF ENERGY
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

GOLDEN, COLORADO

THIS TARGET SHEET REPRESENTS AN
OVER-SIZED MAP / PLATE FOR THIS DOCUMENT:
(Ref: 97-DOE-0542; RF/RMRS-97-073.UN)

Annual Update for August 1, 1996 through August 1, 1997 Historical Release Report (HRR)

Plate 3:

Original Process Waste Lines and Associated IHSS Locations

Map ID: 97-0179-OPWL

September 18, 1997

CERCLA Administrative Record Document, Sw-A-002435

U.S. DEPARTEMENT OF ENERGY
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

GOLDEN, COLORADO

THIS TARGET SHEET REPRESENTS AN
OVER-SIZED MAP / PLATE FOR THIS DOCUMENT:
(Ref: 97-DOE-0542; RF/RMRS-97-073.UN)

Annual Update for August 1, 1996 through August 1, 1997 Historical Release Report (HRR)

Plate 4:

Potential Areas of Concern

Map ID: 97-0179-PAC

September 13, 1997

CERCLA Administrative Record Document, Sw-A-002435

U.S. DEPARTEMENT OF ENERGY
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

GOLDEN, COLORADO

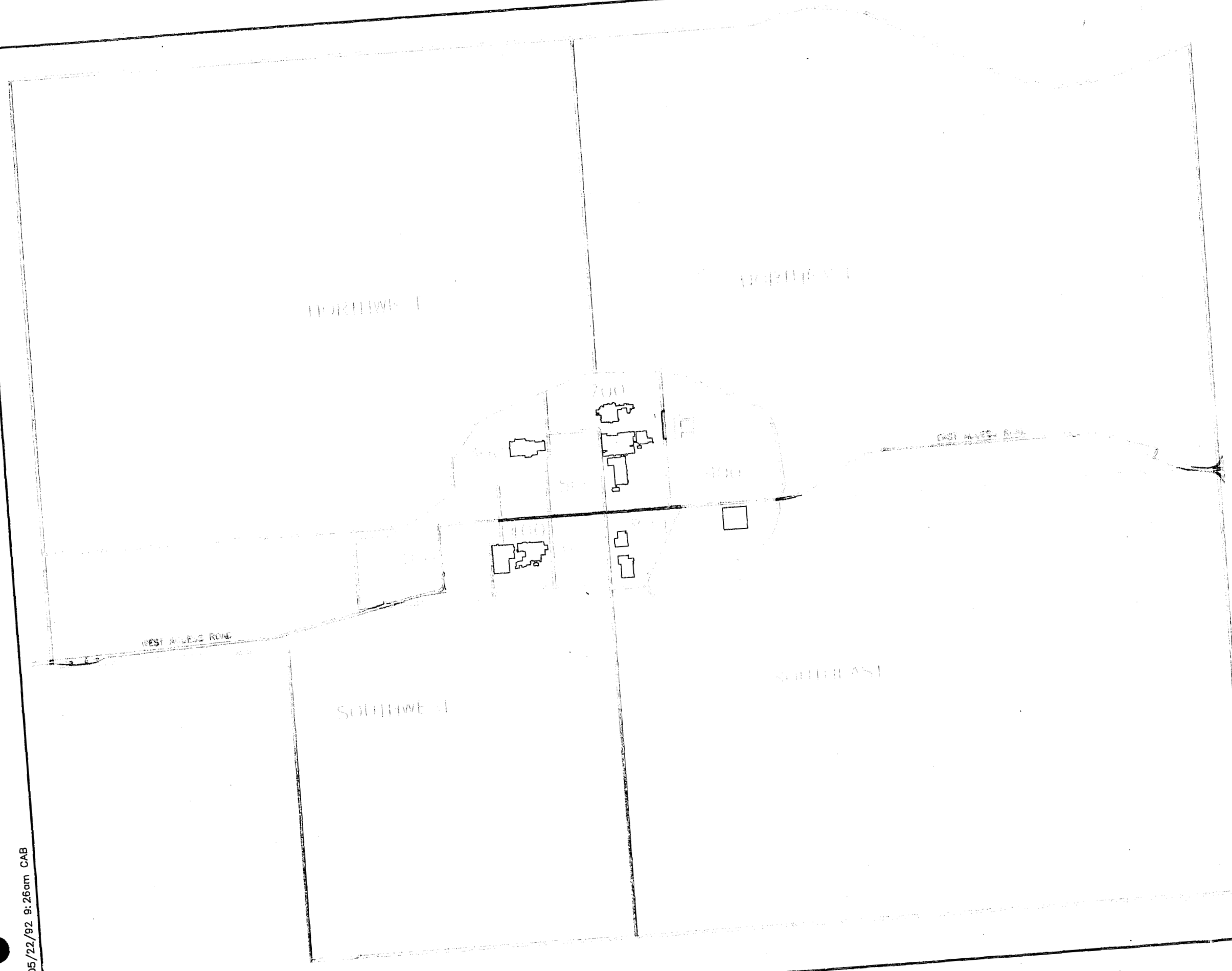

Figure 1-1

SCALE

0 1650 3300 FEET

Note: PAC Areas with 000 prefix and Offsite PAC Areas not shown

PREPARED FOR:
U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant
Golden, Colorado

TITLE:
PAC AREA BOUNDARIES

REVISED 5/22/92

PROJ. NO.	304944	DWG. NO.	304944-B121	SHEET
DESIGN BY	A. VIRGIL	CHECKED		OF
DRAWN BY	A. VIRGIL	APPROVED	FJB	
DATE	12/18/91	SCALE	AS SHOWN	

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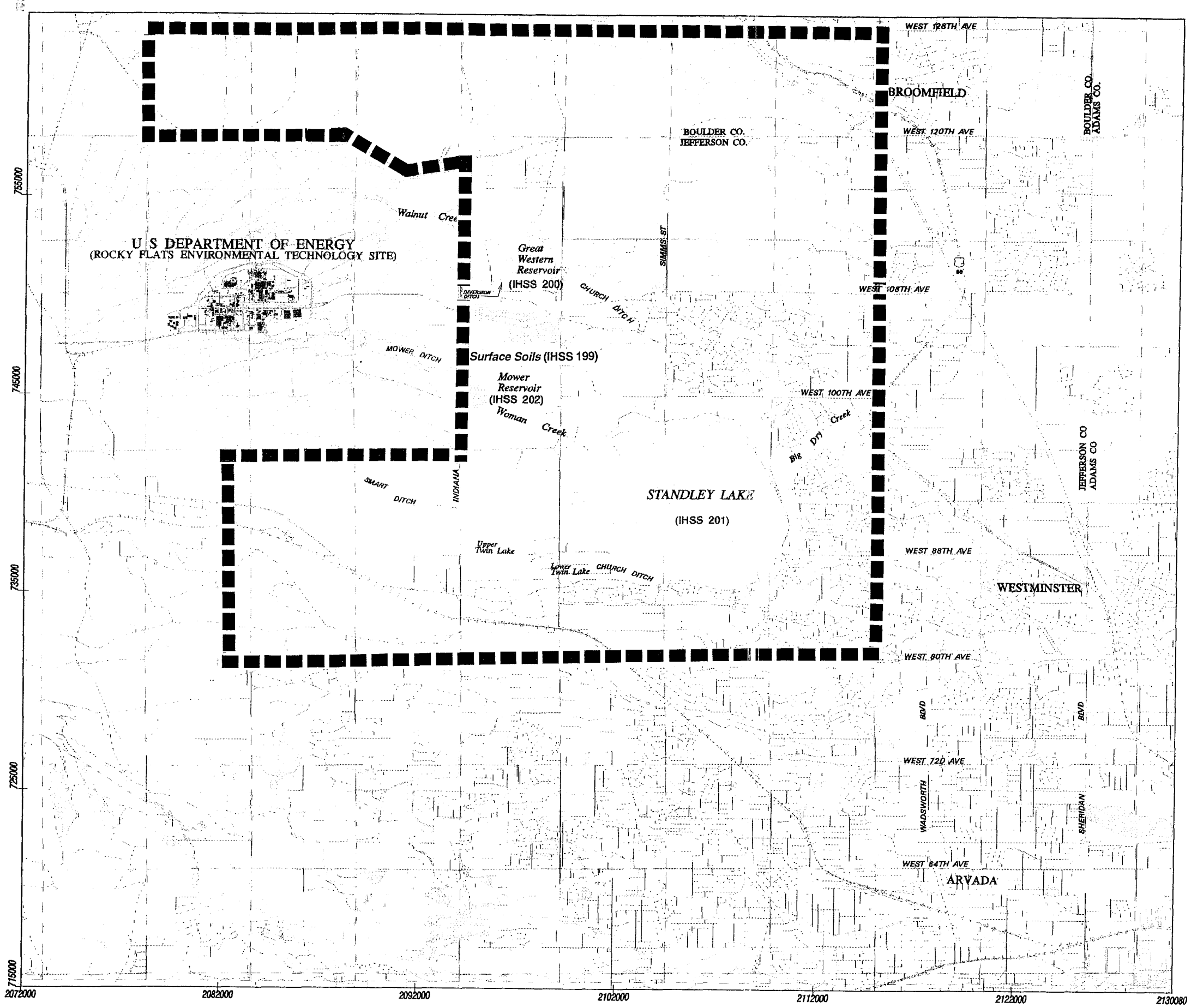


Figure 3-1

Operable Unit 3 Location Map

ROCKY FLATS
ENVIRONMENTAL TECHNOLOGY SITE
U.S. Department of Energy

OU3 Study Area

untilled
tilled — Remedy Lands Area (IHSS 199)

Note: The OU3 study area shown is not intended to represent a definitive boundary and is subject to change.

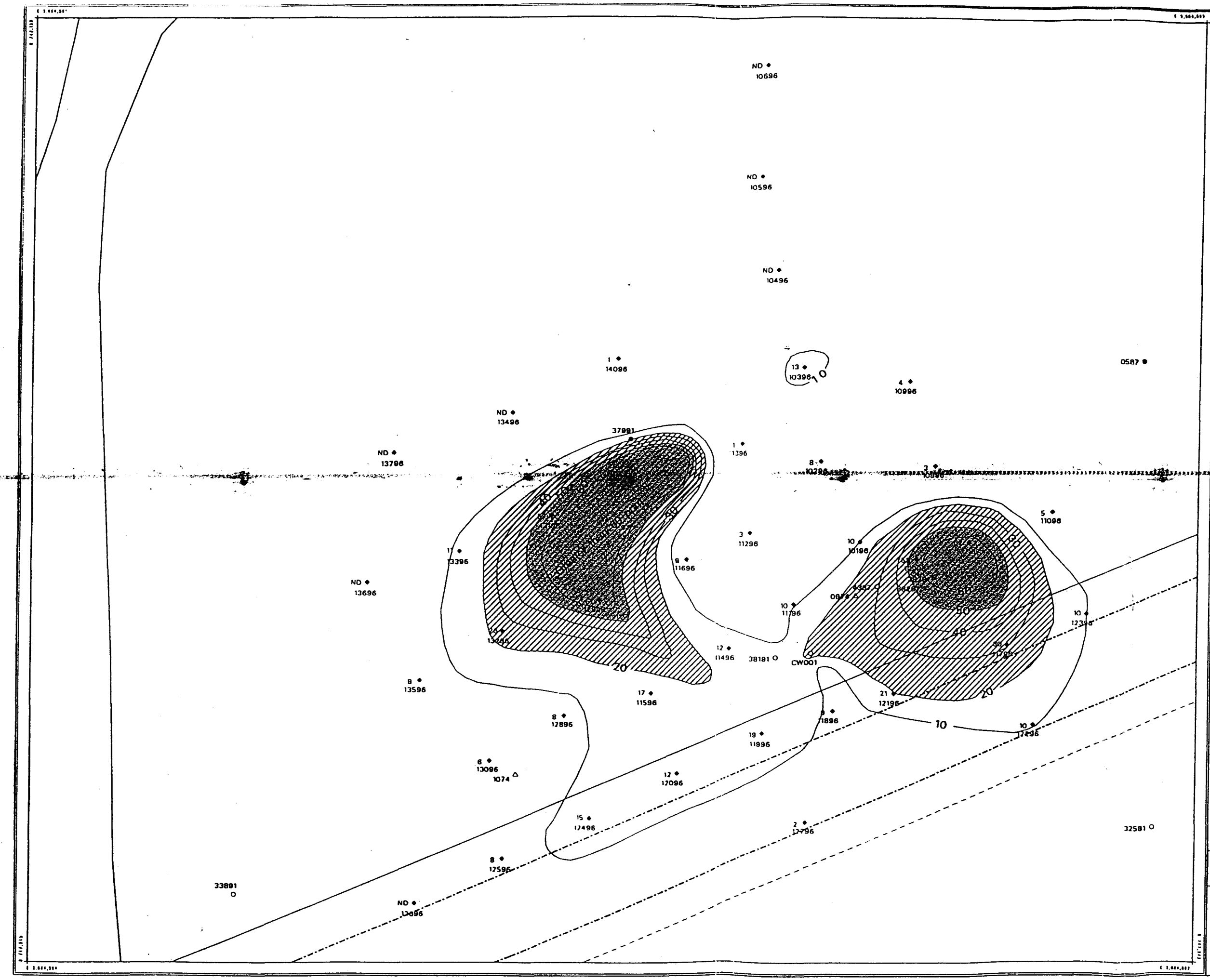
Mapping Sources:
Jefferson County Mapping Dept.
EG&G Rocky Flats, Inc.
U.S. Geological Survey

Scale 1:63360
1 inch = 1 mile

0 0.5 1 2
MILES

N

Polyconic projection. 1927 North American datum.
Colorado central zone state plane coordinate system.



881 Hillside Area (OU1) In the Vicinity of IHSS 119.1

Volatile Chlorinated Hydrocarbon Head Space Concentractions

Figure 3

EXPLANATION

- △ Pre-1986 Wells (Abandoned)
- ◆ Borehole Locations
- ○ Groundwater WELLS (Alluvium)
- ● Groundwater WELLS (Bedrock)
- ● Piezometers
- Individual Hazardous Substance Sites
- Fences
- Dirt Roads
- Contours Intervals 10 ppm

ND = Not Detected
NS = Not Sampled
Head Space readings in ppm
Detection limit 0.1 ppm

Concentrations represent greatest readings from 0-22 feet below grades

Estimated excavation Area using 20ppm head space concentrations as the cut off.

Estimated excavation area using 50ppm head space concentrations as the cut off.

DATA SOURCE:
Ground Water data provided by RMRS/Hydrogeology, - 1995.
Borehole Sampling locations provided by Geosciences.

N

Scale = 1 : 250
1 inch represents approximately 21 feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

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

Prepared by:
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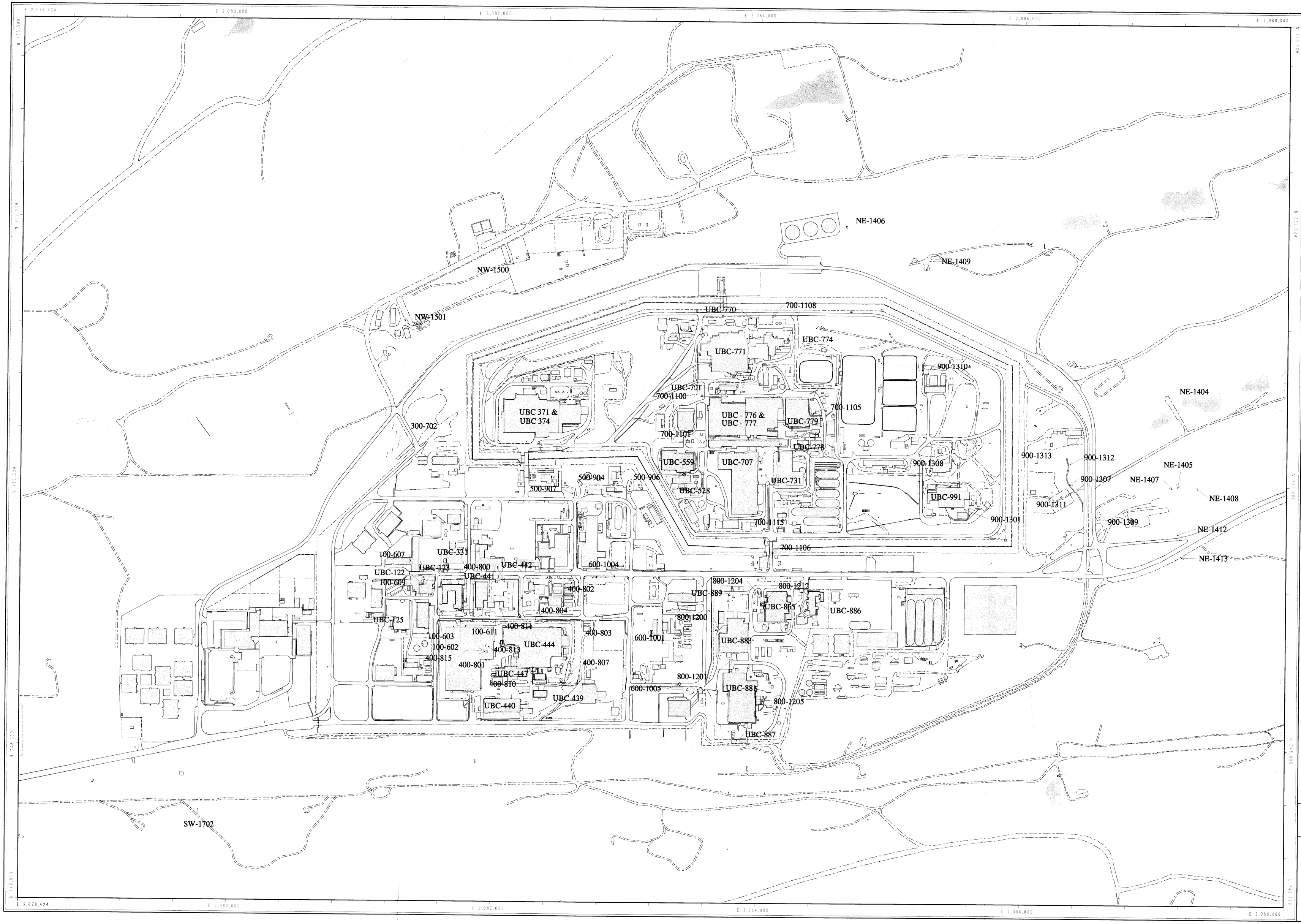
MAP ID: Fig6-1

April 26, 1996



Potential Areas of Concern

(As of Aug. 1997)

Plate 4

EXPLANATION

UBC-559	Under Building Contamination Potential Area of Concern
900-1310	Potential Area of Concern
NE-1406	Potential Area of Concern Point Spill

Standard Map Features

- Buildings or other structures
- Solar evaporation ponds
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Paved roads
- Dirt roads

DATA SOURCE:
Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas.
Digitized from the othophotographs. 1/95
PAC's
Historical Release Report (HRR)
Twelfth Quarterly Update
July 31, 1995

Scale = 1 : 3600
1 inch represents 300 feet

250 0 500 1000ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
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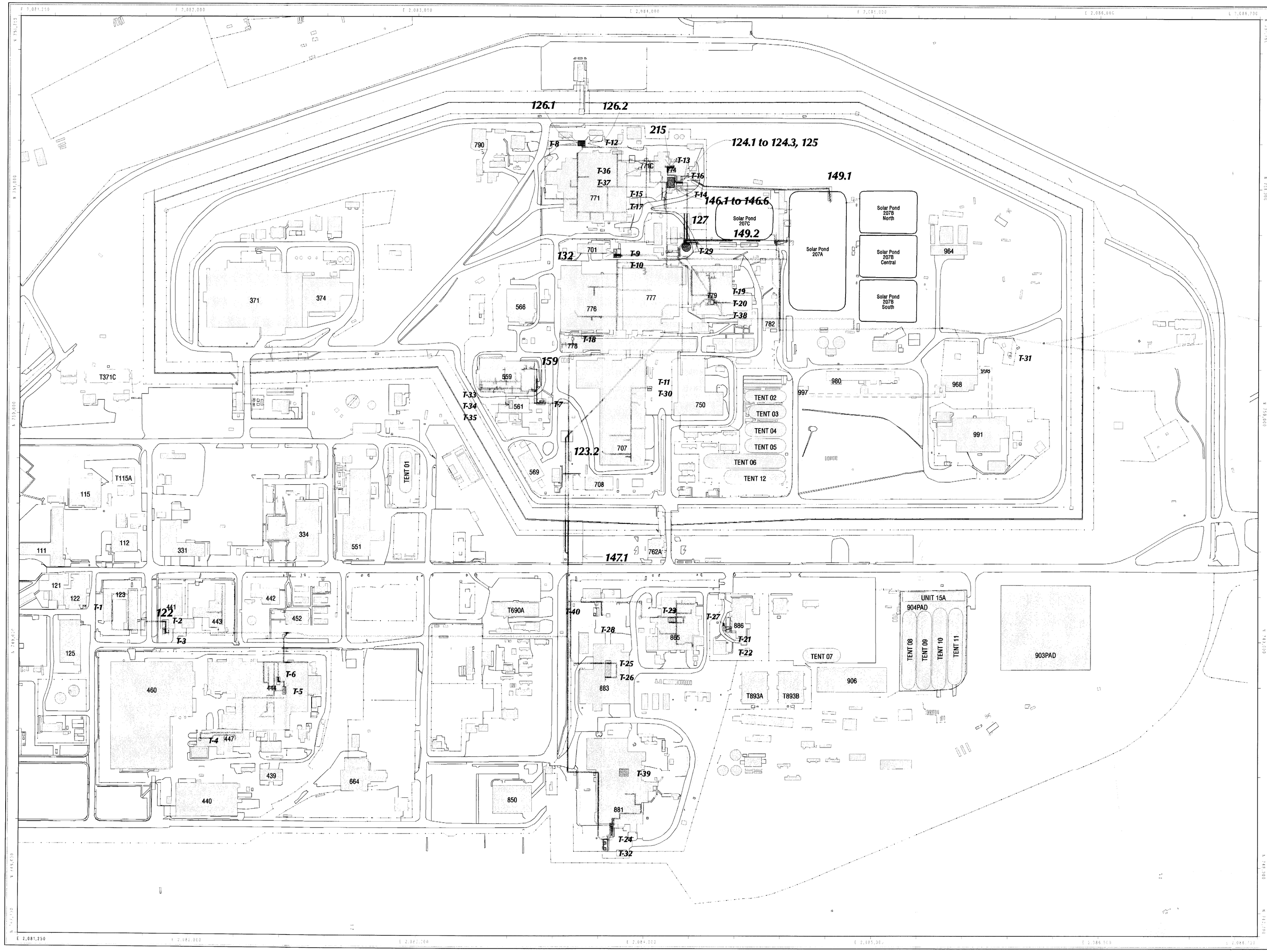
MAP ID: 97-00179-PAC

September 23, 1997



Original Process Waste Lines and Associated IHSS Locations

Plate 3

EXPLANATION

- Tanks of Concern
- Foamed & Stabilized Tanks (Source Removed - Interim Status)
- Remaining Tanks
- Process Waste IHSS Locations (Former OU 9 IHSSs)
- Original Process Waste Lines
- Location of Original Process Waste Lines which may have been removed.

Standard Map Features

- Buildings or other structures
- Solar evaporation ponds
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Paved roads

DATA SOURCE:
Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas. Digitized from the othophotographs. 1/95

Scale = 1 : 2400
1 inch represents 200 feet

100 0 200 400ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

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

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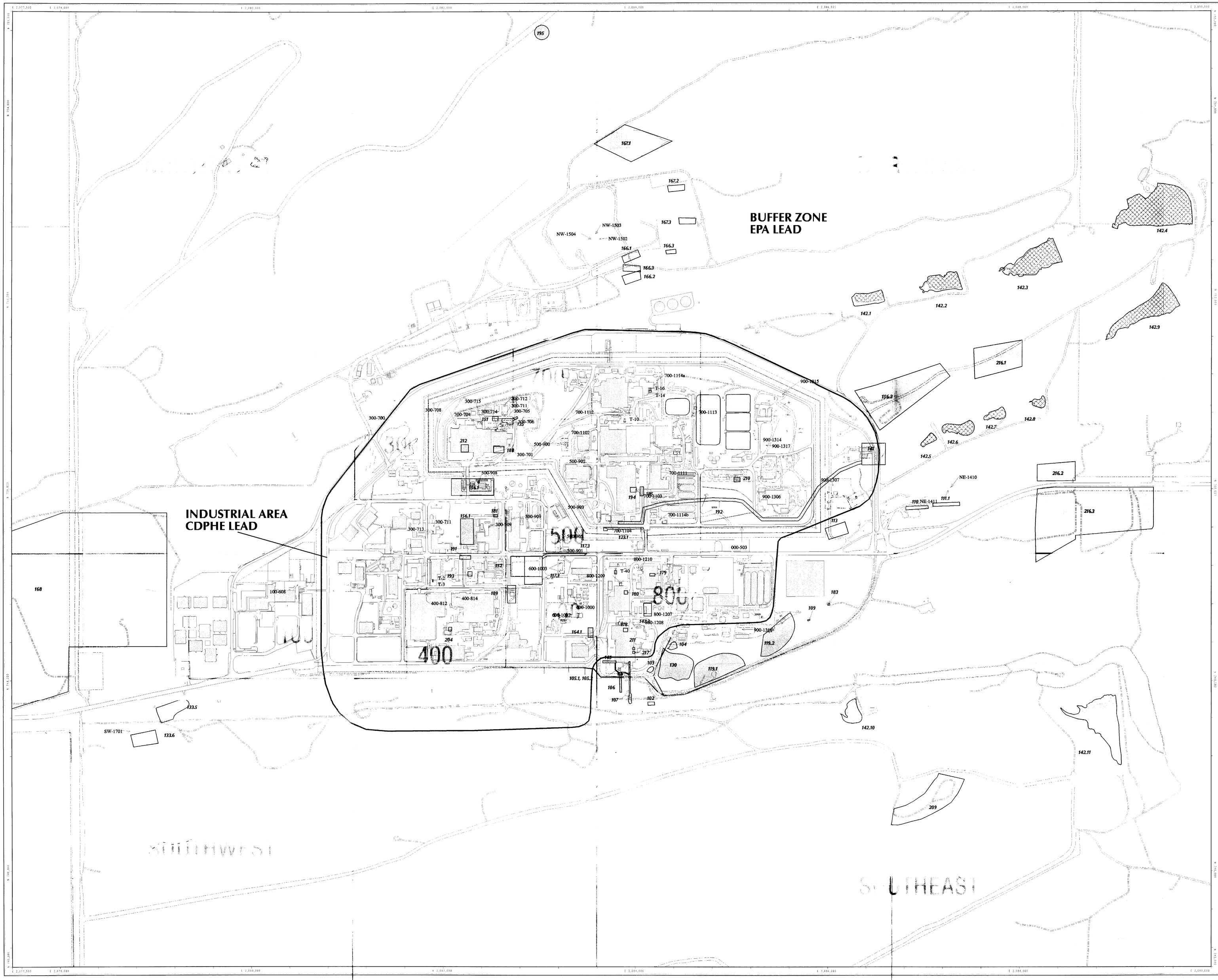
MAP ID: 97-0179-OPWL

September 18, 1997



No Further Action Individual Hazardous Substance Sites and Potential Areas of Concern

(Including Proposed NFAs)
(As of Aug. 1997)

Plate 2

(Former Operable Units)

- Operable Unit 1 (Closed through CAD/ROD Process)
- Operable Unit 2
- Operable Unit 5
- Operable Unit 6 (Note: IHSS 142.12 - "Flume Pond" at Walnut Creek & Indiana Street not shown due to map scale.)
- Operable Unit 7
- Operable Unit 8
- Operable Unit 10
- Operable Unit 11 (Closed through CAD/ROD Process)
- Operable Unit 12
- Operable Unit 13
- Operable Unit 14
- Operable Unit 15 (Closed through CAD/ROD Process)
- Operable Unit 16 (Closed through CAD/ROD Process)

NOTE: Operable Unit 3 (IHSS 199, 200, 201 and 202) not shown due to scale. (Closed through CAD/ROD Process)

Potential Area of Concern (Proposed as No Further Action)

- Foamed & Stabilized Tanks (Source Removed - RCRA Interim Status)

Standard Map Features

- Buildings or other structures
- Solar evaporation ponds
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Paved roads
- Dirt roads

DATA SOURCE:
Individual Hazardous Substance Sites (IHSS)
OU1 - RI/RI Phase III Report
OU2, 4, 7, 11, & 15 - HRR
Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas.
Digitized from the othophotographs. 1/95

Scale = 1 : 4800
1 inch represents 400 feet

250 0 500 1000ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy

Rocky Flats Environmental Technology Site

Prepared by:

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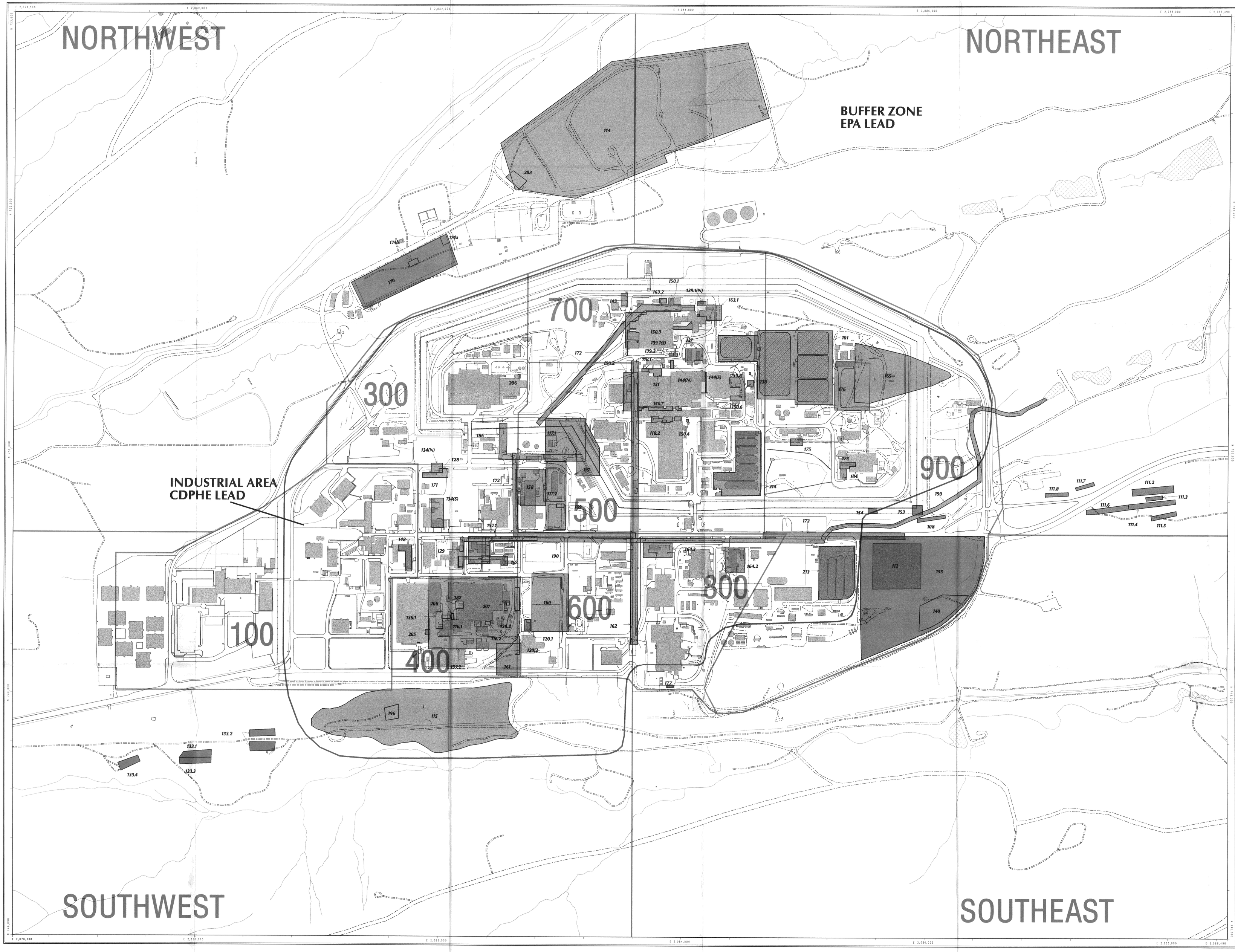
MAP ID: 97-0171-NFA

September 25, 1997



Individual Hazardous Substance Sites by Consolidated Operable Unit

(As of Aug. 1997)

Plate 1

Industrial Area Operable Units

- Industrial Area OU

Buffer Zone Operable Units

- Buffer Zone OU
- Operable Unit 5
- Operable Unit 7

NOTE:
Operable Unit 3 (OU3) that comprises the area East of Indiana Street is not shown on map.

Former Operable Unit 9 (OU9), that is now part of the Industrial Area Operable Unit, is shown on a separate map for clarity. (See Map-ID 97-0179-IOU9)

Other Map Features

- Buildings or other structures
- Solar evaporation ponds
- Lakes and ponds
- Streams, ditches, or other drainage features
- Fences and other barriers
- Paved roads
- Dirt roads
- Industrial Operable Unit (IOU) Boundary
- PAC Area Boundary

DATA SOURCE:
Buildings, fences, hydrography, roads and other structures from 1994 aerial fly-over data captured by EG&G RSL, Las Vegas.
Digitized from the othophotographs. 1/95
Individual Hazardous Substance Sites (IHSS)
OU1 - RF/RI Phase III Report
OU2, 4, 7, 11, & 15 - HRR
Remaining OU's defined by their respective Workplan.

Scale = 1 : 3600
1 inch represents 300 feet

200 0 400 800ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy

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MAP ID: 97-0179-IOU

September 23, 1997